R E S E A R C H   A R T I C L E S
Д О С Л І Д Н И Ц Ь К І   С Т А Т Т І

The impact of electronic textbook applications on the structure of social communications in educational publishing

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The article aims to provide a theoretical understanding of the changes in the social communication environment of educational publishing resulting from the development of electronic applications for textbooks. The relevance of this study lies in the search for a concept of a high-quality cross-media textbook. The research **methodology** is based on a socio-communicative approach. The key features of the educational publishing domain have been identified, providing grounds for considering it a social communication institution. Based on Gerhard Maletzke's mass communication model, models of communication fields for printed and cross-media textbooks have been created. Using the method of comparing communication environments, the main differences in the communication activities of educational publishers are described. The position of cross-media textbooks in the communication field is described using data obtained during five years of work and research at an educational publishing house. As a **result**, it was determined how digital channels of information delivery affect the form and content of cross-media textbooks. The changes in communication interaction between the publishing object and the audience are outlined. The communicative purpose of a cross-media textbook is substantiated. The identified communication relations will help to form a system for assessing the quality of a printed textbook with an electronic application.

Keywords: social communication approach, Maletzke's mass communication model, cross-media textbook, textbook with electronic application, educational publishing, editorial and publishing workflow

Вплив електронних додатків до підручників
на структуру соціальних комунікацій у навчальному книговиданні

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У статті викладено теоретичне осмислення змін у соціальнокомунікаційному середовищі навчального книговидання, що викликані появою електронних додатків до підручників. Актуальність дослідження пов'язана з пошуком концепції якісного кросмедійного підручника. Методологія дослідження побудована із застосуванням соціальнокомунікаційного підходу. Визначено головні особливості сектору навчального книговидання, що дають підстави вважати його соціальнокомунікаційним інститутом. На основі схеми масової комунікації Ґергарда Малецького створено моделі комунікаційних полів друкованого та кросмедійного підручників. За допомогою методу порівняння комунікаційних середовищ наведено основні відмінності в комунікаційній діяльності видавництва навчальних видань. Місце кросмедійного підручника в комунікаційному полі описано із залученням даних отриманих під час п'ятирічного досвіду роботи й наукової діяльності у видавництві навчальної літератури. У результаті визначено, як цифрові канали доставлення інформації впливають на форму та зміст кросмедійного підручника. Окреслено, як змінюється комунікаційна взаємодія між видавничим об'єктом та авдиторією. Обґрунтовано комунікаційне призначення кросмедійного підручника. Виявлені комунікаційні зв'язки допоможуть сформувати систему оцінювання якості друкованого підручника з електронним додатком.

Ключові слова: соціальнокомунікаційний підхід, модель масової комунікації Герхарда Малецке, кросмедійний підручник, підручник з електронним додатком, навчальне книговидання, редакційно-видавничий процес

Education around the world is becoming digital. The learning process is shifting to electronic means of information delivery, thereby reshaping the representation of knowledge. Changes are affecting the form and content of publishing products, the channels used to distribute them, and the roles of the parties involved in the social and communication process.

Whereas the Internet previously played a primarily advertising and informational role in publishing communications, promoting the advantages of publishing products to representatives of educational institutions, it is now evolving into a comprehensive channel for the distribution of educational products. Digital textbooks, educational platforms, and electronic publications are sometimes circulated without the involvement of a traditional publisher.

The year 2025 marked the emergence of a new type of educational publishing product in Ukraine's school textbook production – a printed textbook combined with an electronic supplement. Drawing parallels with cross-media products in mass media which create connections between different platforms through hyperlinks and QR codes, the term "cross-media textbook" was proposed to refer to a paper textbook with an inseparable digital component (Herasymova & Zhenchenko, 2022).

A cross-media textbook represents a new product in the field of educational publishing, specifically in the area of social communication. Since "social communication is always a systemic phenomenon" (Rizun, 2022, p. 3), the emergence of a new product should lead to changes in the system of communication, including participants, organizational forms, customs, and the official legal framework. The change in what constitutes a textbook, along with the expanded

understanding of its concept, and the approval of requirements for the electronic supplement to a textbook raise several questions: How should this type of publication be evaluated? What standards should editors in publishing houses follow to prepare it? What principles should guide a harmonious integration of the printed and electronic sections? How can teachers be taught to use the resources of a cross-media textbook effectively?

Without a socio-communicative context, attempts to answer these questions will lack the depth that communicative processes provide. To formulate practical recommendations for ensuring the quality of textbooks that include electronic applications, it is necessary to consider textbooks not as isolated artefacts, but as products of social communication activity involving various social actors – editors, authors, teachers, students, the state, software developers, and other stakeholders in the education sector.

