Education & Pedagogy Journal

ISSUE 2 (4) 2022

MINISTRY OF EDUCATION OF THE RUSSIAN FEDERATION

Tomsk State Pedagogical University
(TSPU)

EDUCATION & PEDAGOGY JOURNAL

ISSUE 2 (4) 2022

TOMSK
2022

Address:
ul. Kievskaya, 60, Tomsk, Russia, 634061. Tel./fax +7 (38-22) 31-14-64

Publisher and editorial address:
pr. Komsomolskiy, 75, office 205, Tomsk, Russia, 634041.
Tel. +7 (38-22) 31-13-25, tel./fax +7 (38-22) 31-14-64. E-mail: epj@tspu.edu.ru
https://edujournal.tspu.edu.ru/edujournal-contacts.html

Printed by: "Skorost' Tsveta".
30/2, Lenina avenue, Tomsk, 634050, Russia.

Certificate of registration of mass media
The Federal Service for Supervision of Communications, Information Technology, and Mass Media (Roskomnadzor)
PI No. FS77-81195, issued on 02.06.2021.

Approved for printing: 09.12.2022. Publication date: 30.12.2022. Format: 60×90/8. Paper: offset.
Printing: screen. Circulation: 1000 copies. Price: not settled. Order: 1237/H

Production editor: Yu.Yu. Afanasyeva. Text designer: O.A. Turchinovich.
Cover designer: V.Yu. Zyubanov. Translator: V.Yu. Zyubanov. Proofreading: E.V. Litvinova.

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The journal is published twice a year.

The call for papers for the upcoming issue is open.

UDC 378.147:004:174
DOI: 10.23951/2782-2575-2022-2-5-14

DIGITAL FOOTPRINT TO SOLVE EDUCATIONAL PROBLEMS*

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Abstract. Some aspects of using the digital footprint in education are described. The connection of this approach with the use of expert systems and Big Data technologies is shown. Current trends are described, and the risks and challenges of using digital technologies in education are outlined. It is shown that the role of society and government institutions will only increase. The important role of a priori algorithms and expert judgments in processing digital footprints is demonstrated. Finally, the authors argue that expectations about the prospects for using digital footprints to optimize management decisions in education must be tempered. They suggest focusing on developing digital culture, democratizing digital technologies, and the widespread acceptance of ethics in using Big Data.

Keywords: *digital footprint, Big Data, education, digitization, digitalization, expert systems*

Introduction

Nowadays, education can be described as one of the biggest users of digital technologies. The use of digital technologies, especially Big Data technologies, in education today is both an obvious reality and a necessity [1, 2]. The new technologies make it possible to neglect a number of physical barriers to communication in education (limited time resources, remoteness, pandemic constraints).

The potential applications of digital technologies in education are extremely diverse, and among the most promising are the following:

- Technologies for presenting instructional materials [1]
- The digitalization of administration in education [3]
- The digital footprint of students [4, 5]
- A system for creating a smart environment for students and learners [6, 7]
- The electronic internationalization of scientific and educational activities [8]

Digitization and digitalization affect the content and organization of teaching [9]. The teacher is transformed from a transmitter of knowledge and skills to a navigator who helps to navigate the treasure trove of knowledge. As a result, pedagogical work acquires a new character and is filled with new meanings. Thus, one of the particular issues that attract attention in the pedagogical environment is the optimization of students' choice of educational path. At the same time, it is proposed to give a new meaning to the concept of efficiency and change the approach in favor of recommendation systems based on students' digital footprint [4, 5, 9].

Digitization and digitalization of education with all its benefits are, as national and international experience shows, necessary but not sufficient conditions for increasing the effectiveness of education and educational work. The active introduction of digital technologies

* Original Russian language version of the article:Balyakin A. A., Mamonov M. V., Nurbina M. V., Taranenko S. B. Tsifrovoy sled v obrazovanii: ot nauki k obshchestvu [Digital footprint in education: from science to society]. *Nauchno- pedagogicheskoye obozreniye – Pedagogical Review*, 2022, vol. 5 (45), pp. 9–19. https://doi.org/10.23951/2307-6127-2022-5-9-19*

helps improve individual creative teachers' work but cannot increase the efficiency of the traditionally organized educational process [10].

One of the promising areas of using digitization and digitalization in education in general (and digital footprint in particular) is the creation and analysis of an educational institution's digital communication in the external educational space. Such digital communication and analysis of the totality of the formed digital agenda will make it possible to create a positive brand of educational institutions, integrate into the all-Russian and international scientific and educational Internet communication, and ensure the competitiveness of Russian education [11, 12].

On the other hand, digital technologies can and should be actively used as one of the new tools to optimize educational processes. The most obvious solution in education is an intellectual analysis of educational data to predict students' academic success [13]. In addition, data directly related to the educational process and additional information, including student demographic data, and psychological characteristics of students, teachers, and parents, are helpful [6].

This approach is already being successfully implemented in our country and abroad to varying degrees. For example, in 2013, the English University of Nottingham Trent experimented with and implemented a system for Big Data analysis of various student outcomes in the form of a dashboard [14]. The goal of implementing such a system was to get an overview of student participation in the educational process to reduce the number of dropouts and strengthen the sense of belonging to the university. A specially designed dashboard showed information about a student's engagement compared to his or her peers, time spent in the library, courses taken, attendance, and more. The information was accessible to all students, teachers, and mentors. The three years of using the system showed that 72% of students used it in the first year and rated it positively. Since 2018, the Moscow State Law Academy, named after O.E. Kutafin (Russia), has been using a virtual learning environment that allows students to record their academic results and activities and register for consultations and additional courses [15].

According to the information announced at the online conference "Digital Footprints in Education" (October 13, 2021), Ural Federal University uses its own digital service – Digital Tutor, and, based on the results of educational analysis, manages the process of individualized education. Volga State University of Technology's education portal has organized the collection of a digital footprint of all students to monitor and analyze ongoing education. Predicting academic performance and creating individualized education paths for Tomsk State University is organized by collecting a digital footprint of first-year students before they complete the first session in the VKontakte network (for more details, see [16]).

This paper considers a case of using Big Data technologies to analyze students' digital footprints. In practice, we are concerned with building predictive systems in education based on Big Data processing technologies. The data source is the digital footprint of students. This term refers to the amount of data associated with a particular individual, generated consciously or unconsciously, and collected and processed using Big Data technologies.

In this work, the authors used an integrated approach to analyze the interaction of a large number of actors. The methods of comparative law and formal legal analysis were used to study regulatory documents in the field of high technologies. In order to highlight the specifics of the development of digital technologies, the method of analysis and a systematic approach was used.

In addressing the issue of digital technologies in education, the authors relied on the experience of using unique research facilities in the Russian Federation, based on their work at the National Research Center Kurchatov Institute, which is the scientific coordinator of the Mega Science Class research facilities on the Russian side. The results of studies conducted by other scientific groups on related topics were considered, as well as the conclusions reached by the

authors and their colleagues under similar conditions with unique research facilities. Thus, the authors have tried to apply the available information to the educational process and to transfer scientific approaches from science to education. The attempt to consider the specifics of the emergence and use of a digital footprint in education is made exclusively in the context of management decisions and their impact on society. This article does not consider technical and methodological issues (using digital technologies directly in the educational process) and legal regulations (data protection).

The use of a Digital Footprint in the Operation of Unique Research Facilities: an Educational Aspect

Let us briefly describe some features of the use of digital technologies and, in particular, of a digital footprint in the operation of unique research facilities (so-called "digital twin").

Of course, creating a complete digital twin (as accurate a model as possible) of any Mega Science Class project is a Mega Science Class project itself and requires a comparable level of resources and intellectual activity. Accordingly, such work will also be unique and relatively rare. However, they may be conducted as international projects or privately funded.

As for the pedagogical aspect, creating a digital twin will solve the problem of offering a form of remote work to many professionals in the scientific and pedagogical fields. This democratization of technology will allow easy access (even for non-specialists) to technical and economic knowledge without lengthy or costly training. This policy, called Citizen Access, finds its application in app development, data and analytics, design, and knowledge [17]. To ensure that students from secondary and higher education institutions are involved in complex scientific issues, it is proposed to use existing game shells and complement them with the possibility of modeling the processes under study.

The authors formulated the main requirements for successfully transferring scientific methods to the educational sphere based on the basic principles of working with digital twins of scientific mega-research facilities [18].

- Data sources for the education process are taken from recognized research centers (e.g., PIK, DESY, CERN, EuXFEL, ESRF, ITER). Their data have undergone the necessary verification, falsification, and reduction processes.
- Proven algorithms and approaches tested in real research facilities are used to work with the data. The development of proprietary methods and approaches is based on traditional successful methods and reliable data.
- A high level of digital infrastructure is ensured.
- Technical support for data storage, transmission, and processing (considering implementing the possibility of repeated use) is ensured.
- Links to existing approaches and programs have been established (the research program CERN and ITER, the Russian program of synchrotron research).
- The possibility of updating data, methods, and algorithms was implemented as a continuous process. Therefore, the proposed educational product aims to implement continuing education and skills training.
- The focus of the educational process is on interdisciplinary research.
- There is an opportunity to use cross-transfer technologies and transfer educational practices to the real world.

These approaches have already been implemented in the adaptation for a practical course on synchrotron research using digital twins of megascience facilities in Russia [18, 19]. The proposed course, "Methods based on synchrotron radiation in interdisciplinary research," was developed

using virtual reality technologies, based on which digital twins of unique Mega Class research facilities were developed. Mega facilities already in operation, such as the European X-ray Free Electron Laser (EuXFEL, Hamburg, Germany) and the Synchrotron Center of the National Research Center "Kurchatov Institute" (Moscow), served as a basis.

Specifics of the Emergence of the Student Digital Footprint

Initially, it was assumed that the digital footprint is created based on collecting and analyzing available data about the student [14, 20]. Usually, it is digitized data about academic performance, class attendance, participation in the educational process, the quality of the student's work, and test scores. It is an extended personality test (like the MMPI) translated into a digital format.

However, the pandemic has underscored the need to use new tools to ensure the individualization of education while ensuring continuity of education in the changing realities of the world. As a result, there was a need to create and use a digital footprint consciously. However, a number of difficulties arose in the process. For example, the University 20.35 activities involved organizing data collection during a series of long-term events to create a digital footprint of participants. However, organizers estimated that more than 51% of the uploaded data was useless information. In the initial phase, the percentage was as high as 98% [7].

Based on the studies conducted, one can formulate the requirements for the information needed to create a digital footprint [7]:

1. The maximum objectivity of the model allows for automating the process of selection and analysis of information.

2. The priority of the result (the final "artifact") over the process (teaching in the form of lectures, events in themselves, virtual laboratory work).

3. The ability to divide the acquired skills into hard and soft skills.

It is necessary to regulate the processes that optimize the collection and use of the digital footprint, not only in technical terms (implementation of predictive modeling technologies using neural networks and deep machine learning methods [2, 3, 6, 21]) but also in organizational terms. Therefore, based on the experience of collecting information (both in education [6] and in the operation of sizeable Mega Science Class research facilities that produce vast amounts of information [19]), it was decided to fill the data lake as much as possible in order to extract useful information later with Big Data technologies. At the same time, due to the continuous progress in computing power and the development of new algorithms, it is necessary to provide for the possibility of repeated access to the data (e.g., for data reprocessing). This approach is implemented based on the FAIR principle [22], which is actively used in scientific research and is currently being transferred to the level of practical application. Thus, it becomes possible to ensure the consistency and accuracy of multiple access to information once entered.

The extracted data may become unintentionally generated knowledge, and it is still unclear how to attribute it and distribute the rights for its use.

An important issue is interpreting the extracted data, the models, and the algorithms used [23, 24]. It is well known that a priori assumptions can/should be made to build an appropriate model. For example, in what direction will the student's digital footprints evolve? Can they be predicted? The traditional approach states that the main source for the formation of self-determination (the choice of the direction of development) are strictly defined factors given by the existing social institutions: Society, State, Church, traditions, and customs. In the past, the choice was strictly defined, the number of professions was indeed limited, and their popularity (and, accordingly, the answers received) was in a narrow range, or rather, it was easy to algorithmize this task and largely predict the outcome.

The Higher School of Economics' approach to passive education can be seen as an attempt to break away from this predetermination. It proposes a synthesis of distance learning and autonomous education models that includes the development, testing, and transition to mass deployment starting in 2023 of fundamentally new digital educational and methodological complexes that will partially or fully replace traditional textbooks. Based on AI technologies and expert systems, these complexes adapt to students' main individual cognitive characteristics and ensure successful mastery of the material by students with different levels of knowledge, students with distinctive perceptual characteristics (e.g., predominantly pictorial and predominantly logical thinking) [25]. It should be noted that this system is a tool that helps students or teachers track learning changes and make adjustments. The main advantage of the digital footprint is that it provides systematic and reliable feedback.

However, these approaches do not consider that in the transition era to the innovation economy (where new institutions have not yet emerged), the formulation, design, and implementation of development tasks that affect society are often shifted to businesses and large corporations. Moreover, the role of external actors not associated with the state government is increasing, such as by analogy with the law in the digital economy [26]. As a result, the choice itself becomes situational and spontaneous, under the influence of momentary factors and emotions, to achieve immediate benefits or to be emotionally colored [27].

These tendencies conflict with state interests that aim, among other things, to create a long-term educational environment that provides valuable human resources for the development of strategically important industries. The state is interested in maintaining a "minimal/correct" digital footprint sufficient to exploit Big Data technologies for further processing. Accordingly, there is the prospect of enforced digital footprinting. One of the options is the mandatory switch of all civil servants and state employees to Russian messenger, mail, and video conferencing services. In the future, this initiative will be extended to teachers of schools and universities, who will be able to communicate with parents and students only through Russian IT services [28]. The data obtained in the aggregated and depersonalized form will be used mainly for educational management decisions.

