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PSYCHOLOGICAL AND PEDAGOGICAL CONDITIONS OF APPLICATION OF QR-CODES IN MODERN TEXTBOOKS OF THE NEW UKRAINIAN SCHOOL

Lesia Viktorova

Doctor of Pedagogical Sciences, Professor
Yevhen Bereznyak Military Diplomatic Academy, Kyiv, Ukraine

 <https://orcid.org/0000-0002-4072-974X>

 viktorova2022@gmail.com

Artur Kocharyan

Candidate of Pedagogical Sciences,
Institute of Gifted Child of NAES of Ukraine, Kyiv, Ukraine

 <https://orcid.org/0000-0003-3854-4532>

Valeryii Lashcul

Candidate of Pedagogical Sciences, Assistant,
National University of Life and Environmental Sciences of Ukraine
Kyiv, Ukraine

 <https://orcid.org/0000-0002-3709-3306>

 lash58095@gmail.com

Olena Korotun

Candidate of Pedagogical Sciences,
Kyiv National University of Trade and Economics, Kyiv, Ukraine

 <https://orcid.org/0000-0001-9600-1849>

 ol.korotun@gmail.com

The article outlines the problems and prospects of using QR-codes in modern textbooks of the New Ukrainian School. The analysis of the modern scientific researches devoted to problems of the modern textbook in the context of the use of QR-codes is generalized. Prospects for the integration of modern information and communication technologies on the example of QR-codes with the traditional presentation of educational material in the

textbook are considered. It was found that the use of this technology has certain advantages for improving the quality of learning, individualization of learning and will extend the overall impact on traditional teaching literature in the context of solving a number of issues (maximum information on the minimum space of the textbook page, use of activity approach to learning, etc.). Psychological and pedagogical conditions of effective use of QR-codes in modern textbooks of the New Ukrainian school are singled out.

Keywords: modern textbook; information and communication technologies; QR code; blended learning.

Among the problems of modern school education, the problem of school textbooks, which, being the most important cultural product, is one of the key elements of the educational process and is of particular interest. In recent years, the problem of school textbooks has become the focus of many experts in the field of pedagogy, psychology, methodology, various subject disciplines.

The concept of the New Ukrainian School stipulates that updating the content and methods of teaching students involves reorienting the educational process to the result of education in the activity dimension, and therefore shifts the emphasis from the accumulation of knowledge, skills to the ability to apply learning experiences in solving real specific life tasks. It is clear that these guidelines should be reflected in modern textbooks. In accordance with the Order of the Ministry of Education and Science of Ukraine «On Approval of Instructional Materials for Experts to Conduct Examinations of Electronic Versions of Textbook Projects» № 1183 from 31.10.2018 defined scientific and methodological, psychological and pedagogical, anti-discrimination, design and sanitation requirements for a modern textbook.

Given the implementation of the concept of the New Ukrainian School and the implementation of this order of the Ministry of Education and Science of Ukraine, the leading requirement for a modern textbook is to strengthen its developmental impact on the learner, namely the focus on listening, seeing and feeling (development of mental processes); the ability to plan their own educational activities, analyze, compare and summarize educational material (development of general learning skills); development of creative abilities and critical thinking. Given the conditions for the introduction of competency-based and personality-oriented approaches in the educational process, a modern textbook should also have a significant share of practice-oriented tasks.

The urgency of the problems of the modern textbook is deepened in the conditions of the COVID19 pandemic, when students spend more time in the format of independent mastering of educational material. Active introduction of the blended learning format, distance learning only actualizes the problem of textbook modernization — the student should spend more time on independent mastering of the textbook and other sources.

Thus, we can state the following contradictions:

- between the sanitary and hygienic requirements for printed materials for students and the volume of the content of the textbook, which must comply with the curriculum and the general provisions of the concept of the New Ukrainian School;
- between the sanitary and hygienic requirements for printed materials for students and the time that students have to spend on mastering the content of the textbook in accordance with the curriculum;
- between the need in the context of the COVID19 pandemic for the introduction of blended learning and the adaptation of modern textbooks to these realities of today.