The aim of this study is to provide a theoretical overview of the changes in the socio-communicative environment of the educational publishing sector resulting from the creation of interactive electronic applications for textbooks. The objectives of the study are: 1) to define a model of the communication field of a cross-media textbook, or a printed textbook with an electronic application; 2) to analyze a cross-media textbook as a product of social communication activity by answering the following questions:

A. How do the channels of information delivery influence the form and content of a cross-media textbook?

B. How does the interaction between the cross-media textbook and its recipient unfold during information delivery and processing?

C. What effect does the publisher seek to achieve on the audience when creating a cross-media textbook?

Completing these tasks will help determine the intended purpose of a cross-media textbook in the social communication environment, justify the requirements for the form and content of a textbook with an interactive electronic application, and clarify the nature of cross-media links in this type of publication.

Method

To clearly observe the transformations in the editorial and publishing process resulting from the transition to cross-media textbook production, a comparative method was employed. The study compared communication models for traditional and cross-media publishing products. For this purpose, Gerhard Maletzke's communication model (1963) was selected and adapted 1) to the publishing process, where the communication product is a monomedia paper textbook, and 2) to the process where the communication product is a paper textbook with an electronic supplement. A schematic representation of these processes and subjects of communication allowed for a comparison of the two models, illustrating the cross-media textbook as a product of social and communication activity within the editorial and publishing process.

The socio-communicative approach enables an analysis of the editorial and publishing activities of educational literature publishers "in the context of social interaction between social institutions, means and social roles" (Rizun, 2016, p. 289). To trace the communication links that influence the stages of the edit-publishing process and the communication product itself, the study attempts to prove that educational publishing can be regarded as a social communication institution. Data on the interaction between publishers and participants in the textbook production process, along with external influences, were gathered through an analysis of scientific sources and supported by the author's five years of experience working at the educational literature publishing house "Ukrainian Educational Publishing Center Orion".

Working at the publishing house provided insight into the internal processes of the organization and served as a source of empirical observations. Key informants included editors and managers, the majority of whom had prior experience at the state publishing house "Osvita". Given

that the publishing communities within the school education book sector are often resistant to field research, this "internal" perspective on publishing practices proves to be especially valuable for academic research. The author recognized the risk of seeing social reality solely through the lens of key informants. Therefore, a combination of qualitative and quantitative research methods was employed to substantiate the conclusions and critically evaluate the collected data.

In this study, the socio-communicative approach and understanding of the socio-communicative environment draw upon the scientific works of Volodymyr Rizun (Rizun, 2017; Rizun, 2022). This approach was employed by Svitlana Fiialka to study educational literature (Fiialka, 2019), while Olga Trischuk (Trischuk, 2018) and Emilia Ogar (Ogar, 2016) utilized it to examine editorial and publishing processes within publishing houses.

Results and Discussion

Digitalization and global changes in education have highlighted the complexity of the textbook production system. In December 2015, a conference organized by the German Research Foundation (DFG) initiated an international dialogue on how the production of educational materials is evolving in the digital age (Sammler et al., 2016). The position paper, which reflects the results of the discussion, analyzes the production practices of creating educational media from the perspectives of four stakeholders: authors, the state and interest groups, political economy and business models, and changes in technology, particularly in the media sector. The authors' viewpoints, supported by scholarly sources, highlight the non-standard and unique complexity of the communication model involved in producing textbooks and educational content.

Researchers first examine the concept of a "broken market" (Sammler et al., 2016, p. 16). The argument is that the school textbook market has a flawed sales logic, where manufacturers and suppliers of publishing products do not have direct access to the end consumers – students and their parents. To reach these readers, publishers must convince teachers – another vital audience – of the quality of their products, so that they, as intermediaries, choose the right textbooks for their students. This structure of the communication process adds another mediator, another filter through which the communication product passes, layering the means of communication influence.

In addition, "the political governance of textbook production through formal approval procedures was repeatedly criticized by textbook publishers as hindering their ability to predict potential economic profitability, an aspect that could be dramatically improved by including state actors in planning processes from an early stage" (Sammler et al., 2016, p. 16). Similarly, in Ukraine, regulations governing the competitive selection of textbooks, requirements for the quality of educational materials, and rules for the preparation and selection of quality assessment experts affect not only publishers but other stakeholders too. To a certain extent, they shape the opinions of teachers, authors, and society at large.

The aforementioned German researchers also regard the role of the author of a textbook or other educational media as unconventional. "Textbooks give a voice not so much to their author(s) as to the owner of the intellectual property they contain; the textbook's discourse is spoken by an unknown entity, sometimes an institution, which is more-or-less authorized by society" (Sammler et al., 2016, p. 6).