A similar policy is followed by private companies (especially social networks) that sell this information to government officials (or share it at the request of the relevant authorities). For example, according to Clario, in July 2021, Facebook collected 70.59% of personal data from the total amount of data, Instagram – 58.82%, Tinder – 55.88%, and Grindr – 52.94% [29].

In addition to the quantity, the demand for the quality of the collected data is also growing. Therefore, the University 20.35 has proposed two approaches to increase the effectiveness of the digital footprint [30]:

First is creating a dedicated educational environment to facilitate the creation of a digital footprint (a specially designed space where people's activities can be recorded in an accurate and multidimensional digital model). This is the gamification of education or so-called edutainment [31, 32]. Note that similar processes can be observed in the scientific environment when a specific environment (e.g., Minecraft) is used to place a digital footprint of unique research facilities [33].

Second, the evolution of the culture and skills of the creators of the digital footprint and its consumers. This means the emergence of a new ethic of human interaction in the digital environment (primarily developers of algorithms and consumers of digital content) and the optimization of algorithms used for the processing and presentation (primarily visualization) of information. For humans, the second way means nosce te ipsum: "If you want to maintain at least partial control over your life and the future of the world, you need to run faster than Amazon's and the state's algorithms and know yourself before they do" [34].

An unavoidable drawback of Big Data, forcibly generated in the public interest, is the risk of determining the course of a person's perspective too early (a priori). In addition, there is an inevitable delay, both in implementing digital transformation and using the obtained results [9,35]. It is necessary to use special algorithms and technologies to transfer the digital footprint data from the past (retrospective copy) to the future. It turns out that the student's digital footprint is divided into at least two paths: For the pre-digital era, it is enough to study the traditional values that are socially accepted and implemented by students, and for a modern student, it is necessary to create a sequence of images (filmstrips) of the digital world in dynamics.

A characteristic of the modern student is the high lability of thinking, the absence of fixed rules and authorities, flexibility, volume, and ambiguity [27]. In practice, the transition from the real world to the digital world (data digitization) used to work, and now, the reverse dynamics are implemented. However, algorithms (created from the rules, ideas, and assumptions of the pre-digital age) do not work for young people who physically exist in a ubiquitous digital environment. Therefore, the choice of algorithms (models) used a priori for data processing plays a significant role.

Conclusion

In the development of digital technologies, the benefits and risks of using artificial intelligence technologies, Big Data, and related technologies must be taken into account to achieve the goals of balanced development of humanity [36]. In this direction, it seems appropriate to use digital technologies in education. Moreover, the use of a digital footprint will allow:

- develop recommendatory decision-making systems in which a Friendly AI acts as an advisor and navigator for human development
- obtain accurate, systematic, and reliable feedback from students, which is particularly important as the scope of online education expands
- systematically adapting methodological support for the educational process within a reasonable time.

To meet the challenges, it is essential to use a top-down digitization approach while directing creative energy and vitality bottom-up [37].

Education, the key differentiator of our time, is becoming more creative, critical, problem-solving, and decision-making, fostering communication and collaboration, forming new potential tools and using existing technologies, and most importantly, developing social and emotional skills in students.

Awareness of choices becomes an important prerequisite for designing a development strategy. Society (through the state and its institutions) must take away the right of economic actors to set priorities. First and foremost, it is necessary to focus on solving the problems of the state and pursue national interests.

At the same time, the authors are sure that the digital footprint will not solve the problems of optimizing education. As our analysis shows, the use of a digital footprint in education will be accompanied by the following features:

- Big Data technologies have gained the right to be a criterion in the decision-making process for the organization and management of educational processes. The role of collected data and decisions made based on their analysis will only increase in science, education, and everyday life.
- The amount of unstructured data (data lakes) will increase, and this process will only accelerate. In addition, some form of the digital footprint will become mandatory in the near future. Currently, it is unclear what coercive mechanisms will be used (material incentives, persuasion, denial of access to services, mandate).

● We must remember the responsibility that the digital technologies impose on us, and create data consciously. In practice, Big Data must be ethical.

● Similar requirements are placed on the consumer of the data. The state (society) must form the hierarchy of good in addition to the hierarchy of power [38]. Currently, there are active discussions about how this should be implemented: in the form of ideology (conditional checkpoints) or algorithms (a priori knitted models). The United States is pursuing the path of correcting artificially induced solutions, while the PRC focuses on the ideology of programmers and consumers of the algorithms (correct tasks). The EU proposes the introduction of the gradation of algorithms (allowed – partially allowed – prohibited). The Russian Federation has not yet formulated its position [39].

● Too early self-determination of a person may occur with simultaneous ambiguity of conclusions based on a digital footprint.

● A feedback loop between society and technology (primarily through science) is critical. The process of influencing a person through algorithms cannot be considered unidirectional. This means critical thinking and conscious, responsible decision making is essential. One possible solution is to increase the use of expert panels that take collective responsibility in formulating decisions.

The authors believe that all the above difficulties will be successfully overcome and the progress of science and technology will contribute to constructing a balanced, just society, which will be expressed, among other things, in new pedagogical forms and formats.

The introduction of digital technologies into the educational process will also require the refinement of legal documents, which is currently somewhat difficult. At the same time, the gaps in legislation are not insurmountable, and already the Federal Law of December 29, 2012 No. 273-FL On Education in the Russian Federation contains a reference to the possibility of using e-learning, which at least indicates the readiness for transformation. Furthermore, on July 16, 2021, on behalf of Rosstandart GOST R ISO / IEC 20546-2021 – Information Technologies, Big Data, Overview and Vocabulary – a terminological standard was adopted, which became the first domestic regulatory and technical document in the field of Big Data.

Acknowledgments

The authors thank V.G. Zhulego for his valuable comments and recommendations to improve our paper.

This work was supported by RFBR grant 20-010-00576.

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Submitted August 12, 2022

UDK 378.126
DOI: 10.23951/2782-2575-2022-2-15-41

PEDAGOGICAL EDUCATION AND SELF-DETERMINATION: REDEFINITION OF BOUNDARIES

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Abstract. The initial thesis of this article is to consider the contemporary cultural situation as hyperdynamic, transterritorial, and formed by a multiplicity of mutually disproportionate worlds specifying a person's position in them, together with the totality of their inherent meanings, visions, relations, behavioral patterns and possibilities of self-determination. Such a situational definition is a challenge to established educational practice, prompting it to dynamize and diversify the connections and relationships at work within it and to reorganize the forms of educational semiosis and the sign-symbolic mediators that support them, including texts specifically designed to orient students.

After a critical evaluation of mapping as a constructive basis for the formation of students' orientation competence (leading to a discursive unification and homogenization of educational practices), the authors attempt to develop an instrument of orientation mediation that highlights the multidimensionality of pedagogical positions and is subject to several key requirements. These are as follows: Orientation to the qualitative differences in educational relations in the processes of pedagogical self-organization; abandonment of the position of an absolute subject with the ability to perceive the educational environment panoptically; the incorporation of the student's self-organization techniques that allow him/her to build moving and transforming coordinate systems and actions relevant to them in the orientation process.

The semiotic construction of the mediator, designed by the authors to ensure the variability of the configurations of educational reality, aims analytically, above all, to explain and differentiate the political images of the production of educational subjects in the minds of students. Therefore, each of these policies is considered a discursive construction aimed at establishing and reproducing a model of a certain anthropological type in the educational environment. This means that this environment is an area of symbolic struggle of different pedagogical forms, which necessarily involve the consciousness and self-consciousness of their bearers in their structure. Thus, their self-reference or self-referentiality becomes the basic condition for constructing and reorganizing orientation systems.

The form of mediation support for students' orientation proposed by the authors uses the fundamental distinction between humanistic (pedagogical, anti-pedagogical) and post-humanistic policies of the genealogy of educational subjects, emphasizing their ontological specificity and epistemological incommensurability. The design of the text is based on posthumanist (postmodernist) concepts in search of a positive educational project that "creates new possibilities for development" rather than on critical engagement with the dominant discourses in education. The authors' textual experiment raises a number of new research and practice questions, including those of textual exposition of ontologically heterogeneous forms of education, overcoming the effects of sign-symbolic reification of educational statements due to educational reproduction, clarifying the self-referential psychological and pedagogical conditions of the pedagogical self-determination subject.

Keywords: *educational semiosis, self-referentiality, plurality, counter-text*

The work was supported by the Ministry of Education of the Republic of Belarus (Research # GR 20211214)

Introduction

Many would probably agree that the most salient goal of education, at least the liberal version, is to provide students with reliable "sailing directions" to help them navigate the complex and changing modern world.

The modern world of education, the subject of this paper, is no exception in this regard. On the one hand, teachers of pedagogical disciplines are increasingly confronted with the situation that it is impossible to "reduce to a common denominator" the diversity of pedagogical approaches. Yet, on the other hand, pedagogical publishing is teeming with sailing guides whose authors seek to provide their readers with thoughtful and scientifically sound ways to move forward in the flow of events but also to recognize the dangers and risks that young people entering professional and educational life may encounter along the way.

Developing such guidelines usually lies in theoretical and methodological disciplines (philosophy, sociology, psychology, and logic) that claim to be fundamental. However, it is worth noting that common sense can also serve as such a foundation. One of the goals of these guidelines is to create in students a holistic picture of the emergence and development of the branch of knowledge under study in the context of related sciences and practices.

It happens that in creating such an orientation scheme, voluntarily or involuntarily, a metaphor for map data is used, which, according to the authors, makes it possible to grasp the entire field of interest at a glance. Even when historical detail is used in creating a map, the retrospective inevitably relies on topology as the context that guides its development. These are the constructive foundations of the preliminary schematization of knowledge in education.

A map, as we know, is an established universal representation of territory that reflects landscape features and positions the user in a particular way. Those who can read it (indeed, the main efforts in education are aimed at teaching such a skill) acquire the necessary relatively stable vision and the life skills that go with it. Finally, a map is not just about marking an area; it is also a form of vision, i.e., support for shaping action.

Since all these knowledge carriers use the same representation, the metaphor of map data acts as a reliable mechanism of social identification and homogenization, contributing to the formation of an "educational identity." Its most important feature is the perspective of the observer, whose actions do not affect the scale or landscape of the observed area in any way. Moreover, this observer must trust the map/knowledge, because doubts about its authenticity lead to disorientation and confusion. You may invoke the need to develop and even teach critical thinking in students, but you should in no way question the principle of mapping and the ideology of knowledge deposit[1].

The fact that a person's position in the modern hyperdynamic and transterritorial[2] world cannot be represented in planar terms and, moreover, depends on his or her own orientation efforts is now increasingly being recognized by the educational community. It turns out that there can be more than one orientation scheme, and the differences between them are not merely scale- or object-related, but qualitatively and ontologically heterogeneous. In particular, this calls into question the principle of orientation based on a universally valid map. According to F. Jameson,

[1] The critical pedagogue P. Freire writes about knowledge as a bank deposit: "It is not surprising that, within the concept of the Bank, a person is seen as a malleable, controlled being. The more students work to preserve the deposits invested in them, the less they develop the critical thinking that might result from their interaction with the world as its transformers. The more abjectly they accept the passive role imposed on them, the more they tend to simply conform to the world that already exists and to the fragmented vision of reality that has been invested in them, as in a bank" [1, p. 47].

[2] The interpretation of trans-territoriality in this paper is a renaming of the well-known term in sociology Extraterritoriality by S. Bauman and means the weakening of the spatial factors of identity constitution and the delegation of the conditions of social control to communicative instances. "It no longer matters where the one who gives the orders is located; the distinction between "near" and "far" or between the wilderness and the civilized world, the organized space, almost disappears." [2, p. 17].

the participation of an orienting person in the process of orientation "implies the practical conquest of a sense of place and the construction or reconstruction of a coherent ensemble that can be retained in memory and that an individual subject can re-map even as a function of mobile, alternative trajectories" [3, p. 166].

There is no doubt that humanists working on the navigation problem do much to avoid errors in planar representation. For example, some rely on the history of disciplines to solve the problem of orienting students in the growing epistemological diversity. They believe that "the history of the emergence and change of a scientific discipline is a valuable experience in overcoming the limitations of everyday consciousness as well as a source of ideas that provide support in a situation of epistemological uncertainty and value relativism" [4, p. 69].

The teacher should demonstrate (in person or through a particular text) a model of orienting behavior. The emphasis is on the teacher's rhetorical art, that is, on his or her ability, first, to present the material in understandable and accessible language that avoids profanity, and, second, to impress students with fascinating material [ibid., pp. 72–73]. At the same time, it is assumed that the variability of presentation, i.e., what is said, is the necessary condition for learning orientation.

Meanwhile, as I. Gofman stated, it is not so important what the teacher says but from what perspective his/her text is implemented. In analyzing the lecture structure, Gofman writes: "A lecture is an institutionalized extended holding of the floor in which one speaker imparts his views on a subject, these thoughts comprising what can be called his Text. The style is typically serious and slightly impersonal, the controlling intent being to generate calmly considered understanding, not mere entertainment, emotional impact, or immediate action. Constituent statements presumably take their warrant from their role in attesting to the truth, truth appearing as something to be cultivated and developed from a distance, coolly, as an end in itself" [5, p. 165].

The speaker may be as critical as he likes of the subject of his message, but the truth of his position, the authority in whose name something is reported, must not be questioned. We should also consider the publicity of this message and its social purpose. The principle of order is conveyed and shaped in the consumer's perception of orientation as an ontologically unified world. To put it figuratively, once thrown out the door, Unification has now climbed in through the window.

The creation of maps that aim at a two-dimensional representation of educational phenomena has the effect of neutralizing the ontological differences in educational relations precisely because of the spatial organization of this type. J. Derrida, in particular, draws attention to this point when discussing the question of the panoptic organization of knowledge. To illustrate his point, Derrida uses an optical metaphor – the Panorograph.