The use of QR-codes in modern textbooks of the New Ukrainian School will, in our opinion, resolve these contradictions.

Analysis of recent research and publications. With the reforms of the New Ukrainian School, the reform of textbooks in Ukraine had begun. Key competencies and cross-cutting skills are the basis, the basis for successful learning of the student (New Ukrainian School, 2016). A modern textbook should also become competence-oriented. Thus, O. Baranovska (2018) defines the following levels of changes in the modern textbook: object, structural, qualitative and level. The authors of primary school textbooks are constantly improving the methodological base of textbooks (e. g. N. Bibik, M. Vashulenko, O. Vashulenko, O. Savchenko)

The works of O. Baranovska (2021) are devoted to the possibilities and prospects of a school textbook in the conditions of blended learning. O. Svistunov summarizes the prospects for the use of information and communication technologies (ICT) in textbooks and notes that «the current level of development of technologies provides ample opportunities to increase clarity in learning» and highlights the problematic issue, which is that modern textbooks and technologies develop in parallel planes, intersecting purely conditionally» (2012, p. 145). Y. Melnyk. (2021) investigates the scenarios of using QR-codes in modern textbook creation on the example of physics textbooks and notes the effectiveness of their use. L. Popova's research confirms that the use of QR-codes in modern textbooks should be used to the maximum (2019, p. 39).

Thus, our analysis of recent research and publications and the author's experience show that the use of modern ICT on the example of QR-codes in the textbooks of the New Ukrainian School is not new in scientific research. However, despite the significant number of such studies, they remain relevant due to the emergence of new technologies and their rapid development, which stimulates the constant search for new scenarios for their application and insufficiently studied psychological and pedagogical conditions for their effective use.

The aim of the article is to determine the psychological and didactic conditions for the effective use of QR-codes in modern textbooks of the New Ukrainian School.

Presenting main material. We consider it appropriate to clarify the conceptual apparatus and find out what we mean by «psychological and didactic conditions for the use of QR-codes in modern textbooks of the New Ukrainian School» (PDC) — these are

external and internal circumstances that affect the effectiveness of QR-codes in modern textbooks and ensure their adequacy of use in accordance with the age of the student and the subject content.

The concept of «effectiveness» characterizes the quality of learning. We agree with O. Matveieva, who notes that quite often the problem of measuring the effectiveness of learning is replaced by criteria that relate only to determining the quality of learning, although «education is only one component of learning», so «efficiency as a quality of learning can not be comprehensive characteristics, if it is considered only in the framework of the psychological theory of assimilation» (2015, p. 267).

Today, research is being conducted on the modernization of the educational process through the use of computer technology based on Internet resources. We consider it appropriate to involve the Internet in the educational process in the simplest, most accessible and purposeful way (modern textbook) through the use of mobile phones and QR-codes.

QR-code (quick response) — matrix code (two-dimensional bar code). The main advantage of the QR code is easy recognition by scanning equipment (including a mobile phone camera). Today, this more than ever reflects the essence of the problem, because no additional special devices are required for scanning. Just bring the smartphone to the code and you can get all the necessary information. QR codes are already used in modern textbooks. However, we found in open sources psychological and didactic conditions for the effectiveness of their use in modern textbooks.

Thus, a QR-code is a link that is designed as a simple image that can redirect the user of any modern gadget to the desired page of the Internet. QR codes transmit links to websites and files, eliminating the need to manually enter complex URLs or use search engines.

Most often, when working with the textbook, and especially in blended learning, the teacher needs to demonstrate the image in the dynamics (animation), clarify and compare some of the data presented in the description. Many nuances in a short paragraph are almost impossible to describe due to the lack of time and volume of the printed version of the textbook. However, short video links, animations, enlarged 3D images and drawings of the textbook largely avoid some of the shortcomings of the printed version of the textbook.