John B. Thompson's theory of "publishing fields", further developed by Marina Zhenchenko, allows us to view the educational book publishing sector not as a part of the publishing industry, but as a distinct field with its own agents of action and influence, specific interrelationships, and "a logic determined by established traditions and historically formed publishing practices, as well as the functional purpose of the products being created" (Zhenchenko, 2018). The researcher of transformations in the publishing industry notes that each field is undergoing its own, sometimes unique, transformations.

The field of educational publishing is notable for the high degree of institutionalization and technologization of its communication and production processes, as well as the leading role of publishing in the educational process. Jocelyn Hargrave, who holds a PhD in publishing with 25 years of experience in the educational publishing industry (including Oxford University Press, Cambridge University Press, and Cengage Learning), presents several arguments in favor of viewing educational publishing as a distinct sphere within the publishing industry. If summarized, the researcher states that educational publishing operates through distinct value and supply chains. Publishers commission content in accordance with official curricula, adhering to strict editorial standards that prioritize both educational accuracy and market viability. Profitability relies on backlists and curriculum-driven new editions, while marketing is mediated through teachers and academics rather than directed at end-users (Hargrave, 2014, p. 36).

Educational book publishing and pedagogy are so intertwined that, in today's reality, most of the publishing team may consist of professionals with pedagogical background who have experience teaching in schools. Consequently, editors at educational publishing houses often assume the role of education experts, collaborating as co-authors on educational programs, textbooks, and workbooks. Notable examples include Iryna Krasutska, the editor-in-chief at the Ukrainian Educational Publishing Centre "Orion," who co-authored publications for primary schools in the Ukrainian language and reading course, and Olga Korshunova from the publishing house "Osvita," the author of educational programs, textbooks, and workbooks in computer science.

Educational publishing as a social communication institution

Examining the educational publishing sector from the perspective of a socio-communicative approach involves analyzing the activities of educational publishers "in the context of the production of this subject area by socio-communicative institutions and its functioning in society, its impact on society, and the study of society's response to the subject area" (Rizun, 2016, p. 289).

Educational publishing operates within the social institution of education. The publishing process, which specializes in the production of educational materials, fulfils a communicative function, organizing the public exchange of knowledge through its products. When viewed as a social and communicative institution, publishing consists of various entities (organizations, publishers, professional communities, the state, and users), means (media, technologies, and channels), and norms (laws, ethics, and standards), all working together to fulfill a socially significant function: convey meaning. Within this framework, educational publishing can be seen as a subsystem or subordinate institution.

Nevertheless, when comparing the regulatory framework and communication network system that support the sustainable organization of educational book publishing with other types of publishing activities, educational book publishing can be regarded as a separate socio-communicative institution. The system of social interaction in educational book publishing involves publishers, the Ministry of Education and Science of Ukraine, its administrative bodies (such as the Institute of Education Content Modernization, the Ukrainian Institute of Education Development), printing companies, educational institutions, and their representatives (teachers, methodologists, and directors), as well as end users (students and parents). Educational publishing is integrated into the educational system and is subordinate to the Ministry of Education and Science. It also has its own standardized genres developed within the Ukrainian education system. The social communication institution of educational publishing regulates communication in the field of education and science. Its network enables the creation of various types of educational publishing products. "This network is technological. Specific social institutions are responsible for its functioning. The purpose of social institutions is to provide people with certain information of social content, i.e., socially significant knowledge that can be used by people to satisfy their needs" (Rizun, 2011, p. 311).

Social communication within the education system takes place in several "technological systems of spiritual unity among people: the publishing network, the Internet, and the documentation system" (Rizun, 2022, p. 3). In other words, it is not only educational publishing that provides the entire communication process, even though it is the leading system for providing students and teachers with educational products. Instead, the documentation system plays an intermediary role, serving as a channel of communication between publishers and the Ministry of Education and Science, along with its various administrative bodies.

Communication models for creating printed and cross-media textbooks

In traditional textbook creation, the nature of connections between the participants in communication is unconventional (for example, communication and authority between the author and editor, students and teachers, and students and publishers) and is further complicated by the direct influence of various external actors within the system.

In cross-media textbook production, the usual communication process is augmented by electronic media, which includes stakeholders such as companies that create digital content, software developers, and copyright holders and its own patterns of communicative interaction. Consequently, the communication process for cross-media textbook production cannot be linear.

To ensure that important elements and communication links are not overlooked, the cross-media textbook creation framework was developed based on the traditional model used for paper textbook creation. In search for a foundational structure for the communication process, attention was drawn to Gerhard Maletzke's model from 1963. The choice of this model is justified by two key factors:

- the creation of a textbook is highly dependent on communicators who belong to different communication institutions and on their mutual perception;
- the media —as the intermediary, in this case, the publishing house—functions more as a "relay, and not as an autonomous communicator with own initiative and message" (Ioniță & PĂSTAE, 2017, p. 51).