A panorograph is a device that allows the totality of objects intended for observation to be visible simultaneously. "Thanks to schematism and the more or less explicit introduction of a spatial dimension, we are able to observe [objects] on a plane and with greater freedom – a field that has lost its power... Thus, the terrain and outlines of structures become more visible when the content, that is, the living energy of meaning, is neutralized" [6, p. 10]. A panoptically organized text is a kind of panoramic image that solves the problem of holistic representation, eliminates ontological differences and multidimensionality, and makes the neutralized one-dimensionality the basis of the reader's orientation.

In our opinion, one of the most successful attempts to design a text as a diversified description of educational reality comes from Professor Dorota Klus-Stańska from the University of Gdansk, Poland. The didactic space presented in her textbook is heterogeneous and heteronomous, inherently contradictory and dynamic. In D. Klus-Stańska's picture of the educational world, "the

representatives of different paradigms attach different meanings to the observed events, and the application of the same concepts refers to differently explained phenomena. As a result, the theories become untranslatable for each other, and researchers remain in different worlds either way" [7, p. 39].

The text of the handbook mentioned above attempts to present education as a field of competing pedagogical strategies that cannot be reduced to a single, even abstract, entity. The book written by Klus-Stańska directly declares the goal of shaping students' attitudes towards educational diversity, as it is addressed to "future teachers and educators oriented towards didactic theories and events taking place in the countries where academic reflection is developed and institutional forms of education are implemented" [ibid., p. 7].

At the same time, the perspective from which Klus-Stańska presents the pedagogical account remains largely traditional, outside[1] the didactic reality depicted, and tends toward an objective (unbiased) description. As a result, her representation of the text turns out to be paradoxical in itself. On the one hand, it creates a diversified educational landscape in which specific languages are used in each field. On the other hand, if we apply J. Derrida's idea of neutralization to this textbook, a kind of objective perspective emerges from which a panoptic overview is possible. The instance of the semantic organization of representation disappears from the description that determines the text's composition and intention[2].

The question can be formulated as follows: In the name of what authority does the author speak? And does this not mean that a change in the presentation perspective can sometimes radically alter not only the structure and content of the text but also the reading process itself? This gives rise to the unprecedented goal of making a statement with a moving and changing coordinate system that can bring an image ordered according to its rules to life in each of its versions. Yet, at the same time, each of them should be denied not only the right to their synthesis but even to their juxtaposition.

The search for a structure of a multidimensional text that exposes the heterogeneous elements and connects the exposure with the position of the only ordering reality is a problem with many unknowns that cannot even be formulated as a key question. The problem turns out to be multi-layered, and the removal of any one of the layers reveals new layers and associated questions rather than revealing the core of the phenomenon. That is why we have taken a purely practical approach in writing this text – we take a trial-and-error approach to our search, making progress where we can and looking for ways out in dead ends and places of great uncertainty.

This is how we arrive at the idea of Pure Experimentation based on an experiential activity – research through practice. The primary goal is to rehabilitate the technique known as the Hit-and-miss method. It is used when it is not possible to form a theoretical picture of a situation a priori, and it is necessary to act through experimentation and subsequently understand it. An American researcher of management problems, Bill Torbert, once tried to conceptualize the hit-and-miss method. He refers directly to a particular form of reflexivity inherent in action research, which stems from "commitment to an intention or the general concept (idea, vision of a problem) and attention to contradictions between concept, strategy, execution, and results... (leading, above all, to a sensitivity to change in oneself)" [10, p. 16].

[1] Outsiderness is a term coined by M. Bakhtin to denote the fundamental possibility of an esthetic position that makes it possible to see and create a whole image without bringing in the author's subjectivity. Bakhtin considered outsiderness as the goal of constructing a certain position when analyzing a work of art. It means "the outsiderness of the author in relation to the hero, a loving removal of himself from the sphere of life of the main character, the purification of the whole sphere of life for him and his being, and the participation in the understanding and completion of the event of his life by a real-cognitive and ethically indifferent spectator [8, pp. 41–42].

[2] After all, as the French semiologist R. Bart said, "By giving a name to this or that thing, I give a name to myself; I enter into the competition of the many different names" [9, p. 486].

Likely, navigation based on the recognition of the ontological and spatial plurality of educational worlds should exclude, at least as a basic assumption, the possibility of an external perspective and build an orientation text according to the rules of self-reference (above all, receptivity to change in oneself), which implies the explication of the structure of this perspective that creates a vision of educational reality consistent with it. The experience of creating such a multidimensional mapping is the central message of this article.

The structure of this article is as follows. First, we will name the educational ideology on the basis of which the order of orienting actions is built, as well as consider and evaluate this or other reconstructed educational orders. After that, we will try to describe (in a model way) several educational perspectives we are confronted with in an ontological conflict. The last part deals with the analysis of the results of the conducted text experiment, the formulation of the problems found in its implementation, the description of the results, and the principles for constructing a reality-diversifying text that seems clear and unambiguous at the moment.

Preliminary notes

In constructing a text that solves an orientation problem, as already mentioned, the coordinate system is of particular importance, the projection of which onto Locality produces its particular representation. Its construction involves a certain cultural and pedagogical arbitrariness. In other words, the point of view applied here is, first, precisely, the point of view and, second, only one of the possible perspectives. Arbitrariness implies recognition of the problem of deriving this or that position from a general principle and agreement with the fact that "it is possible to establish the objective truth of pedagogical influence through this logical *constructum*, which has neither a sociological nor a psychological reference" [13, p. 18].

Arbitrariness, according to French sociologists P. Bourdieu and J.C. Passeron cannot be understood as a simple voluntary act. Setting a starting point and thus setting oneself in motion means making a choice in a situation with many possibilities, finding oneself in a culture, and also "relating it to a multiplicity of cultures of the present or of the past, or projecting it onto the universe of possible cultures of the future" [ibid., p. 25]. Arbitrariness is also consistent with recognizing the practicality[1] of other educational choices, their subordination to other social and cultural choices, life programs, and professional positions. Our research strategy is consistent with the assumption of pluralism in educational programs and practices operating in the heterogeneous and heteronomous network of modern culture. Pluralism does not mean rejecting our educational values, but it is associated with certain self-restraint and rejection of self-universalization.

The arbitrariness also applies to the subject to become a figure that excludes or eclipses the other contenders for participation in the orienting game of education. In the case of our choice, this status has a Mysterious phenomenon called Identity, Personality, and Subject. All these and many other designations are a kind of euphemism whose discursive existence is related not only to the characteristics of their owners – the humanities – but also to the educational programs that prevail in a particular historical epoch and place. Dealing with them is both the content of educational practice and an area of irreconcilable cultural confrontation.

In other words: In this presentation, we *postulate* that "education is always connected with identity (personality) and is a site (tool, environment, mechanism) of its qualitative transformations. The image of the person, a model that has always guided educational practice, is

[1] By practice, according to A. McIntyre, we mean "any consistent and complex form of socially established cooperative human activity through which the benefits internal to this form of activity are realized in the course of attempts to apply those standards of excellence that are suitable for this form of activity and partly identify it with the result that human powers in achieving excellence are systematically expanded, as well as the corresponding concepts of goals and amenities" [14, p. 255].

the central link in the humanistic discourse of education, a necessary condition for the functioning of any educational structure" [15, p. 137]. Therefore, we focus on the image of the human being as the humanitarian core of any educational program, regardless of how consciously that image is deployed by the authority that holds it.

The orienting representation of educational practices described below is not the Truth but is employed as a specific educational structure to pluralize students' perceptions of education. In this case, it acquires an instrumental meaning, and its evaluation is not subject to the criteria of reconstructive truth so much as to its conformity to the educational goals for which this reconstruction is intended.

The goal of constructing a text (a statement) that can trigger in its user (addressee) the effect of a differentiated perception of education requires, among other things, that the addressee adopt such a position that does not raise hopes of an ontological guarantee in the context of educational interaction. Alternatively, in other words, it requires such a view of the world in which it appears as a phenomenon of the constant creation of the world and the person who creates it. It is very likely that this view is best expressed in contemporary postmodern philosophy. The question arises as to what enables us to associate such hopes with this tendency of humanitarian thought.

We find the basis for such confidence in J.F. Lyotard, who provided the educational community with a postmodern definition of the sociocultural situation in his famous account of knowledge. His description of the state of postmodernity takes the form of a heteronomous and heterogeneous description that denies unity to the world and implies the impossibility of finding that absolutely stable position in culture from which the production of universally meaningful meaning is possible. According to Lyotard, "there is no reason to expect even the slightest reconciliation between the 'language games' that Kant called faculties, knowing well that they are separated by an abyss and that only a transcendental (Hegelian) illusion can hope for their totalization in a real unity" [16, p. 32].

The orientation implied in Lyotard's text coincides with our experimental goal, which is to create conditions for students' orientation in a situation of educational plurality. At this point, it should be noted only that for Western researchers, the situation of postmodernity is an essential feature of the present, while for education in the countries of Eastern Europe, a pluralistic project is only one of the possibilities. It follows that the use of postmodern discourse to solve our problems must be "tied to the locality," as well as experimental and textual concretization.

The difference between the appeal to the postmodern statement in the logic of the Existing and the Due can be illustrated by the example of the work of one of the famous French researchers of modern education, J.-M. Lamarre. In his definition of the educational situation, Lamarre writes: "The school today is not so much an object of doubt and criticism, but of distrust and contempt from within, a particular kind of distrust that is not an intellectual quality (critical spirit) but arises from a lack of commitment and a desire to know... The distrust that prevails today is a silent distrust that is more a consequence of the postmodern processes of destroying familiar cultural relationships and bonds" [17, p. 91].

The above statement by Lamarre is quite conclusive. If we use the language of the Dutch intellectual historian Frank Ankersmit, it is constructed according to the rules of the so-called "narrative realism." This technique refers to the text as an expression of an extralinguistic reality outside the text, which makes it possible to recognize the description as true or false. Narrative Realism is based on the visual metaphor of Paintings or Photographs, which proposes the possibility of verifying the correspondence "between photographs and paintings (in their totality and detail) and the fragments of visible reality depicted on them" [18, p. 118]. In this way, Lamarre creates a reality effect through which the author and the reader "believe together that

organized language is capable of reflecting, expressing, describing, revealing, or even recreating the real world, and that there is, after all, a real, structured, reasonably unified world that can be understood" [19, p. 252].

It is evident that Lamarre, with the help of narrative realism, not only describes the educational situation on the ground but, through his writing, establishes it as a fact in the reader's perception. Of course, his French readers will have no doubts about the appropriateness of Lamarre's text, and even in the case of some inconsistencies, the reader's sense of reality, imperceptible to native speakers, will compensate for the inevitable gaps. In this case, however, we are more interested in the educational semiosis[1] effects produced by the use of the technique of narrative realism than in the consistency of the statement with reality. We believe that the realistic representation mode can produce hypostatic effects in the reader, which clearly contradicts the idea of diversified orientation.

However, even if we agree with Lamarre's version of the situation in education and project it into the context of the Eastern European region, it will not be difficult to see the "availability of absence," so to speak, of the signs of "distrust and contempt from within" noted by Lamarre. Criticism of education in our region, if any, is parametric in nature, calling for the optimization of certain features of the educational system (humanization of relations between teachers and students, strengthening the material base of educational institutions, improving the financial well-being of teachers).

In any case, the institution of education and what happens in it is perceived by its subjects in a reified[2] quality, and this circumstance implies, among other things, additional textual processing of the borrowed postmodern statement. We relate this change to implementing the principles of "narrative idealism."The latter is based on the thesis that "we 'see'... only through the masquerade of narrative structures (although behind this masquerade there is nothing that has a narrative structure)" [18, p. 130].

In our case, however, it is not only the narrative style that should be discussed. When Lamarre talks about education, he objectifies it (with or without intention). In other words, Lamarre's signifier refers to the object of signification that constitutes its referential part. Such a voice speaks of education, of course, but not from within education. For the sign that is placed inside the education process radically changes the referential relation. It now corresponds to another sign denoting an event rather than an external object. In other words: When we speak of the use of the sign From Within, we refer to a specific sign transformation – a use that avoids direct designation.

The signs that come into play in education are forced into a kind of Self-Care. They are confronted with the need, according to Derrida, "to point out the conditions, circumstances, and limits of their efficacy by insisting that they belong to the machine they are capable of disrupting (déconstituer), and thus also to the gap through which shines a still nameless light that flickers on the other side of the fence (clôture)" [6, p. 128]. By addressing the process of pedagogical semiosis, deconstruction interrupts the automatism of the work of the sign and its semiotic connections by promoting their "postponement and at the same time their elimination (differer)" [ibid., p. 140]. The pedagogical use of a sign, for we speak here of an intersign relationship, correlates with a systematic postponement of its use, with a constant search for a "detour" [22, p. 106].

[1] The educational semiosis in this article is interpreted, firstly, as an educational environment, and secondly, as a communicative relation that places statements and the interaction between signs associated with them in the focus of pedagogical attention. It is believed that the key in pedagogy is not the subjects of educational interaction, but the sign-symbolic formations used by them. Or, in other words, the educational semiosis in a practical sense means the key role of the regulation that "signs are everywhere, but they only impact us if we take notice of them in some way" [20, p. 292].

[2] "Reification is the perception of human phenomena as objects, i.e., in non-human and possibly superhuman terms" [21, p. 47].

In this respect, narrative idealism coincides with the ideology of self-referential judgment of the text. The idea of self-referentiality implies a shift of emphasis in word use and its analysis from the content of the statement to the conditions of its production, which in teaching is accompanied by the development of a linguistic self-consciousness associated with its participation in the constitution of meanings. Self-referentiality is related to the removal of "the connection of language with external circumstances and the appeal to itself (to the relationship between sign and language as an instance of a statement). Self-referentiality is the precondition for "the possibility of autonomous regulation of language practice, which should become a specific ethical message of the linguistic analytics of subject constitution" [23, p. 62].