Studies by scientists-practitioners, authors of NUS textbooks, have shown that the greatest effect on students is caused by short fragments of the video series (not more than 4–5 minutes). After getting acquainted with the additional content, students lose a number of questions on the content of the direct paragraph of the textbook; in addition, there is interest in educational material. Consider the example of how to integrate a typical picture from a textbook with a QR-code (Fig. 1).

As you can see, the QR code does not obscure the essence of the images, but it is separate and allows you to scan it. No additional instructions are required for the education

provider — the very fact of having a QR-code on the page implies the need to scan it. In this case, the link takes the user to a YouTube page New Ukrainian School(https://www.youtube.com/watch?v=V_SpW0blo4A&ab_channel=%D0%9D%D0%A3%D0%A8) — Art lesson 1st grade, textbook page 12–13.



Fig.1. Fragment of the textbook «Art» for the 1st grade
(O.V Kalinichenko, L.S Aristova), 2018

And this, of course, has a certain advantage in the use of QR-codes in modern printed textbooks:

- ease of use;
- fast and convenient access to the required array of data (information);
- the maximum amount of information that can be placed on the minimum page area of the textbook.

However, there are some usage warnings:

- not all students have smartphones;
- not all students have access to the Internet to scan links and get to the right resource on the Internet;
- The issue of children’s safety on the Internet, the reliability of reliable information on the link, the possibility of its hacking and posting on the link of prohibited, harmful or unethical content remains debatable.

Analyzing the available research, we believe that the lack of criteria for the effective use of ICT, and in the context of our work the use of QR-codes in the modern textbook, has led to the formation of certain stereotypes about the form, structure and content of school textbooks that may hinder the development and implementation of textbooks of the new generation in the practice of schooling. Such stereotypes can affect both textbook authors, experts who are responsible for identifying and evaluating their relevance to the scientific understanding of the modern textbook, and teachers who are responsible for choosing “the best textbook for their students», and for parents who are worried about their children when an «unusual» textbook appears in class. Let’s summarize the main of these stereotypes.

Narrow subject orientation of the textbook. It is assumed that its content and structure are determined by the logical connections of scientific knowledge in the relevant subject area. Accordingly, the content space of the textbook, as a rule, can be limited to the given samples of scientific knowledge with clear descriptions of the facts, definitions of concepts, formulations of conclusions within the given subject area. In addition, the textbook presents a mandatory minimum knowledge (information) and tasks that students must master. In our opinion, the use of QR-codes can significantly expand these boundaries and promote competence training.

The predominance of reproductive-explanatory type of presentation of educational material, as a result, there are criteria for assessing learning outcomes, which guide both teacher and student to reproduce the information contained in the textbook by its author. The use of QR-codes will significantly expand both the scope and content of the information provided and direct the student to a more applied and practical application of the acquired knowledge. For example, these could be links to video channels or pages of research institutions or libraries.

The requirement of conciseness and brevity of the presentation of educational material. Usually, this requirement is based on the idea that «the shorter the textbook, the simpler and therefore better it is». However, the irrationality of this criterion for evaluating a school textbook is obvious, because in reality, when reducing (collapsing) the volume of the textbook, its complexity increases, respectively, increasing the difficulty of understanding it by students. It is the reference to additional training resources that can solve this irrationality.

The style of the school textbook should be maintained in the genre of educational and scientific literature without any elements of curiosity and popularization. Of course, the textbook is a book that presents a scientific, consistent, accurately stated content of the subject. However, drawing such a hard line between educational-scientific and popular science literature leads to the fact that the school textbook turns into a boring, uninteresting book for the student. The application of modern technologies in the context of NUS reform allows not only «revive» it, but also to significantly enrich the resource.

Subject knowledge set out in the textbook is a sufficient basis for the formation of techniques and methods of educational and cognitive activities. As a result, the procedural side of learning is usually taken out of the textbook and redirected to teaching methods. Focus on the activity approach, which involves the practical application of the information obtained in practice and a broader independent study of a particular topic — all this significantly expands the use of QR-codes in modern textbooks.