Maletzke's model is based on Harold Lasswell's communication model from 1948, which consists of five elements: sender, message, medium, receiver, and effect. Maletzke excluded the effect element from his structure because "he believed this represents the fundamental issue in mass communication" (Ioniță & PĂSTAE, 2017, p. 49). Additionally, he applied the "cybernetic category of interdependence" to his model, which encompasses two principles: 1. Parameters control, correct and adjust each other; 2. The study of specific variables is relevant only if you consider the functioning of the entire system" (Ioniță & PĂSTAE, 2017, p. 49).

Unlike Lasswell, Maletzke refers to the sender as a communicator. His view of publishing as "a filter that can alter information to various degrees" seems methodologically significant for constructing a model of publishing communication (Ioniță & PĂSTAE, 2017, p. 50): the layout of a printed textbook (especially the adaptation of the author's material to a multimedia format) that complies with all regulatory and customary filters significantly reformats the author's original. According to Maletzke, "a communicator is that entity which generates the content and the form of the public message depending on social, cultural and psychological factors" (Ioniță & PĂSTAE, 2017, p. 50). At the same time, the intended form of the medium influences the content of the message. In textbook creation, the standards and criteria for expert evaluation of content, along with testing conclusions, often dictate the textbook's content. Conversely, the publisher influences the form, as clearly demonstrated in the creation of the concept of a cross-media textbook. Although the number of pages, format, paper, and printing options also impose restrictions on the author's ideas.

Roland Burkart adapted Maletsky's model for digital communication but did not include the Internet as a linear connection. In his model, the Internet functions as an intermediary that structures messages, influencing their form and content. Burkart's model assumes that "the digital

communication processes take place via a technological medium and the messages are not filtered by any agent" (Ioniță & PĂSTAE, 2017, p. 53). However, for textbooks – whether electronic or cross-media – and in the digital environment, there are numerous filters that shape the final product in various ways. The nature of the medium's control over interactive relationships remains unclear in this model, especially since digital communication allows participants to alter their roles.

The communication field model of a printed textbook

Based on Maletzke's model, a communication model of traditional textbook production was initially created, where the transmitter is a printed textbook (Figure 1). In this model, the structural elements of the communication process are the author, content, publisher, paper textbook, teacher, and children. The publisher does not perform the functions of a transmitter, as it does not interact directly with the audience; rather, it ensures the materialization and physical transmission of the message, i.e., it performs the infrastructural role of a participant. The textbook acts as a medium for the transmission of knowledge. The position of the transmitter emphasizes the independence of the textbook as a communication subject – it is not only a product but also a transmitter that operates independently from the user's viewpoint.

In the communication scheme we propose, unlike Maletzke's scheme, a filter for competitive textbook selection appears, which separates the transmitter from the end consumers. The filter in this scheme resembles a sieve wall, reflecting the competitive processes that impact the product from the author's initial concept through to the final stage of producing the original publishing layout. Competitive selection acts as a barrier, allowing only certain textbooks to reach the target audience.

Our diagram also has two audience groups: teachers and children. Children are excluded from direct communication channels, as all communication with the author regarding the educational product is conducted by the teacher. However, it is impossible to completely exclude students from the communication process, as all requirements for the textbook and its design must take into account the comprehension abilities of children at specific age levels. The communication diagram does not include parents at all, although it is generally accepted that they are responsible for the purchasing and, accordingly, the consumer capacity of children. However, in traditional textbook creation practices, the influence of parents is secondary and manifested through public opinion (Figure 1).

The communication field model of a cross-media textbook

The primary difference between the communicative field of a cross-media textbook and that of a printed textbook lies in the publisher's and the textbook's stronger position, as they engage in a wider range of communicative interactions and influence more factors. A communication product can be the result of the activities not only of the author and publisher, as in the traditional model, but also of a multimedia publishing partner, IT developers of state or commercial platforms, state platforms (e.g., the All-Ukrainian Online School), etc. However, despite the participation of all these actors in the textbook creation process, none possess the same level of influence as the publisher. Editors at the publishing house set the rules and requirements for the text, images, and multimedia design of the content (Figure 2).

In cross-media production, when developing an application as a supplement to a traditional textbook, the publisher can now communicate directly with teachers, children, and parents (all three elements of the audience are included in the scheme) without the author's mediation. Editors are increasingly involved in developing model curricula and coordinating groups of authors for further textbook creation. The publisher defines the concept of the textbook, including an electronic supplement, and provides teachers, students, and parents with instructions on how to work with the platform and its individual technological components. Editors moderate meetings between authors and teachers, talking about textbooks, manuals, and digital learning platforms. In addition to such direct communication with the audience, publishers incorporate electronic feedback forms

on their platforms to gather data on interactions with the interactive elements of the cross-media textbook. Such forms of communication free publishers from the need to act as intermediaries between authors and readers.