The self-referential character of utterances makes it impossible to make judgments from the perspective of the Absolute Subject, since they seem related to cultural, social, professional, and communicative contexts. Moreover, self-reference is consistent with auto communication, the subject's creative attitude toward his or her position, and the conditions that constitute the statement's position. In a sense, self-referentiality means an optical doubling through which the author of the text traces both the subject context of the speech and the constituents on whose behalf the speech is realized. From this perspective, the voice belongs not so much to the author as to the culturally and situationally conditioned entity with which the speaker forms a temporal unity.

Creating a differentiating, orienting text also touches on the problem of otherness. First and foremost, it concerns what Lyotard has defined as the ability to "tolerate mutual disproportion" [24, p. 12]. However, it is appropriate to make the following remark here. Lamarre, like Lyotard, speaks of mutual incommensurability[1] as a kind of event in education and culture that has already taken place and determines positions in communication. Considering the presence of heterogeneity as the Existing of the educational situation, he discusses in this context the use of a text in the classroom. What is evident for him is the loss of integrity through education and the many ontologically heterogeneous forms that compete in it. In this context, the question of otherness arises for him, which he interprets in terms of the conflict of differences, which means that for education, among other things, a special kind of cultural mediator is important – texts and works that contribute to the development of the student because of their otherness (altérité) [26, p. 77].

Since these cultural mediators do not correspond to students' experiences, they not only contradict them but also can cause "a trauma of astonishment, a trauma of an unknown and strange sense" ("traumatisme de l'étonnement," "traumatisme du sens inconnu et étrange") [ibid., p. 77]. In other words, power in educational communication, according to Lamarre, is realized by artistic works and teachers "through themselves and their otherness (altérité)" [ibid., p. 99].

Regarding education in the Eastern European region, the problem, in our opinion, lies not so much in the conflict of differences, which is typical of Lamarre's experience, but in their creation. The educational practices currently prevalent in this region are characterized not so much by their discrepancies as by their surprising similarities. In our opinion, they are primarily due to the proximity of the social problems solved by the educational systems and are related to the fact that in them, the effects of homogenization and standardization are reproduced, which is expressed – at the level of educational practices – in the dominance of the tendencies towards conformity and the smoothing of contradictions.

From this point of view, otherness is marginalized by education, while homogeneity and monism are generally welcomed. Therefore, cultivating the value of otherness in educational relations, including the functioning of educational practices, serves as a blueprint for the possible

[1] Incommensurability is well known as an incompatibility that holds between scientific theories that seem to compete about the explanation of some type of phenomenon [25, p. 323].

future of the Eastern European region. That is, the differentiation of the perception of educational reality in the context of the mismatch between the worlds of human presence is an urgent problem that may still need to be solved by the national educational system. We connect its solution with the methods of mediation of texts in them. However, the nature of this mediation is determined by a particular pedagogical construction. We speak here about such an arrangement that causes the suspense effect (V.B. Shklovsky), which transforms what it perceives into the strange and surprising.

In order to solve the problem of orientation, which is more about the production of diversity than about its reception, we need, as already said, a specific semiotic construction, the creation of which we now begin.

As a basis for the specificity of educational reality, we will use the image of a person, with the help of which we will try to make the necessary distinctions. With the help of this orienting construct, we will begin to clarify the politics of the use of the image of a person in education, which includes both its particular interpretation and the related structure of education. This structure consists of two parts, which are not equally weighted: **humanistic** and **post-humanistic** projects. The former, in turn, consists of the *pedagogical* and the *anti-pedagogical* version. The latter is presented as a single block due to the indeterminacy of many designs. In our presentation, the humanistic orientation will start from the orientation to the certainty of the humanitarian ideal and the ways to its realization. On the other hand, the post-humanistic orientation will attack the idea of a model and expose it as part of a historically conditioned and problematic educational practice in the modern world.

1. The Humanistic Educational Project

1.1. The pedagogical formulation of this project can be related to the practice of purposeful development of the subject, which is connected with the public manifestation of the necessary future for the achievement of which pedagogical efforts should be made. From a posthumanist perspective, “it is a pattern based on a model, and therefore this pattern assumes that patterns and images are in some sense given, presented, and exist at least at an intuitive level for those who do pedagogical work” [27, p. 4].

The operation of pedagogical discourse is also actively supported by the psychological science that underlies it. Thus, L.I. Bozhovich, a disciple and follower of the Soviet psychologist L.S. Vygotsky, who shared these aspirations, considered that the goal of the humanities is “to create a specific pattern of behavior and activity of the child, to determine that complex of features of their personality toward the formation of which pedagogy should work precisely at [each] particular stage of the child’s age development” [28, p. 17].

In the language of this type of psychology, the pedagogical project can be defined as education or development. In American pedagogy, Benjamin Bloom, a well-known American psychologist in this part of the world, contributed to developing a humanistic pedagogical project. Bloom is known for presenting the developmental process as a hierarchically organized sequence (and subordination) of mental acts, including knowledge, understanding, application, analysis, synthesis, and evaluation [25, p. 18].

The development practice uses the models of intellectual progress in its construction, which “takes the form of irreversible changes... during which the system moves to a new level of functioning” [30, p. 5]. The achievements of the developing individual of the previous stage are absorbed into the structures of a higher order and begin to function therein according to the laws of the new whole (the idea of withdrawal).

At the same time, the development process is not disjunctive. That is, it is integral, which emphasizes the value of the unity of the humanitarian image model. In a Normal personality, according to the author of the idea of *non-disjunctionality* A.V. Brushlinsky, "the various stages, levels, components and aspects of such a process are not separated from each other like the elements of a mathematical set or the blocks of a machine; on the contrary, they are organically interconnected and interpenetrate each other" [31, p. 44]. Holistic consciousness is not characterized by contradictions and conflicts, which occur, if at all, only in transitional phases when development undergoes restructuring. During such restructuring, "the system is susceptible and sensitive to influences" [30, p. 13]. The principle of non-disjunctionality, as the posthumanists would say, excludes or pathologizes the heterogeneity of consciousness, its polycentricity, co-presence, and disharmony of qualitatively specific human states.

The structure of the pedagogical project includes the principle of deficiency, which complements the imperative of non-disjunction. It states that a student has a certain incompleteness that education must overcome on the way to a harmonious unity of the individual[1]. The teacher's gaze "should first be directed to the integrity of the human mode of being or of some kind of life activity" [32, p. 126]. Actually, the development consists in the elimination of the deficiencies that the student has.

The paradox, however, lies in the fact that the appearance of deficiencies in a pedagogical project precedes (or accompanies) their overcoming. A teacher, according to the French philosopher J. Rancière, a critic of the pedagogical project, is the one "who needs the incapable and not the other way around; it is he who constitutes the incapable as such. To explain something to someone is first to show him he cannot understand it by himself" [33, p. 11]. In other words, the formation of a student's intellectual (or other) inadequacy is necessary for the formation of the teacher's position. By organizing the development process, "the teacher establishes an absolute beginning: only then does the act of learning begin. But, on the other hand, the teacher lifts the veil of ignorance that he must lift about all things that are the object of study" [ibid.][2].

As can be seen from Rancière's observations, the strategy of guided development necessarily presupposes the asymmetry of the positions of the student and the teacher. What is meant here is the position in pedagogical communication necessary to solve didactic problems, not the correlation of human essences (although this is not uncommon in teaching practice).

A pedagogical project cannot be carried out outside the ideology of the teacher's authority. In its structure, Christian anthropology is clearly oriented toward the imitation of the image of God. In its particularly extreme forms, its pedagogical version reduces to the duplication of the teacher's personality and the hope of its continuation in the students[3]. The latter is consistent with a special pedagogical *responsibility* for the self-embodiment of the ideal. In analyzing its emergence, M. Foucault refers to the image of the shepherd. The pastor – the shepherd – ensures that all the sheep, without exception, are fed and safe. In his activity, Foucault distinguishes between two aspects: "First, he acts, works, and makes expenditures for his domestic sleeping animals. Second, he watches over them. He keeps a watchful eye on them all and never lets one out of his sight. He must know his flock, both in general and each animal. He must know not only the location of the rich pastures, the peculiarities of the seasons, and the order of things, but also the needs of each one." [36].

[1] As the Russian psychologists E.I. Isaev and V.I. Slobodchikov write in this regard, "education" has the meaning of replenishing the individual to the universality of the human race, creating conditions for turning a person into a whole, real person, restoring the universal in a person" [32, p. 61].

[2] The Dutch psychologists who share the contexts of pedagogical strategy write that "students and teachers are the same in their human nature, but not in their concrete existence. Behind every discursive practice in teaching, there is not only integrity but also asymmetry" [34, p. 23].

[3] An educator should be himself or herself what he wants to make of a student [35].

Over time, Christianity, oriented towards universalization and social unity has increased the importance of pastoral responsibility. Now "the shepherd must give account not only for each individual sheep, but also for all the actions of the sheep, for all the good and bad of which they are capable, for everything that happens to them. Even the transgressions of the sheep are imputed to the shepherd." [36]. The responsibility of the shepherd becomes total. It is no longer enough for the shepherd to know the condition of the flock; he must also know the condition of each sheep. For this purpose, two tools are used: "the study of consciousness and the direction of consciousness" [ibid.]. The goal of a detailed study of the inner world of the Sheep stimulates the formation of psychological knowledge, which has as one of its sources the need for social control and regulation. From a posthumanist point of view, psychological science in education is an entity that tracks a student.

Summarizing this part of the analysis, we can conclude that the pedagogical project we are reconstructing turns out to be quite vulnerable from a posthumanist perspective. This vulnerability is due to the following:

a) The lack of an answer to the question of the developmental ideal, as different ideals, including mutually exclusive anthropological ideals, clash in multicultural and dynamic circumstances, inevitably leading to culture wars and other forms of struggle for dominance.

b) The weakening of the pedagogical monopoly of information, leading to a crisis of authority and, accordingly, to the teacher's inability to control the symbolic boundaries of the educational situation and content.

c) The overvaluation of the cognitive factor in the development of the student leads to the devaluation of other forms of the orientation of the individual in the modern world (esthetic, practical, moral, and religious).

d) The inclusion of homogenization and unification in the discourse, as well as their subordination to the normative plan of development, which accordingly marginalizes the otherness, randomness, and heterogeneity of educational practices and their effects.

e) The dominance of the logic of progressivism in the development plans underlying the educational project makes the student hostage to the "need-to-be-future" and devalues the relevant needs and conditions of the student.

To defend against these charges, proponents of the pedagogical project accuse posthumanists of being unscientific, of depriving students of the experience of submission to authority that is important to their social lives, of students' rejection of consistency and consequence, of irrationalism, of programmed social maladjustment and asociality, of depersonalization, and of pedagogical irresponsibility. In particular, it is argued that for posthumanists in education, "the process becomes more important than the product and communication more important than solving the problem" [37, p. 46] and that the posthumanist attitude leads to the defamation of "any universality-norms, rules, principles, and values" [ibid., p. 416]. According to the critics, the posthumanist image of man is "the image of a psychotic, a psychopathological personality whose life dissolves in a series of contradictory situations and does not follow a single line" [ibid., p. 420].

Currently, criticism of posthumanism is also directed against the new realities of life. Its proponents are accused of a lack of control and acquiescence to a situation where streams of information, often uncontrolled and unreliable, are poured into students. "Messenger and chat platforms offer a unique opportunity to create an infinite number of Simulacra that erase the facets of personification... leading to processes of destruction of the unified space of the world, its deconstruction and fragmentation, and resulting in a clip consciousness and a departure from the culture of theoretical knowledge" [38, p. 98].

"The clipping and fragmentation of thought lead to difficulties in logical cognitive operations such as analysis and synthesis. When children and adolescents immerse themselves in virtual reality, they gradually lose their sense of reality; moreover, the virtual world has more meaning and significance for them than the real world. When immersed in the realities of the objective world, students feel helpless in both communication and action situations" [ibid.].

Listening to these accusations, the posthumanists, strange as it may seem, agree with the sociocultural and psychological observations of their critics, but the conclusions are just the opposite. If uncontrolled streams of information are pelting students, then one should not adopt a protective posture but the other way around. In their view, information chaos is a new, unprecedented life challenge, so the answer to it cannot be found in the usual pedagogical schemes.

1.2. We will present the ***anti-pedagogical version of the humanistic project*** as an opposition to the pedagogical project. The origins of the anti-pedagogical position can be easily related to the humanistic ideas of J.-J. Rousseau [39, p. 112; 40, p. 80; 41, p. 10; 42, p. 61, among others]. It is well known, after all, that many of his works proclaim the child's autonomy, the subordination of development to an inner law that an adult interacting with a child can only reckon with. In this context, the following theses of his teaching seem reasonable: "Let childhood mature in children; ... if a lesson becomes necessary for them, beware of giving it today, when you can confidently postpone it until tomorrow" [43, p. 233]. Of course, the world of children that Rousseau describes is not a preparation for future life, nor is it identical to an adult's world. That is, it is qualitatively specific. And, of course, it cannot be understood from the opposite perspective, particularly from the fundamental determinations of pedagogically oriented cultural-historical psychology[1].

The main principle of anti-pedagogy is the postulate of the child's natural development (the botanical metaphor Maturation is often used). Even parents do not have the right to impose this or that choice on the child. "Children are assumed to be capable of making fateful choices for themselves from the moment they are born. For each person is responsible only for himself" [45].

The imperative of the child's world autonomy does not allow us to consider the child's development in the context of socialization, which is understood as the transmission of cultural values and meanings to the developing individual. The term Enculturation is more characteristic of the anti-pedagogical discourse and emphasizes the activity of the individual himself or herself, who in the "cultural act... creates himself through culture and asserts himself as a person" [46, p. 34]. It is assumed that in the process of enculturation, each person creates his or her own unique image of the world. As a result, all people live in different worlds "in which rules of behavior are developed that are authentic to them, which means that "reality" falls apart and the classical model of education loses its obviousness since it is not known for which world the child should be prepared" [45]. Moreover, the value of the individual world of a growing person is equal to the world of the one who supports him/her in the course of their maturation.