The textbook records some mandatory content for all students, the pace of which, its number and level of difficulty for different students are guided by the teacher. That is, it is the teacher who determines when and how the textbook will be used. Students are required to work in strict accordance with the instructions to work out the required section of the textbook (for example, solve a number of problems, read two paragraphs

at home and retell them in class, etc.). However, the use of QR-codes, on the contrary, more individualizes the learning process, makes it more meaningful depending on the desired level of knowledge of the student.

Therefore, in order to avoid the emergence of such stereotypes, special attention should be paid to stimulating students' interest in the subject by means of the textbook, and in the context of this work — the use of QR-codes. Let's highlight the advantages of using QR-codes for students:

- explaining to students the importance of their knowledge and skills in an exciting, more vivid form;
- creating conditions to stimulate students' mental activity: knowledge is not presented in a ready form, students must «acquire» it;
- answers are formulated by students independently;
- the use of figurative presentation of the material, including images of abstract grammatical concepts in the form of drawings;
- a variety of educational material;
- correspondence of the content and volume of the material for children of the appropriate age, while the format of its mastering is easy and interesting.

Conclusion. Among the problems of modern school education, the problem of school textbooks remains especially relevant, which must meet not only scientific and methodological, psychological and pedagogical, anti-discrimination, design, sanitary and hygienic requirements, but also be modern, interesting and motivate students to study a real modern textbook. The use of modern information and communication technologies can successfully solve this problem.

The use of smartphones and tablets due to QR-technologies is becoming increasingly popular in the educational process. As practice and analysis of the scientific literature on modern textbooks have shown, students are willing to apply technical innovations, both in everyday life and in the educational process.

Systematic and rational use of QR-technologies from the pages of a modern textbook during the educational process helps to increase the motivation of cognitive activity of the learner. By following a coded link, students get access to full-length audio and video content (podcasts, educational films, webinars, etc.). At the same time, we are convinced that the key to the effective use of QR-technologies is the presence of motives for its successful educational activities.

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***Вікторова Леся**, доктор педагогічних наук, професор, Воєнно-дипломатична академія імені Євгенія Березняка, м. Київ, Україна.*

***Кочарян**, кандидат педагогічних наук, Інститут обдарованої дитини НАПН України, м. Київ, Україна.*

***Лашкул Валерій**, кандидат педагогічних наук, асистент кафедри романо-германських мов і перекладу, Національний університет біоресурсів і природокористування України, м. Київ, Україна.*

***Коротун Олена**, кандидат педагогічних наук, доцент, Київський національний торговельно-економічний університет, м. Київ, Україна.*

ПСИХОЛОГО-ПЕДАГОГІЧНІ УМОВИ ЗАСТОСУВАННЯ QR-КОДІВ В СУЧАСНИХ ПІДРУЧНИКАХ НОВОЇ УКРАЇНСЬКОЇ ШКОЛИ

У статті окреслено проблеми й перспективи застосування QR-кодів у сучасних підручниках Нової української школи. Узагальнено аналіз сучасних наукових досліджень, присвячених проблематиці сучасного підручника в контексті використання QR-кодів. Розглянуті перспективи інтеграції сучасних інформаційно-комунікаційних технологій на прикладі QR-кодів з традиційним викладом навчального матеріалу у підручнику. З'ясовано, що використання зазначеної технології має певні переваги для покращення якості навчання, індивідуалізації навчання та поширить в цілому вплив на традиційну навчально-методичну літературу в контексті вирішення низки питань (максимальний обсяг інформації на мінімальному просторі сторінки підручника, вирішення питання яскравої візуалізації та наочності, використання діяльнісного підходу до навчання та ін.). Виокремлені психолого-педагогічні умови ефективного застосування QR-кодів у сучасних підручниках Нової української школи.

Ключові слова: сучасний підручник; інформаційно-комунікаційні технології; QR-код; змішане навчання.