Figure 1
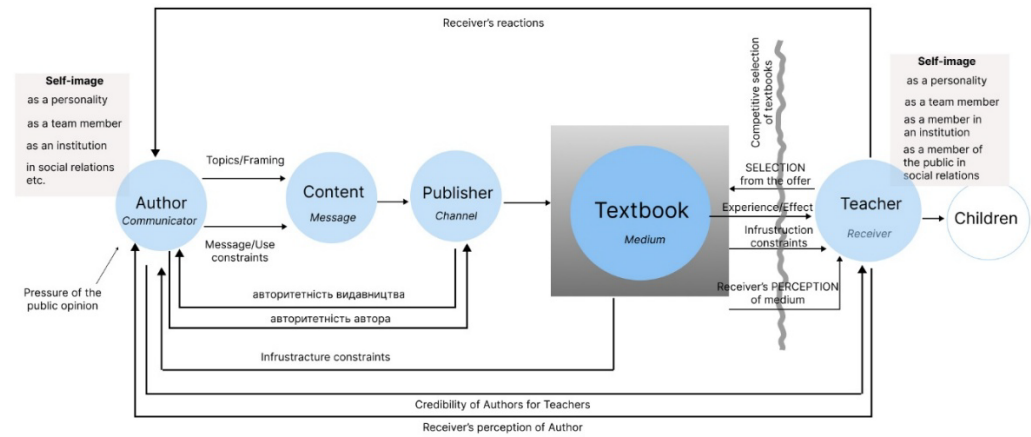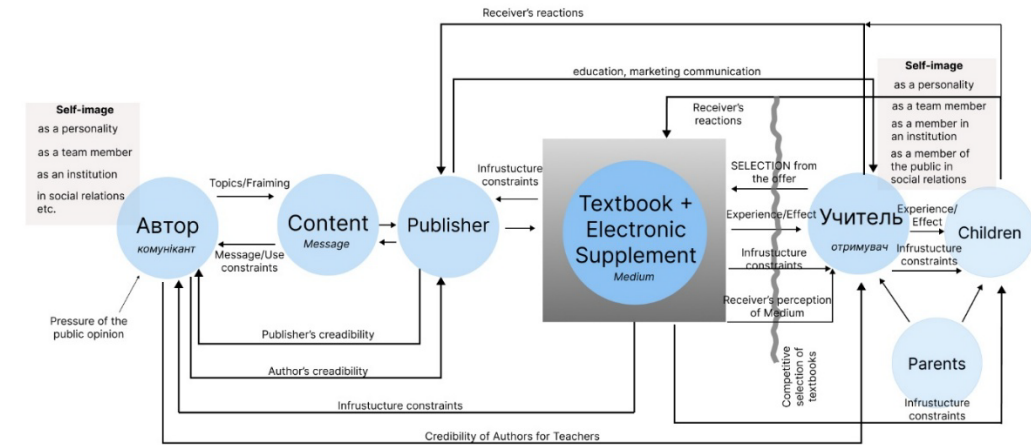*The communication field model of a printed textbook*

Figure 2
The communication field model of a cross-media textbook

Publishers' brand communications have intensified due to the integration of brand style elements in digital educational materials and all accompanying methodological tools. These changes

in communicative activity empower publishers to communicate independently, regardless of the authority of the authors.

In addition, publishers exert more influence over authors due to their credibility. In the era of printed textbooks, authors might have chosen a publisher based on reputation, established connections, the atmosphere within the publishing team, and the author's fee. In cross-media production, however, these factors may be supplemented by the publisher's technological capacity to implement the author's idea and the publisher's significance as a stakeholder in the textbook creation process particularly concerning government agencies. After all, publishers have helped shape the requirements for electronic interactive applications and can advocate for their interests, influencing regulations during the implementation of electronic applications in public procurement.

The role of children in cross-media production is also growing. As children interact with interactive elements, their activities can be tracked and recorded. The ability to personalize learning paths according to specific student outcomes significantly enhances the child's engagement with the publisher. In addition, children's feedback can be directed to both the transmitter – the cross-media textbook – and the publisher. Therefore, publishers who have created technological platforms and websites for electronic applications must communicate directly with the end consumer regarding product quality.

We also included parents as a distinct element in the communication model for the production of a cross-media textbook. After all, some educational platforms provide for the creation of parent accounts, enabling parents to monitor their children's learning, pay for educational services, and communicate with teachers.

Changes in the social communication environment of the educational publishing sector

Different communication channels influence both the perception and structure of information. For example, if a printed book in the form of a codex is used as a channel for delivering information in a textbook, the structure will be clear, and the content will be linear. Such a channel does not promote communication between the student and the teacher to the same extent as multimedia materials. It is more oriented towards in-depth reading. The ability to convey information through a single object, which is a characteristic of the entire teaching and methodological complex, since didactic materials are selected for it — makes the product an authoritative source of knowledge.