In this respect, the most important context of the pedagogical project, the future, is disempowered in the anti-pedagogical promise and loses relevance. As a result, the pedagogical ontology takes on a *presentist* shape[2]. Only the presence of the child and what happens "here and now" in the course of interaction with him or her matter.

[1] "Human anatomy," L.S. Vygotsky and A. R. Luria quote Marx, "is the key to the anatomy of the ape. Allusions to the higher in lower species can be understood only if this higher is already known" [44, p. 27].

[2] *Presentism* is the theory of time according to which there are only real things and events, while the past and the future do not exist. In order to implement this thesis, it is necessary to control the use of language, since the tenses (past, present and future) are actively used in everyday language [42, p. 30].

In the anti-pedagogical educational project, according to the posthumanists, an anthropological legend is used, the core of which is the organic idea of self-development. The intervention of an adult may have some significance, but only in cases where there is an imbalance in the natural tendencies of self-realization or their blockage in the course of self-formation. In this context, the equivalence of the positions of an adult and a child in educational relations is proclaimed. The German antipedagogic theorist H. von Schönebeck generally presents it as friendship. He argues that our own and others' feelings are more important than ideas about what our friend "should" become. And we must respect the child's right to be who he or she wants to be. "We can be whomever we want to be, including children. The opportunity to "show one's true colors" is a great blessing based on trust and respect for new relationships" [48]. Trust and openness are the most important features of interaction in an anti-pedagogical project. Openness, in this case, is not understood as the possibility of the experience to be understood [49, p. 444] but as an essential feature of the interpersonal interaction between an adult and a child, as openness to the world, as trust in one's ability to establish new relationships with the environment [49, p. 453].

Within the anti-pedagogical approach, two versions can be quite clearly distinguished. The first, *logocentric*, can be illustrated by educational practices based on Piaget's genetic epistemology. It focuses on the intellectual component, which has a universal and transcultural essence. Through this program, an individualized subject is reproduced, which in the course of adaptation to environmental conditions at a certain stage of his/her development (the stage of formal operations), acquires the capacity for reflective self-determination, and becomes a full participant in social and cultural life. Clearly, this program, in the anti-pedagogical, logocentric version, is declared to be the law of mental life [50, p. 92].

The social interaction of a developed individual takes a distinctively decentered form, in which the position of another person is taken into account and, if necessary, a mutually beneficial compromise is found. From this perspective, decentering is important for establishing a relationship with another person and reflecting one's own position (in the mirror of that person). Of course, the other person's position at the level of formal operations is not identified with the position of the developing subject; however, it is assumed that fully developed communication participants have compatible coordinate systems.

The second anti-pedagogical version is most clearly represented in humanistic psychology and pedagogy, especially in the educational projects of the American psychologists C. Rogers and A. Maslow. In contrast to the European child-centered tradition, in which the mechanism of development is located in the mental space of the child and, according to J. Piaget, coincides with the experience of accommodation of cognitive structures, in the antipedagogy of Rogers and Maslow, the mechanism of individual transformations is focused on the affective experience of the child, his *values* and *feelings*.

In a critical evaluation of the discourse of the pedagogical project that focuses on abilities and skills that are external to the person, A. Maslow argues that all the content that is overrated for this field, "all these lengthy works on the psychology of learning, contain nothing essential, nothing vital, at least not for the human being, for the essence of man, for his soul" [51, p. 180]. In this context, "the goal of education and the object of education are the man himself and the humanistic goals, that is, those that correspond to the interests of man, and among them – the "self-realization" and "humanization" of man, the full embodiment of what a human being can achieve as a representative of a species, what the best representatives of humanity already possess. In less technical terms, the main goal of education is to help a person realize his or her full potential" [ibid.].

In the context of what Maslow wrote, the most important provisions for the anti-pedagogical project should be highlighted. First, it is a statement about the existence of a human essence that is subject to a Natural tendency to self-actualization. And secondly, it is the existence of a universal ideal, i.e., the image of a person, in the direction in which the development process should unfold. In other words, the question of the model is not excluded by the anti-pedagogical ideology but is Immantized and attributed to the inherent program of every human being, which, although rooted in each individual representative of the human species, is the same for all in its incarnation.

Since such antipedagogy postulates both the existence of human essence and the notion of education as a practice that corresponds to the interests of the student himself or herself, it makes sense to ask what this interest is all about. The answer lies with Carl Rogers, who believes that "behind every (mostly) superficial conversation lies the same basic, vital problem: 'Who am I really? Will I ever be able to discover my true *Self*, or at least touch it? Will I ever feel certainty or consistency within myself?' And these questions are asked by countless, not only young people but seniors as well" [49, p. 105].

The mystery of the *Self* needs no structural description. This is, as shown above, the privilege of the pedagogical project. The motivating basis of development, i.e., the mystery of the *Self*, has its potential mainly because it lures with its obscurity. The desire for self-knowledge is the motor of development, and its anticipation by adults is a justifying condition for adult Inaction. The development itself consists of "personal growth, in the fact that the individual can allow himself to immerse himself in the immediacy of what is felt, to strive to feel and clarify all the complex meanings of these experiences" [ibid., p. 402]. In fact, forming a new harmonious relationship with one's experiences, and reorganizing the connections of the *Self* with the world and myself that have become inefficient, is anti-pedagogical self-actualization.

Summarizing the preliminary results, it can be said that the anti-pedagogical version of the humanistic approach to education does not deny the need for external participation in the development of students[1] but determines it through a set of axiomatics and reservations aimed at ensuring the maximum manifestation of the child's own activity and creating conditions for equal communication between two (and more) subjects of education. At the same time, the assumption of the initial atomic subjectivity of the dialog partners is included in the list of axiomatics of antipedagogy, along with the manifestation of the "nature" and autonomy of childhood attributed to the development of the mechanism of self-knowledge, self-movement, and self-rehabilitation.

In the Eastern European educational space, the anti-pedagogical project opposes formalism and alienation, which, according to its adherents, are reproduced in mass pedagogical practice. Thus, the Russian humanistic psychologist A.B. Orlov, defending the idea of authenticity of the world of children from the expansion of the pedagogical project, writes that "the majority of school teachers and other practitioners of the public education system still adhere to the traditional (formative) pedagogical ideology; therefore, they (with or without intention) slow down the processes of positive transformations. As a result, both are deaf and blind to children's individual experiences and inner world, i.e., to what psychologists call the child's true (inner) *Self*" [53, p. 126].

In their argument with representatives of the posthumanist orientation in education, anti-pedagogues are primarily concerned with protecting the sovereignty of the individual and established ideals. Posthumanists, according to opponents, reject traditions, ignore generally

[1] "Antipedagogy does not fundamentally deny the necessity of an adult's participation in a child's developmental processes; however, its critique focuses on the most vulnerable component of the pedagogical project-the child's inadequacy-and encourages the search for and reinforcement of moments that make it possible to mitigate or eliminate those conditions in educational relationships that diminish the potential for autonomy and freedom of the person being educated" [52, p. 570].

accepted rules, and neglect scientific data. They employ two main techniques in their struggle: discursive exclusion (ignoring, devaluing, demonizing) and neutralization. In the first case, the posthumanist educational orientation is either not mentioned at all or presented negatively. In particular, it is claimed to attack the natural foundations of identity, threaten the Great Synthesis of knowledge, and negate a positive developmental agenda [54, p. 381]. It is also accused of lack of scientificity, analytical superficiality, and incorrectness when it wants to "talk about scientific theories of which there is at best a vague impression" [55, p. 11]. The proponents of the anti-pedagogical project do not accept the posthumanist thesis that asserts "the dissolution of the subject in the processuality of discursive practices" and the randomness of its *Self* [56, p. 90].

In the case of neutralization, the posthumanist point of view is removed from the political and educational context and appears as a system of ideas, i.e., as the subject of the so-called Weighted criticism (on the one hand, on the other hand...). It turns out that the posthumanist vision excessively "relativizes moral values and norms and rejects priorities and clear guidelines," but at the same time, it contains elements of positivity because it recognizes cultural polyphony and the possibility of a real dialog; it frees it from dogmatism and emphasizes the radical pluralism of language games [57, p. 66].

In their opinion, the characteristics that its critics attribute to the posthumanist educational project make it totally unsuitable for solving educational problems and developing perspectives for educational research [58, p. 223].

Despite many other disagreements, in this respect, the positions of the two representatives of the pedagogical and anti-pedagogical projects are in complete agreement. According to the Polish philosopher of education, T. Szkudlarek, "it is not even conceivable for pedagogy to turn to the discourse of postmodernism, not to problematize and challenge development, but to create new possibilities for development" [59, p. 84].

2. The Post-humanistic Educational Project

We will consider the post-humanistic educational project (which we associated in the introduction with the philosophy of postmodernism) primarily in the context of its attack on the holy of holies of humanist education, i.e., the category of "humanism." The politics of the *Self*, which expresses the essence of the humanist project, corresponds to the anthropocentric stance, as mentioned earlier. And although this orientation is realized in different ways in its two versions (the pedagogical one goes down to the student, shaping his/her internal psychological conditions, and the anti-pedagogical one goes out from them), the hope that the child can eventually become Master of Themselves unites these two versions.

The view of the human being that is consistent with the posthumanist view is often presented as non-anthropocentric humanism. The proponents of this perspective consider the crisis and even the death of the subject in the form of its cultural symbolization, in which it has historically developed, as the condition that produces it. In the first place, it is a question of exposing the illusion of subjectivity begun by S. Freud. It is already important for our analysis that "the idea of the Death of the Subject was in sharp contrast with the subject-centrism of the first half of the 20th century (phenomenology, existentialism, hermeneutics, humanistic Marxism)" [60, p. 57].

Considering the human being from the perspective of the processes taking place in modern culture, from a posthumanist point of view, allows us to see the limits of the humanist program since the new situation of human life activity reveals this life activity itself as a cultural structure and problematizes its fundamental components (subject/object; nature/culture; personal/social; internal/external). It also reveals the illusory character of the humanistic idea of human domination over the world.

The Polish methodologist E. Domańska says: "The ongoing discussion within the framework of the new humanism about human essence, otherness and exclusivity increasingly concerns non-human existence – animals, plants and things. The *Other* is no longer just someone who is different from us in terms of race, gender, class, or sexual or religious options, but someone who can be any this/that/that, i.e., someone who is different from us in terms of species and/or organic (in the sense of, e.g., inorganic life)" [61, p. 11]. According to her interpretation, this kind of revision of descriptions of reality is not the result of an intellectual fashion and the cognitive curiosity of avant-gardists. However, it arises from the realization that the usual ways of thinking about the world do not correspond to the changes that are taking place in it (genetic engineering, transplantology, psychopharmacology, and nanotechnology) [ibid., p. 12]. In the context of non-anthropocentric humanism, "the non-human (animals, machines, and plants) is granted agency and subjectivity" [62, p. 140].

In humanitarian thought, "the notion of the human as a complex being rooted in an environment whose relationship to others is not obvious and who is subject to careful analysis and critique is increasingly affirmed. This is related, among other things, to the discovery that humans are involved in many different systems, processes, and events, a hodgepodge of forces and forms of existence" [63, p. 10]. For example, the boundary between the human and the non-human proves problematic from its marking point of view. M. Chutorański describes the following paradox: "The bacteria that live in my body, which I call mine, poison it and cause various changes in it or are simply neutral – is that a part of me? Or is the neoplasm that I want to destroy with the help of chemotherapy, doctors, and people close to me a part of me, or is it something foreign to me that I want to kill?" [ibid., p. 11].

The non-anthropocentric perspective of education refuses to reduce it to interpersonal interactions or individual situational receptions. "Education is much more than the intentions of teachers and the curiosity of children; it is a particular relationship that connects participants in space and time: in a particular classroom, in a courtyard, in a factory... they are specific networks in which something more than one person acts. We must recognize that every learning interaction is local, but it can create both longer and shorter networks. When the networks are very long, the relationship stabilizes... and there is a structural effect" [64, p. 141]. The latter does not mean the implementation of the popular opinion in pedagogy that "everything educates." It merely follows from the non-anthropocentric concept that "we must constantly strive to understand how many entities participate in the educational event, how they become educational actors. And how many participants are set in motion by education" [ibid.64, p. 144].

The non-anthropocentric definition of the situation confronts education with a series of unprecedented questions, one of which is the principle of anthropocentrism itself. The possibility of the Self dominating itself and the surrounding circumstances thanks to the reflexive efforts of the individual, as the humanists believe, loses its fundamental status in post-humanistic discourse, since the individual is considered as one and, at the same time, not the most significant part of the process of personal identity.

The posthumanist critique focuses primarily on the ideology of the true *Self*, which is popular in education. Education that accepts this attitude becomes a condition for stabilizing the educational situation, while the task of education is to model instability and uncertainty. The thesis of the anti-pedagogues about openness is no less sharply judged. This is especially true for interpersonal relations. The interpretation of openness as access to the inner world of another and the interpretation of closeness as a personality defect can, according to the posthumanists, lead to the enforcement of conformity on the one hand and to the legitimization of social control on the other.

In conjunction with the idea of a true *Self,* openness transforms education into a psychotherapy session. As a result, according to the posthumanists, a humanitarian program is implemented that is no less socially ethical than a pedagogical project but is covered with a mask of goodwill and mutual trust. As the American posthumanists, R. Usher and R. Edwards write: "In the educational field, the person-centered or student-centered curriculum, although apparently centered on the intrinsic characteristics of the learner and the rightness of students making decisions about their own learning, actually works to increase the efficiency of the 'learning system'. In other words, despite the stated rationale of students taking control of their own learning, the emphasis is on cost-efficiency, 'value for money' and more efficient regulation through engaging students directly in a supposedly democratic process of participation – a process, however, which is empty of 'empowering' content and centered on adaptation" [65, p. 45].

However, the main criticism of the posthumanists that is constantly reproduced in humanistic discourse, namely that the posthumanists ("and the postmodernists who have joined them") lack a positive educational project, does not stand up to scrutiny. This applies to the teleology of the posthumanist orientation and its technological structure. Since the limited scope of the article does not allow us to present its provisions in more detail, we will briefly explain them point by point.