Authors Anna-Lena Kemp and Åke Grönlund note that "not long ago, representations of a subject in textbooks were held as objective mirrors of reality, enclosed and explicated by scientists in print or other symbols" (Kempe & Grönlund, 2019, p. 2916). In other words, the knowledge in a textbook reflects the interpretations of its authors, making it resistant to transformation, and discouraging the construction of individual knowledge. The scholars further state: "By using endorsed artifacts like textbooks in schools, knowledge becomes standardized, and unified into a single voice, the recognized view of the subject matter" (Kempe & Grönlund, 2019, p. 2916).

With the wide variety of media formats available today, cross-media textbooks no longer impose a single authorial version of knowledge. Since in cross-media formats the content of electronic and print media is complementary and inseparable, the main challenge for publishers lies in how to connect the content of both media through factors such as layout, content, and compositional techniques. In a cross-media textbook, information is presented in a mosaic form, unless the printed material is designed to deliver theoretical content and the electronic format aims to reinforce it.

Different types of cross-media publications can be designed differently based on how the electronic content is organized. Their form depends significantly on the bandwidth of the software or device. Organizing additional material on a platform—such as a separate website or software application —requires the publisher to combine the design concepts of both the printed textbook and the electronic application. In addition to the design connection between these two components, all electronic applications hosted on the platform must be interlinked. Since the learning platform is

capable of creating a virtual environment separate from the physical classroom, the information delivery channel must provide functionality for a hypertextual non-linear structure. Users should be able to navigate through the content in any order using well-designed navigation elements.

The platform as a well-organized space with a specific purpose—distinct from a communication platform or online store, like those that house a variety of multimedia resources on a publisher's website, allows for the tracking of interactivity and user actions. The ability to communicate with users is a crucial consideration when developing a platform's structure. If the platform's functionality includes social interaction and personalized algorithms, its format and content must also align with these requirements.

Product and communication: interaction in the socio-communicative space of education

In the study of the phenomenon of collaborative digital textbooks in Sweden, researchers Kempe and Grönlund explain that new educational developments should be perceived not only as effective learning tools but also as "a complex socially evolved vehicle" (Kempe, & Grönlund, 2019, p. 2915). They emphasize that "every educational instrument is shaped by different historical notions of 'teaching', 'learning', and 'knowledge', as well as the 'activities' that are supposed to result in 'learning'" (Kempe & Grönlund, 2019, p. 2915). According to Squires and Price, a socio-constructivist perspective on knowledge facilitates the identification of fundamental learning questions that should be incorporated into software evaluation (Squires & Preece, 1999).

The printed textbook was intended to "transmit" knowledge which in the printed era was viewed as unanimous and canonical. The idea behind the publication was not to encourage teachers or students to construct their own knowledge based on the material provided. Instead, students were required to "memorize" the printed content and accurately reproduce generally accepted concepts of the world. As stated by Kempe and Grönlund (2019), "the teacher, on the other hand, has to perform the role of a gatekeeper in order to protect the norms conveyed in the textbooks and assess students' achievements according to these norms" (as cited in Fleck 1979; Banks 1993; Pingel 2010; Kress and Selander 2012; Selander 2016; Åberg and Åkerfeldt 2017).

Richard Mayer, the developer of the multimedia learning theory, adopts a constructivist view of learning, in which multimedia are not simply systems for delivering information, but rather "cognitive tools for constructing knowledge" (Mayer, 2020, p. 14). The researcher challenges the idea of learning as "knowledge transmission" by asserting that "students are not empty vessels" (Mayer, 2020, p. 16). Mayer's cognitive theory of multimedia learning suggests that information processing occurs through the active participation of the recipient. Consequently, the learner must select and organize material, build connections, organize information, and synthesize it with their prior knowledge.

Mayer describes multimedia learning as a meaning-making activity, where the learner attempts to construct their own understanding–individual knowledge–a personal representation of the information presented. The learner's responsibility is to create their own meaning while the teacher's role is to facilitate the process of meaning-making. Additionally, the multimedia format of knowledge presentation should "provide guidance for how to process the presented information" (Mayer, 2020, p. 17). The researcher explains such moderation by highlighting the main points, thought organization, and connecting new information with past experiences.

The introduction of electronic materials in the classroom, which are not presented in a linear, monolithic format, has transformed students' role from passive consumers of information to its producers. The digital tools that an electronic application can provide students with offer more opportunities for creativity and help them build their own understanding of accepted concepts or ideas. For example, modern programs enable students to create their own melodies, program algorithms, and model the environment; immersion techniques are particularly effective with electronic systems.