2.1. The Teleology of the Posthumanist Educational Project

Since in the posthumanist discourse, the sovereign inner world of an individual is revealed as a place of competition between different (even anonymous) forces, some of which act as products of artificial intelligence, the most important condition for the liberalization of the human being is the individual's ability to discover and to recognize himself or herself as a derivative of the cultural practices, life programs, information flows, and cultural mediators (texts, images, and symbolic organization) that dominate his consciousness. By these Objects, we mean those that have both external and internal status. For example, the values conveyed by the mass media are perceived by their consumers as their own desires, which testify to the existence of a True *Self*. From this point of view, the content conveyed by education is not fundamentally different from the messages of mass media or the influence of social networks. All these and some other cultural and educational factors require a response at the pole of identity, which, in the face of a multiplicity of influences, is transformed into a structure of Operational Response, a position that an individual assumes in the communication processes of a heterogeneous environment.

From this definition of a cultural situation emerges an unprecedented problem for education – modeling the conditions of a plurality of forms of knowledge in which participants in educational interactions are immersed in a polyphonic environment, experience themselves under the conditions of epistemological and linguistic relativity, reveal the practical rootedness of any discourse, as well as objectify the connection of a particular position (one's own and another's) and discursive (communicative) power. "Meanwhile, the cognitive field of knowledge as an object loses its integrity (which has already become a myth of epistemology), but at the same time, it develops into a certain mosaic of necessary knowledge that reflects the idea of heterogeneous integrity possible in the educational experience of each subject (student)" [66, p. 88].

In the post-humanistic educational project, the *Self* of a participant in educational interaction loses its status of psychophysical self-identity common in traditional education and becomes a *Self*-illusion. What is meant is the emergence of a new "hero" in educational communication, i.e., the discursive *Self* is a communicative construction.

In the humanistic tradition, an utterance (gesture, movement) is firmly linked to the individual who produces it and is subject to the imperative of responsible speech. In other words, there is no

distance between speech production and the content or form of the utterance. Moreover, distance usually implies a lack of authenticity and sincerity in communication. In this case, a playful, ironic judgment that reveals an attitude toward its subject and the conditions of its expression has every chance of being suppressed by a teacher who controls communication or by a learning group. And even if not, the speaker will be forced to ask himself the question: What are you thinking right now? For in humanistically oriented practices, this kind of appeal is justified and conceptualized because the existence of a particular *Self* is assumed that gives rise to a thought and controls the form of its expression.

The post-humanistic perspective[1] that brings the discursive subject onto the educational scene corresponds to the need to "distinguish" between the subject in discourse and the subject (individual) in itself. In the logic of discursivity, the continuity and self-identity of the student are broken. In the language of E. Husserl we can speak of a kind of exception that takes the circumstances of the psychophysical individual out of the bracket and deprives them of their effectiveness. "The gap between the subject-in-itself and the discursive subject is an indicative event relation, an act of education" [68, p. 48].

The distance created by this act becomes a condition for the individual to experiment with the position of his/her statement as with the organization of the current interaction. "Within the framework of a single discourse... the subject is insignificant, it is subordinated to the discourse and plays by its rules (i.e., it is secondary)" [66, p. 88].

In this case, the discursive educational identity functions as a linguistic (textual) position or as "the effect of interventions that enable the subject to identify itself in the short term" [69, p. 346]. From this follows the specification of the practice of the self-relation of the discursive subject. In this case, it is not a matter of cultivating the narcissistic attention of the student to him/herself or the individualization of learning, which presupposes that the teacher understands the characteristics of "the student's knowledge (private, public) and the characteristics of his/her interests for the realization of a mutual understanding" [70, pp. 324–325].

The discursive position of the student implies the implementation of the model of "practice of the self" in teaching, which is based, first, on a special self-relation, "not-*Self*." This self-relation, as mentioned before, is based on the fact that the statement does not belong to the participant but to the communicative position. Secondly, it allows self-experimentation with emergent positions for theoretical identifications and playing the related perspectives.

The above list of new educational goals leads to rethinking the logic of development in education. The latter is now consistent with subjective transformations in education that return the subject to itself and are based on "the metacognitive application of critical thinking that transforms an acquired frame of reference-a way of thinking or worldview with orienting assumptions and expectations that include values, beliefs, and concepts-by evaluating its epistemic assumptions" [71, p. 124].

2.2. The Praxeology of the Post-humanistic Project

In contrast to humanistic education, which focuses on the internalization of the content of culture or the exteriorization of the structures of the inner world, the content of interaction in post-humanistic education is determined by the ideology of deconstruction, which we have already briefly discussed above. The invocation of this practice is primarily due to considerations of symbolic redundancy, which is specifically modeled in the educational setting. This circumstance exacerbates the problem of orientation in this environment, which becomes more

[1] A discursive subject is a concept that describes the position of a participant of an educational interaction in which he is faced with the need to "take care of the integrity of such model of his "Self", which enables him to reassign the statement in the acts of making an identification of "Self" with his speech" [67, p. 175].

important through the analysis of the structure of symbolic mediators, their connections, and dynamic changes in the course of their application. The latter is particularly important due to the constraints that program the individuals. As a result, deconstruction in education is seen as "a strategy of immanent critique built into a given cultural code...that helps to distance the analyzed subject "from within" [59, p. 132].

The task of deconstruction in the post-humanistic project is to ensure that dealing with statements circulating in the situation of learning "makes it possible to breathe a new spirit into ossified thinking, to dereify events that have become obvious and objective, as well as to revive the discourse and the schemes of thought operating within it and to gain a different perspective on what seemed to be known/cognized" [72, p. 299]. The practice of deconstruction makes the sign (image, symbol) the main subject of education. The deconstructive operation with a sign means an attack on the usual understanding of the sign as a "trace" of meaning and asserts its secondary character and representative status. The deconstructive operation "involves a revision and envelopment of the traditional structure of the sign (signifier/signified), when the signified here loses its dominant position" [22, p. 118].

However, the semiotic transformation in the course of deconstruction is not only connected with the reversal of the established connection between the signifier and the signified. In its course, overcoming the so-called "metaphysics of the presence of human being in the world of language" [ibid., p. 50] is no less critical. Here it is about the experience of distancing a student from language, teaching him/her to consider it not only as an expression of inner human states but also to make him aware of the nature of linguistic functioning, its rules, and its productivity in relation to group and individual relations.

In specifying the methods of deconstructive experience, posthumanists also mention specific rhetorical techniques, including the dismantling of a conversation, i.e., loosening. This makes it possible to make the interlocutor's position unstable and indeterminate, to move it away from the Dead Point and to rock it... [73, p. 11]. Loosening, according to Polish philosopher Łażewska, at the pole of the learner leads to "...confidence that nothing can be said with full certainty" [74, p. 168].

The creation of "double oppositions" can also be attributed to a series of deconstructive techniques that enable the identification of Indistinctions present in the text [59, p. 135]. Here, the aim is to create" 'counter-texts,' that is, texts with an alternative structure of meanings that explode the metaphysical vision of the world and affirm innocence" [ibid., p. 138]. The counter-text, in this case, is not a "meta-text" because "the deconstructive thought cannot be realized above the text; it is woven into the meanings of the primary text, extending and moving it, creating an intertextual relationship that makes it possible to recognize the 'semantic violence'" [75, pp. 40–41]. The use of counter-texts leads to a focus on awareness of "textual literacy" in the sense of "understanding cultural messages, cultural texts, and the mechanisms for their production and dissemination" rather than the acquisition of "positive knowledge" [59, p. 138].

The peculiarity of the use of deconstruction techniques in education lies primarily in the fact that, as a field of instruction, they are accompanied by an "epistemological transformation" for the participants in the pedagogical interaction, i.e., a change in the student's attitude toward knowledge. Here, it is about the formation of the student's attitude towards the fact that knowledge is "produced," that it is not synonymous with truth: knowledge is a text produced by someone under certain circumstances, and to some extent, it carries a cognitive perspective, depending on the conditions for its creation... Therefore, teaching should encourage the student to a) deconstruct the meanings circulating in communication, b) critically transform his or her knowledge, and c) deconstruct the educational process... The goal of the third phase is to prevent the limitation of

the critical attitude...; that is, the results of deconstruction should not be absolutized as a New Truth that replaces the Old Truth... This critical epistemological attitude toward knowledge as a process involved in specific social situations becomes not only a source of deconstructive teaching, but also its result" [59, pp. 131–132].

Conclusion

As mentioned in the introduction, this work was a text experiment to create such an explanation to help students interested in educational structures to at least somewhat navigate when a reliable objective educational map is not possible. Moreover, in the course of the experimental work, many problems related to the implementation of the claim to the generality of the created explanatory mechanism were discovered. They concern, first, its dependence on the position and actions of the person performing an act of educational self-determination, and second, the connection of this design with the conditions of education, in which orientation takes place exclusively in artificial circumstances that bear little resemblance to the realities of surrounding life, and not on sight.

In the first respect, the orienting statement can be associated more with the position of a stalker who wanders with his/her companions each time through unexplored territory than with the activity of a guide who presents a cultivated landscape to his/her followers. The stalker is not sure of his/her knowledge of the path nor of the clarity of the intentions of those he or she accompanies. However, the certainty of choice is also not characteristic of his/her fellow travelers. Moreover, a student at the beginning of his/her professional training and the young specialist he or she will be after training are not linked by genetic continuity. Moreover, this means that the orientation mechanism in the educational environment cannot be permanent.

In view of these and some other challenges, we decided to abandon the mapping ideology in constructing an orientation structure and chose to be guided by considerations of a different nature. For example, constructing an objective image of educational status is impossible in principle. But, in that case, this does not mean that it is impossible to undertake a journey together with fellow travelers, like a stalker, whose outcome is the experience of the journey rather than patterns of movement that might prove inappropriate in the future. The only question was what kind of experience that might be.

In creating our text experiment, we started from the fact that prospective teachers' perceptions of the educational situation are loaded by their previous stay in educational institutions. D. Klus-Stańska writes in this context: "Everyone who has ever had a school experience has an imposed idea of what learning is and how it happens, and this idea strengthens the uncritical trust in the results of the research conducted in such a school, which is considered to be the only possible one. However, the coincidence of completely different Versions of teaching and learning with completely different images of school makes it possible to discover that what we thought was the essence of learning processes is only one of the possibilities and that the patterns considered universal have been created by the conditions in which we are stuck" [7, pp. 18–19].

The School Heritage concerning education, multiplied by the group conformity of the educational participants, leads to the fact that the student's perception of the educational situation is subject to Schütz's social Law, which deals with the coincidence of relevance systems and the interchangeability of their receptive perspectives. As a result, education appears in the minds of the participants as homogeneous and homonomous and is reproduced in this capacity.

To break the reproduction cycle means to see the educational situation as a site of symbolic struggle between pedagogical politics, a clash of anthropological practices, and a contradiction of humanitarian images. This is the problem that the indicative scheme we have developed is

primarily intended to solve. In this case, the receptive device we are testing is a pedagogical tool that aims to diversify (or facilitate) the perception of its user. And for this, it is important not only to show the difference but also to help students see the emergence of these differences as the product of the actions of a variety of people interested in their approval.

To this end, we developed a semiotic perceptual differentiator that juxtaposes images of humanistic and post-humanistic educational practices to create a basic distinction between educational forms, positioning educational objectivity and identity differently each time. Humanistic practices were presented in two versions: pedagogical and anti-pedagogical. The latter appeared in intellectualist and emotionalist forms. They were oriented to different psychological conditions as the basis for the organization of pedagogical action, but still coincided in their focus on the personality of the student, and with their help, solved the problem of stabilizing the student's position as the top priority of education.

In contrast to the humanistic educational project, the post-humanistic project, from whose perspective we were going to write this paper, abandoned the idea of a stable and centered identity and presented it as a particular kind of discursive construction, that is, as the standpoint of the participants in educational communication. This point of view was consistent with the statements (texts) made during the training with which the users were performing short-term identifications.

However, apart from the above results, our experiment also revealed a number of previously unnoticed research problems. These include the following:

– Difficulties in the Spatio-temporal reorganization of the orienting action and the orienting text associated with it. We are speaking here of the need to overcome the common notion according to which the orienting action (as well as the orienting text) helps to solve the problem of multiplying the effectiveness of the activity by, first, creating a panoptic illusion of the action (since, it is assumed, through it "the general outlook of the forthcoming action, the content of each of its links, as well as their sequence and the connection between them" [78, p. 44], is opened up and the student "will inevitably arrive at the predetermined results" [78, p. 40]), and second, by providing the acting subject with a cognitive economy (for "the preparatory orientation... to the typical features of the subject under study is psychologically important for the formation... from the very beginning of a generalized knowledge that allows to effectively master specific and diverse material without getting lost in its details and particulars and without spending too much time in understanding them" [79, p. 297]). The action research that served as the methodological basis of this textual research can be understood as the key idea of the educational rather than a didactical reinterpretation of orientation – its shift to the students' searching activity from a condition that precedes pedagogical self-determination (through its implementation as a result of this type of activity) to the support of the preconceived idea that the students themselves shape the means of orientation as the main content of pedagogical education.

– The complexity of the representation of ontologically heterogeneous forms of education is due to the inclusion of orienting statements in a single narrative, which reduces polyspatial diversity to monospatiality. In this context, the research focuses on the narrative form of the indicative text, a problem that can be solved by using hypertext structures in its organization. "The essence of hypertext is the multiplicity, the infinity, and the dynamism of the connections of units of knowledge, i.e., of concepts, quotations, images, and theories, i.e., of all elements that can be related in some way to the text being read. At any moment, the user can Jump to the moment related to the given text and start reading a new unit, from which he or she can continue indefinitely. Hypertext is a Perfect Encyclopedia, especially because the verbatim nature of its implementation seems to destroy its core idea: it is not a book and, therefore, cannot (and never will) lead to definitive knowledge. It is too changeable and dynamic for that" [80, p. 103].