In Italy, students even participate in the creation of textbooks. "The aim is to engage students in a process of active construction of knowledge" (Anichini, Parigi & Chipa, 2017, p. 104). An article by Italian researchers states that "teachers who choose this kind of practice claim that auto-production supports and promotes teamwork, encourages discussion and planning, thus providing a dynamic environment for cognitive and social growth of students" (Anichini, Parigi & Chipa, 2017, p. 104).

Therefore, the communicator's work with a cross-media textbook involves constructing their own knowledge based on the diversity of resources and activities offered by multimedia.

The desired effect of using the product

Among the numerous effects of multimedia materials—such as encouraging learning, enhancing responses, providing synchronous feedback, and allowing for personalization, their main function, in our opinion, is to assist the cognitive process. This approach to the goals of social communication activities in creating cross-media textbooks is learner-centered and focuses on the learner rather than on the technology used.

Mayer develops a learner-centered approach to creating new educational products based on the ideas of Norman and Landauer. Norman criticizes scientific and technological innovations that stem from a machine-centered approach to machine design, asserting that such a focus on technology does not support human cognitive processes; rather, it hinders and disrupts them. Landauer identified two phases of technology implementation: the first is automation, and the second is augmentation. At the augmentation stage multimedia learning technologies are developed as computer systems are intended to augment human abilities to learn new things (Mayer, 2020, pp. 13–14).

If the goal of creating a cross-media textbook is to assist students in the learning process, then, according to Mayer, research questions should focus on the relationship between design advantages or features and information processing. The most productive research question in this area would be: "How can we adapt multimedia to enhance human learning?" (Mayer, 2020, p. 13).

Another goal lies in the realm of communication. The hybrid format of the cross-media publishing project facilitates a smoother transition in the roles of teachers and students. While participants in the learning process continue to use the familiar artefact – the printed book – electronic content can gradually take on the role of immersing participants in more active communication interactions, thereby enhancing cognitive processes and aiding in the construction of individual knowledge.

The cross-media textbook presents knowledge in various multimedia formats. It is no longer just a presentation of information through the author's lens, but an opportunity to reconstruct an event, reproduce direct speech, and illustrate the actual course of a chemical or physical process. Such representations of facts encourage students to engage in more discussions with their peers, express their opinions, and stimulate their imagination. They aim to create favorable conditions for communication during lessons: "The learner is given a more active role in processing the content by making their own representations together with peers and not just remembering facts individually" (Kempe & Grönlund, 2019, as cited in Selander and Skjelbred, 2004; Selander and Kress, 2010; Ellis et al., 2011).

Conclusions

Changing the main product for the educational process affects the connections and roles of social actors within the social communication environment. With the advent of electronic applications as a mandatory component of printed textbooks, the approach to representing knowledge is changing, as are the roles of participants in the educational process and their activities concerning the new product and the anticipated effects of the socio-communicative product.

Studying the phenomenon of collaborative digital textbooks in Sweden, researchers noted that "transforming the traditional printed textbook into a collaborative digital textbook consequently

involves much more than a simple renaming of a signifier; it involves a reinterpretation of meaning, functions in school and the future but these questions are seldom addressed concerning cDTB in the literature that we found" (Kempe & Grönlund, 2019, as cited in Horsley and Martin, 2015; Rodríguez et al., 2015).

A comparison between two models of communication in textbooks – monomedia print and cross-media – highlights the increasing role of intermediaries in the transmission of information within cross-media production. A printed textbook with an electronic supplement also becomes communicationally tied to the end consumer, providing the publisher with additional tools to influence them. The emergence of a cross-media product generally makes the publisher visible in the market.

Digital products create technological incentives for the audience. By downloading an app that includes all the textbooks from a single publisher, consumers have more motivation to choose that provider. Digital communication erases time boundaries and weakens the barrier effect of channels, thereby shortening the distance between the publisher and children, parents, and teachers, making the relationship more synchronous. Even the ability to switch from the app's electronic content to the publisher's website with a single click increases the potential for building a stronger publisher brand and improving its positioning in the eyes of the audience.

The possibilities of digital formats and electronic channels of information delivery allow authors and publishers to present knowledge in textbooks in a mosaic-like manner, reducing the one-dimensionality of information interpretation. The digital environment serves as a powerful formative factor: an author's story can be transformed into video, audio, animations, a comic strip, or a game, thereby changing the author's communication message and intended media effects in accordance with the publisher's vision and the audience's needs.

However, with the diversity of media formats for presenting content, it is essential to apply a learner-centered approach and utilize them to maintain a beneficial cognitive load while minimizing unnecessary burden. The choice of a specific content format should be justified by the task the author sets in each block of information. Employees of publishing organizations, and editors in particular, can guide authors in choosing appropriate forms of knowledge representation in textbooks.

The technical characteristics of devices and the choice of technology for presenting information in electronic applications influence the form and content of a cross-media publication. Software requirements must align with the publication's desired communication objectives.

The concept of a cross-media educational product depends more on the requests and reactions of children, parents, and teachers than that of a traditional paper textbook. In the field of cross-media communication, the child's role as a recipient becomes more pronounced. Through electronic technologies, publishers can receive direct feedback from students and analyze their behavior patterns. At the same time, the development of requirements and methodologies for evaluating textbooks with electronic applications should take into account the concept of knowledge construction by students as embedded in multimedia technologies.

The changes outlined in the structure of social communications within educational publishing serve as a fundamental prerequisite for addressing practical questions related to the development of electronic applications for textbooks. To create a system for evaluating cross-media products and methodologies for training teachers and publishing editors, it is necessary to understand the object of social communication – its structure, functions, interrelationships, and impact on communication participants.

References

Anichini, A., Parigi, L., & Chipa, S. (2017). Between tradition and innovation: the use of textbooks and didactic digital contents in classrooms / Entre la tradición y la innovación: el uso de libros de texto y contenidos didácticos digitales en las aulas. *Revista Latinoamericana de Tecnología Educativa - RELATEC*, 16(2), 97–110. https://doi.org/10.17398/1695-288X.16.2.97

Fiialka, S. B. (2019). Socio-communicative approach to studying of the educational literature. *Obriyi drukarstva*, 1(7), 205–215. https://doi.org/10.20535/2522-1078.2019.1(7).169585

Hargrave, J. E. (2014). *Educational Publishing: an Industry in Transition in the Digital Age. 1: Exploring the boundaries of the book*, 36–48. https://txtmagazine.pubpub.org/pub/vol1-2014

Herasymova, O., & Zhenchenko, M. (2022). Кросмедійні шкільні підручники: поняття, класифікація, проблеми редакційно-видавничої підготовки [Crossmedia Textbooks: Concepts, Classification, Problems of Editorial and Publishing Preparation]. *Printing and Publishing,* 1(83), 125–133. DOI: 10.32403/0554-4866-2022-1-83-125-133

Ioniță, M., & PĂSTAE, V. (2017). Gerhard Maletzke's model of mass communication from the social communication perspective. *Bulletin of "Carol I" National Defence University (EN)*, 1, 48–53. https://www.ceeol.com/search/article-detail?id=548335Rizun, V. (2022). Про розвиток науки про соціальні комунікації [On the development of social communication science]. 1–12. DOI: 10.13140/RG.2.2.25290.44488/1

Kempe, A.-L., & Grönlund, Å. (2019). Collaborative digital textbooks – a comparison of five different designs shaping teaching and learning. *Education and Information Technologies*, 24(5), 2909–2941. https://doi.org/10.1007/s10639-019-09897-0

Mayer, R. (2020). *Multimedia Learning*. Cambridge University Press. https://doi.org/10.1017/9781316941355

Ogar, E. (2014). Соціокомунікативний підхід у сучасних книгоорієнтованих дослідженнях [Socio-communicative approach in modern book-oriented research]. *Naukovi zapysky Ukrayinskooyi akademiyi drukarstva*, 4, 160–165.

Rizun, V. (2016). До питання про соціальнокомунікаційні наукові проблеми і про наукові проблеми взагалі [On the development of social communication science]. In Ю. В. Бондар & В. М. Корнєєв (Eds.), *Університети Володимира Різуна: слово на пошану з нагоди 60-річчя та праці ювіляра* (pp. 279–297). Astroprint. DOI: 10.13140/RG.2.2.25290.44488/1

Rizun, V. (2011). Начерки до методології досліджень соціальних комунікацій [Outlines for the methodology of social communication research]. *Psycholinguistics*, 10, 305–314. https://www.researchgate.net/publication/359899976_Nacerki_do_metodologii_doslidzen_socialnih_komunikacij

Sammler, S., Macgilchrist, F., Müller, L., & Otto, M. (2016). Textbook Production in a Hybrid Age: Contemporary and Historical Perspectives on Producing Textbooks and Digital Educational Media. In *Eckert. Dossiers 6* (pp. 1–32).

Squires, D., & Preece, J. (1999). Predicting quality in educational software: *Interacting with Computers*, 11(5), 467–483. https://doi.org/10.1016/S0953-5438(98)00063-0

Trischuk, O. (2018). Соціокомунікативний підхід до дослідження редакційно- видавничого процесу [Socio-communicative approach to the study of the editorial and publishing process]. *Obriyi drukarstva*, 1, 218–230.

Zhenchenko, M. (2019). Цифрові трансформації видавничої галузі [Digital transformation of the publishing industry]. 2nd ed. Zhnetz. https://www.zhnets.com.ua/zhenchenko-maryna-tsyfrovi-transformatsiyi-vydavnychoyi-galuzi-kyyiv-zhnets-2019-2-ge-vyd-zmin-409-s/