– Difficulties caused by the qualitative peculiarities of the indicative text itself, expressed in its own status dynamics. In one case, the signs used in the orientation process are realized as semiotic forms that refer to other signs and are therefore potentially meaningful; in the other case, their meaning is determined exclusively by regulative goals, i.e., by action values that indicate the need to change perspective or to switch from one reading mode (perception) to another. The indeterminacy of these circumstances inevitably requires a series of studies in the field of pedagogical semiology with the subsequent creation of an appropriate sign-symbolic typology. The latter becomes an indispensable tool that can provide orienting solutions. The experience of such developments is available, for example, in modern micro ethnography, when studying communicative operators, that is, contextualization signals denoting the action by which one of the participants establishes one or another version of the situation for the other [81, p. 131].

– And finally, *a series of questions dealing with the educational application of the orienting statements.* As we can see, the statements (texts), which organize and guide the students' movement in the educational environment, are insufficient at this stage since they all acquire meaning only when the students carry out the movement. It follows that it is necessary to develop specific pedagogical tasks that stimulate student activity and find pedagogical techniques that support them. Keep in mind that the deconstructive procedures we briefly discussed above are primarily aimed at breaking the habit of students' perception of education. This means that the methodological solutions should consider students' resistance to the deconstructive effects.

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Submitted May 25, 2022

УДК 37.062.5
DOI: 10.23951/2782-2575-2022-2-42-52

VALUES AND MEANINGS THAT THE INTERIOR OF A SCHOOL CONVEYS TO A STUDENT*

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Abstract. The article is devoted to the analysis of the elements of visual communication presented in the interiors of schools. The lack of textual solutions that meet the emotional and value-based requirements of modern students in the visual space of the school is investigated. Texts in the educational space of the school are a flexible and multifunctional tool that can be used not only to increase the school's attractiveness but also to create an educational dialog with students and their families. Texts can promote the rules of interaction between people and society, the value of ecological behavior, the effective use of resources, respect for others, and a subjective position in educational activities.

Materials and Methods. Photographs and video recordings of the visual environment of modern Russian schools served as material for study. The data was collected not only in classrooms but also in all common spaces of the school – corridors, gymnasiums, canteens, museums, libraries, staircases, and entrance areas. In some cases, the object of analysis included images and texts conveying a specific meaning. Qualitative and quantitative analysis are the main methods used in studying text solutions in educational institutions. The article proposes a classification of visual solutions used in schools (8 types of texts) and describes the group interview method as a research tool for visual solutions in schools. Fixation and attribution of school texts were conducted in interaction with adolescent students.

Results and Discussion. The study reveals the content and stylistics of interior elements in modern Russian schools. The article justifies the use of School Texts to develop students' Flexible Skills. The modern visual environment of Russian schools is largely focused on the preservation of the traditional school system. It conveys a formalized idea of school, in which learning is the main focus rather than other aspects of students' lives and personal development.

Conclusion. In order to develop and implement these solutions, it is useful to combine the efforts of professionals from the fields of design, pedagogy, ergonomic psychology, philology, and linguistics and to listen to the ideas and desires of the main subjects in the educational process – the students themselves. The study results show a lack of professional solutions in the design of modern schools. The article suggests ways to overcome these gaps through a collaborative approach to the design of the visual environment of educational institutions.

Keywords: *educational space interior design, learning space, visual communication at school, value-based text*

* Original Russian language version of the article: Azbel' A.A., Ilyushin L.S., Samoylova E.S. Rol' tekstov v dizayne obrazovatel'nogo prostrsnstva sovremennoy shkoly. Analiz mneniy i kyeysov [The Role of Texts in Modern School Educational Space Design. Analysis of Opinions and Case Studies]. *Vestnik Tomskogo gosudarstvennogo pedagogicheskogo universiteta – Tomsk State Pedagogical University Bulletin*, 2019, vol. 8 (205), pp. 30–38. DOI 10.23951/1609-624X-2019-3-27-34

Introduction

The topic's relevance arises from several objective challenges of the current educational situation. First, achieving a new quality of education that includes the development of 21st-century skills is impossible without significant modernization of the school environment. Second, the new developments in information technology (studies on information perception of modern children, new forms of text presentation) significantly impact out-of-school education and should be considered when designing the school environment.

Finally, the renewal of the school educational environment is envisaged in the National Project "Education" 2018-2024 (section "Modern School").

Texts in the school educational environment are a very flexible, multifunctional tool that can make schools more attractive and engage in dialog with students and their families. In addition, texts can promote the rules of interaction between people and society, the value of ecological behavior, the effective use of resources, respect for others, and a subjective attitude in educational activities.

The aim of the present study is a structured analysis of the content and design of texts that constitute the visual environment of modern schools. We started from the assumption that most texts found in the school environment do not meet the emotional needs of students.

Theoretical Foundations of the Research

A learning space is a place designed for learning [1]. Most often, such spaces are understood to be schools, universities, or colleges, but it should be noted that almost any space, including virtual ones, can be instructive because the learning process itself is continuous and takes place in the interaction between a person and the world that surrounds him or her.

The visual environment of a school is a component of the educational space where ideas and information are conveyed in forms that can be seen and perceived [2]. Furthermore, when we talk about the importance of the communicative component in the school environment, the formulation of G.N. Lola is worth noting: "...design is a communicative practice of constructing a sign product capable of creating an impression." [3] We have studied the influence of educational space on students' activities and conditions from different angles. Based on the analysis of published works in this field [4–7], we identified three main approaches: the architectural-ergonomic, the pedagogical, and the psychological. *The psychological approach* includes issues such as attachment to space [4], psychological well-being in space, and the motivational and inspirational effects of space. *The architectural-ergonomic approach* examines the physical elements of buildings: lighting, ventilation, acoustics, wall color, and space zoning. In this case, the physical objects are the main object of study [5]. Most of these studies focus on the design of new educational buildings or the renovation of existing buildings. *The pedagogical approach* lies in the theory of learning. Researchers attempt to answer a number of questions: How and where do people learn, and what influences their choice of learning space? "Physical space and technology alone are not the answer. What matters first and foremost are pedagogical ideas. The main focus should be on the learners themselves, their activities, the issues of information acquisition and structuring" [6]. The visual environment is considered a tool of the educational process that can influence student engagement, motivation, and performance [7].

In this article, the modern educational space is considered in its pedagogical and psychological aspects, which allows us to analyze the school's visual environment. The analysis of the works on the learning space [8–11] led us to the hypothesis that the visual environment of the learning space influences the learning process and the behavioral model of the actors involved in the educational process.

Let us discuss this hypothesis in more detail because it connects all three components of educational design: the space where learning takes place, the educational process in its entirety, and the different motivations of the people involved in the educational activity. Unlike in open spaces (city, nature), where the human gaze can reach both very high (sky) and very far (perspective, horizon, large objects in the distance), in a school, students perceive only this building and no internal object, text, or image can be so far away that it cannot be recognized. Thus, it can be said that the intensity of students' visual and, consequently, intellectual and emotional impressions is determined by the activity of their movement in the school and the activity of the school to update the school interior.

In general, the chronotope of the modern school, like that of the last century, is defined by a combination of patterns of activity and the organization of space. Although these categories are obviously generalized, there are clear contradictions in this combination that need to be understood and addressed. Let us briefly outline and comment on them.

1. There is a contradiction between the need to make the visual environment of the school dynamic and renewable and the existing rules for the design of the school environment. The administrative system tends more towards the second requirement, which affects the visual esthetics and shifts it towards declarative norms, and instructions.

2. There is a contradiction between the demand of students, especially young people, to participate in the design of the visual environment of their schools and the general opinion of school administrators about the insufficient esthetic level of "children's solutions." In other words, the bar of "flawless execution" of visual solutions (artistic, textual) cuts off a significant portion of what students can develop and realize on their own, even in collaboration with adults.

3. The contradiction between the potential of the school community to produce engaging, vibrant visual/informative content (extracurricular activities, school achievements, events, and personalities) and the minimal design solutions for presenting this material to the entire school community. The rapid development of presentation solutions (stand designs, information boards, video art at exhibitions and conferences) does not affect schools as potential buyers and active users of such solutions.

When studying texts in the visual environment of modern schools, we use the idea of neopragmatism [3] and the semiotic understanding of the text. "Texts are meaningful structures consisting of signs containing verbal information and represented in a synthesis with heterogeneous symbols of nonverbal nature" [12, p. 104; 12, p. 104]. The textual elements of a visual environment in school can be pictures, infographics, posters, photo stories, awards, objects, and installations with explanatory signs or texts. The classification of texts in school space is based on the works of S.V. Savinova, A.A. Harunzheva [13], Y.O. Bryazgina, A.A. Azbel, L.S. Ilyushin [14] and takes into account the results of empirical research.

Materials and Methods

We used the visual capture method to collect a series of photographic and video materials from different educational institutions. The content analysis method was used to study the information obtained and derive qualitative and quantitative indicators of the content, authorship, and stylistics of the elements of the visual environment used in the schools.

We collected the data from March 2018 to August 2018. A sample of 10 schools in Izhevsk, St. Petersburg, and Leningrad Region, whose principals agreed to participate in the study of visual space, was assembled. In total, we collected 578 photos and eight videos related to the school's visual text environment.

School texts were recorded and mapped through interaction with adolescent students. To this end, we arranged with representatives of each school administration for a tour of the school accompanied by 2–3 students (grades 5–7 and 9–11). During this tour, we took photographs and video footage of all elements of the visual and communicative environment. At our request, students commented on each element of the school's visual space (on average, about 50 elements per tour), answering the question: "In your opinion, did the students participate in the creation or/and exhibition of this text/picture/object?" In this way, we had the opportunity to clarify the background of the elements in the schools' visual environments while also capturing students' emotional attitudes toward each object. The students' comments were recorded in written form in the observation table. Each school visit lasted between 40–70 minutes. After the group work with the adolescents was completed, we met with teachers or school administration representatives and clarified information about the authorship of school texts/images and objects based on the previously taken photos and videos. In the majority of cases, the information obtained from students was confirmed.

Several observations made in the course of this work seemed important to us:

1. It is necessary to explain the idea of the study to the students in order to obtain open and detailed judgments about the elements of the visual environment of the school.

2. It is also important to enter into an emotional dialog with the students to point out that every statement about an object is interesting and important to us and that their opinions may differ when discussing the same object or text.

3. When talking to students about particular objects or texts, it is helpful to ask them not only if they like a particular visual solution but also to ask additional questions, such as: "How do you feel when you walk by this text, this object, every day? Do you agree with this statement? How do you understand the meaning of this stand, this poster? What would you change about this object if you had the opportunity?"

We then conducted a content analysis of the information we received, which we used to develop a classification of the school texts:

• *Navigation(guiding) texts.* Texts that help navigate the school day.

• *Presentation texts.* Such texts include various diplomas, letters of recognition, trophies, and descriptions of accomplishments.

• *Self-presentation texts.* Such texts are authorized and usually published in the context of exhibitions. They may include paintings, sculptures, installations, or posters.

• *Announcements texts.* These texts include various notices, posters, invitations, and texts for various holidays and school events.

• *Stories texts.* These elements are used to convey a story about the life of the school or class. Photographs often accompany the texts. Such texts can be school newsletters and visual stories about events.

• *Normative texts.* Orders, instructions, sets of rules, and regulations.

• *Motivational texts.* Aphorisms, quotations, posters.

• *Decorative texts.* Such texts include captions of paintings, objects, and installations.

Results and Discussion

In the content analysis, we identified the characteristics of the different text types and represented them in a quantitative relationship. (See Figure 1)

All the photographic and video material was subdivided according to the classification proposed.

After analyzing the submitted materials, we found that *normative texts*, *presentation texts*, and *announcement texts* together accounted for 56.1% of the total number of text solutions.

Orders, instructions, rules, and regulations, which account for 15.3%, are the least effective elements of the visual environment of a modern school, as they do not fulfill their functions. This is because the texts of regulations are not interactive, are written in an official bureaucratic style, and are presented in a small font that is difficult to see even up close. Moreover, these texts are rarely updated and lack explanatory comments, which indicates their irrelevance.

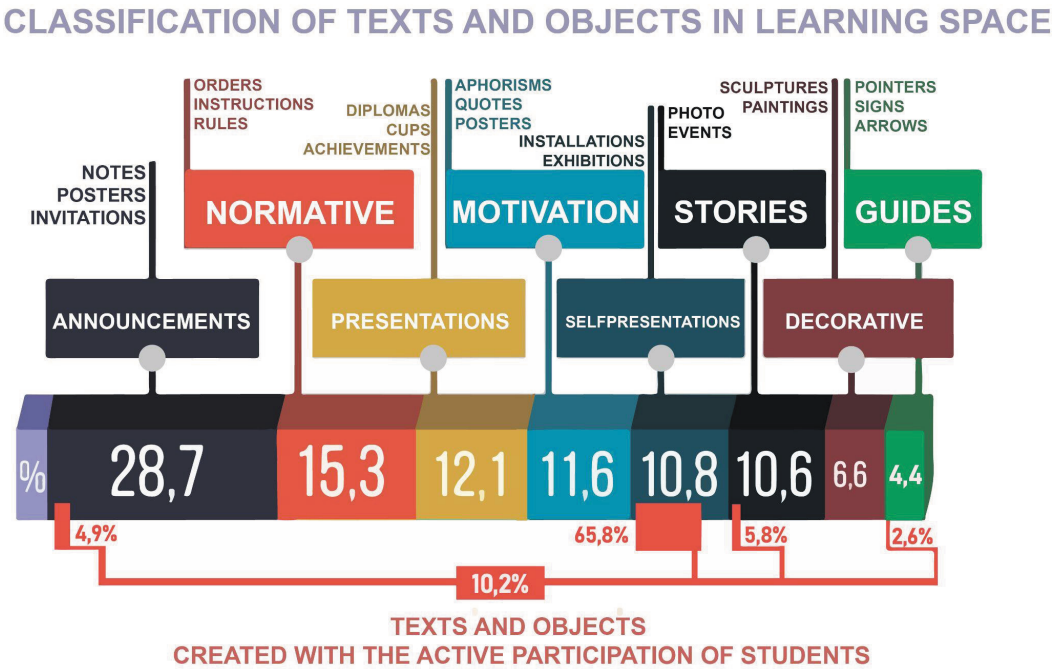

Fig. 1. Texts in the Modern Learning Space

Presentation texts, which include various diplomas, letters of recognition, and other visual evidence of school accomplishments, are important elements of the classroom as they inform about the successful activities, accomplishments, and victories of participants in the educational process. Unfortunately, such texts are often written in an official business style and displayed without student participation.

Most often (65.8%), students' original works are presented in the form of *presentation texts*, which account for 10.8% of the total elements in the visual school environment. Among the self-presentation texts, we also noted the creative works of teachers as well as graduates of educational institutions. Such texts are temporary and are usually exhibited or shown as part of an exhibition or competition.

Elements depicting school life make up 10.6%. It should be noted that there are very few text elements in this category; most (about 85%) are photo reports of events in school life.

Brochures, posters, invitations, and texts about various holidays are the most frequent categories of visual environment elements, with 28.7%. Among these elements, texts written by school children are extremely rare – in 4.9% of all cases.

Therefore, we believe that the modern learning space's visual environment does not meet students' emotional needs and does not reflect the school community's life, as very few texts are created with students' active participation.

We have formulated nine illustrative and analytical cases based on the analysis of texts presented in school spaces.

The Case of Unreadable Texts

Modern educational design is focused on the child. In marketing and merchandising, there is the concept of the Golden Shelf. In this case, it refers to the boundaries of the customer's main field of vision in supermarkets. The main suppliers compete for this line: they just need to place their goods in the right place, and they are sure of high sales of their products. School walls also have their own Golden Shelf, although their main content is ideas and knowledge, and the main goal is to draw students into an educational dialog with texts, images, and video content.

According to our calculations, an average city school has about 500m^2 of usable wall space at the student's eye level. Today, most schools use less than 10% of this space. At the same time, a large part of the analyzed text elements of the school visual environment uses small, illegible fonts and unstructured text solutions without images, icons, symbols, pictograms, and elements of information navigation. To adequately perceive such texts, one needs time and must overcome the difficulty of reading poorly structured material. For students, this resource is scarce, so such text solutions become information noise for most of them. Even less accessible and formalized texts seem like texts that cannot be reached and read because the so-called "info zone" or a stand with a text is far beyond eye level for most students.

The Case of Uninteresting and Disturbing Texts

According to our calculations, 75% of text solutions in a school environment, corridors, hallways, and staircases are written strictly in a business style [14, p.21]. The purpose of such texts is to formally remind about the rules of behavior in school and on the street, about the behavior in case of fire or terrorist attack. Of course, information of this kind is necessary, but its presentation risks creating emotional anxiety or, on the contrary, Visual Indifference in students.

The Case of a Lack of Polite Address to the Students

During the study, we noticed that announcements or information addressed to school children are usually written in the imperative, without words expressing politeness and respect. Thus, the constant tendency of written pedagogical address is more like a command, an instruction, than a request. In these conditions, it is challenging to establish a relationship between adults and children through a dialog.

The Case of Irrelevant Texts

When children become teenagers, they change their appearance and the design of their notebooks and school bags; in a word, they change everything they can. The presence of irrelevant texts in school, aimed at teenagers of the previous generation, reduces the modern teenager's engagement in perceiving school as a place of growth, gaining self-confidence, and focusing on the present and an exciting future. The formal, outdated texts often create the sad certainty that school life is boring and monotonous. Can students create texts for their schools and outside the classroom? Can they do something to shape their schools?

We believe finding positive answers to these questions can change the school environment. School space can engage in a dialog with students using a list of these questions: Am I for the school, or is the school for me? Is this an "official area" or a place for my growth? Is this place about bureaucracy, or can it be heartwarming? Will I always be bored within these walls, or is there room for excitement and discovery? Who am I here? Do I have the right to make a difference in this space, to create something of my own, something new? The right texts in school hallways can help answer these questions by shaping a student's worldview and attitude toward school and life in general.

The Case of Benevolence in the School Space

The emotional message of the school text is the main feature of the texts in the space of the school. The foyer is the first space a child, parent, or teacher sees when entering a school. The group of entrance texts creates a positive or, on the contrary, a negative mood for the upcoming school day. The use of humor, a polite and friendly style in the texts, and an attractive, harmonious color palette increase the attention of students and parents. Using humor in school texts is a tremendous resource for students' creative, esthetic, and intellectual development.

A notable example of the transformation of the educational environment is the concept of "school as a communication space" implemented in the interiors of the cloakroom of the №17 school in the Shchelkovo district [23]. The design studio 33dodo created a visual communication in the form of speech bubbles that humorously express the rules of behavior in the school. For example, "Is the sports uniform in place? Are you sure it's yours?", "Button up! No, one button does not count," "Did you put your hat on? In the pocket does not count", "Smile! You can even do it twice". In addition to the ready-made solutions, the live texts from students and teachers about school life are especially valuable and can inform parents about the latest news and upcoming events.

The case of the dynamics and actualization of texts

Our classification divides texts into permanent and temporary texts, among others. The percentage of temporary texts should be larger because the renewal of texts attracts students' attention. Texts that remain unchanged in the same places for an extended time can lead to visual and emotional fatigue. Of course, some texts are meant to create and maintain traditions – for example, the elements of the school's internal toponymic. Such texts, and names, are used for years and become full-fledged elements of the school's visual and emotional environment. Quotations and motivators, however, are rather temporary texts, as they quickly lose their relevance and novelty and begin to seem instructive and formal.

The Case of From Pictograms to QR Codes and Pokémon

There are ways to create texts that help maintain interest in the topics the school wants to draw students' attention to. These are so-called texts of a new kind [12, p. 104]. They are non-linear because they are built on the principles of hyperlinks, infographics, and combinations of characters, including the nowadays standard QR codes.

In today's world, the number of non-linear, multimodal texts is constantly increasing: web pages, social networks, infographics, and advertisements. Using new types of text in the school space helps convey complex information quickly and clearly, and motivates people to follow a hyperlink to something interesting and important. For example, a geographic map in the classroom with icons in the form of pictograms, QR codes, and augmented reality elements can help students remember basic geographic concepts.

The Case of Interactivity

Interactive texts are an important element of out-of-school learning spaces. Such spaces in schools help students adopt a proactive attitude toward their space. An interactive text encourages young people to play and express themselves. Teachers who want to meet the challenges of implementing a person-centered approach should be aware that children's interaction with the marker wall triggers complex, contradictory socialization processes.

The habit of consciously using this type of self-expression is gradually formed. In addition, interactive texts allow students to develop "flexible skills." These skills encourage students to

interact with the space actively, cooperate and collaborate to develop and design such elements of the visual and communicative environment that develop creative skills.

The Case of Self-Presentation and Teenage Creativity

The creative works of the students exhibited in the Golden Shelf are texts that allow their authors to present themselves in the school environment, stimulate discussions, and evaluate themselves.

There is the concept of Local Texts, i.e., texts created by students or teachers of the educational institution. "Texts form the cultural code of the school and create a sense of security for students and encourage creativity, as any student or teacher can become an author" [15 p. 55]. Student participation in creating texts for the educational space contributes to forming the school community and developing a culture of collaboration. In this case, the culture of collaboration contrasts the culture of consumption. The basic idea of this collaboration is that all people and communities are not only consumers but also creators of intellectual, creative initiatives, events, and artifacts [16, p.129].

By using collaborative practices to change the visual environment of the educational space, students and teachers can change their attitudes toward school and develop a sense of participation in creating their personal space. In classifying the types of texts, we also found a deficit of valuable texts. That is, texts that have an educational or motivational function or reflect moral meanings. In addition, many texts that are perceived as motivational by teachers and school administration representatives are described by students as uninteresting and boring.

Thus, the results of our study allow us to formulate a number of judgments about the practice of using visual-textual solutions in Russian schools.

1. The modern visual environment of Russian schools is largely focused on preserving the traditional school system. It provides a formalized perception of schools that focuses on learning and neglects other aspects of students' lives and development1.

2. Students' emotional detachment from the school environment is partly due to their lack of involvement in shaping that environment. At the same time, trust and loyalty to many aspects of school life are determined by the possibility of "dialog with the school walls," the development of respect, cooperation, and motivation to search for personal meaning in the educational process.

3. According to the Golden Shelf rule within the school, a persistent cliché in evaluating students' potential attention to the text is the thesis of the unconditional victory of the virtual environment over real, offline text solutions. By interviewing students and analyzing the collaborative creation of a visual school environment, we were able to destroy this stereotype and propose new, informal, in-demand text solutions in a school-based space.

4. Informal educational spaces actively exploit the potential of attractive, interactive, and dynamic textual solutions. Such spaces compete with in-school and out-of-school educational environments for the interest and participation of children and youth. Intensification of this competition is not an optimal scenario for developing the Russian educational system, as it may further develop the syndrome of "school fatigue" among students and parents.

From the results of our study, it is clear that texts are part of the educational environment. In this case, a certain type of text can become a diagnostic indicator of the educational environment, as mentioned by V.A. Yasvin [24]. One of the ways to diagnose and change the modality (creative, dogmatic, relaxed, career) of the school environment can be done by modeling text solutions in the educational space. However, this aspect should be verified by empirical research methods.

Conclusion

The study of the corpus of relevant school texts allows us to consider the hypothesis formulated by the authors as interesting for further analysis.

The number of cases presented by the authors can be continued in the direction of further development of the original classification of school texts.

The practical significance of the results obtained in the study is determined by the applicability of the formulated recommendations by the subjects of the developing school environment – teachers, students, parents, and social partners of educational organizations.

Despite the fact that the school space has the potential for narrative and discursive modeling [17], the results of the study indicate a lack of professional solutions in the design of the modern school space.

In order to develop and implement these solutions, it is useful to combine the efforts of specialists from the fields of design, pedagogy, ergonomic psychology, philology, and linguistics.

The application of modern design approaches in the development of the school's pedagogical environment allows us to solve problems in the field of achieving a new quality of education, namely: providing students with opportunities for meta-social practices related to the publication of their own achievements and filling them with pride in the achievements of others; increasing their social responsibility in relation to the design, development, and evaluation of the school's information environment; and allowing variability in the formats of visualization of goals and results of pedagogical practices.

The results of the study suggest that the visual environment of schools can be used outside the classroom to address issues related to the development of students' cognitive, creative, and exploratory values. The task of developing students' so-called flexible skills can also be effectively addressed through a constant dialog with the image of the school conveyed by the wall and multimedia solutions.

Analyzing the corpus of texts in the school space, we also noticed that there are almost no texts that directly deal with the value aspects of social relations, the ideas of education, and personal growth. This fact, of course, requires further analysis.

In the visual-communicative environment of modern Russian schools, there is an obvious deficit of students' own texts. In the didactic structure of subject teaching, this deficit should be compensated by new teaching methods aimed at the development of students' artistic position. It is appropriate to use the results of this study in metasubjective and extracurricular aspects of school education to initiate and support "practices of participation" of students in the development, change, "adaptation" of the visual environment of the school according to the principles of openness, motivational potential, and dialog.

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Submitted July 8, 2022

UDK 378.14
DOI: 10.23951/2782-2575-2022-2-53-64

THE IMPACT OF COMBINING FOLLOW-UP QUESTIONS AND WORKED EXAMPLES IN PROGRAM VISUALIZATION TOOL ON IMPROVING STUDENTS' HELD MENTAL MODELS OF POINTERS' VALUE AND ADDRESS ASSIGNMENT

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Abstract. Previous studies have shown that the lack of a useful mental model of pointers is one of the reasons why many novice programmers fail the data structures course. This study had two main objectives: to analyze the status of mental models of pointers (focusing on value and address assignment); and to evaluate the impact of combining worked-examples and follow-up questions in CeliotM program visualization (PV) tool in the learning of pointers. The subjects of the study were sixty-two second-year undergraduate students taking a course on data structures (PMT 221) at the College of Natural and Mathematical Sciences (CNMS) of the University of Dodoma. Data were collected using pretest and posttest questionnaires. The collected data were analyzed using descriptive statistics. The results showed that 56.5% of the students had incorrect mental models of pointers. The results also showed that using the proposed strategy improved the students' mental models of pointers from 56.5% to 87.1%. These results contribute to our understanding of the most common misconceptions that novice students may have when learning pointers. The findings of this study confirm previous studies that when the new innovative teaching strategies are used in combination with PV tools in teaching and learning programming can help improve students' programming comprehension.

Keywords: *programming, program visualization, threshold concept, pointers, mental model, follow-up questions*

Introduction

Programming is the core competency in computer science (CS) education. To master programming, a beginner must learn and understand various concepts of programming threshold concepts. The Association for Computing Machinery (ACM) recognizes pointers as one of the threshold concepts that any student who learns to program must understand well [1]. Furthermore, pointers are prerequisite for learning data structures and other advanced programming topics in CS education [2, 4]. Being threshold means that they are concepts that act as bridge stones, i.e., once a student masters them, he/she can quickly understand the rest of the topics in the course.

On the other hand, a student who does not understand such concepts well may get stuck and be unable to learn a new concept [5]. Simply put, no student learning to program can implement data structures such as linked lists, stacks, queues, and trees if such student holds an incorrect mental model of pointers. Although pointers are "bridge stones" for learning data structures and other advanced topics in programming courses, they are still considered one of the most difficult concepts for novice programmers to learn and understand [3, 6].

Several studies have investigated students' misconceptions when learning pointers and suggested methods to address them [1, 3, 4, 7]. However, despite these efforts, few studies have investigated the viability of mental models of pointers in novice programmers using mental model theory [8]. To fill this research gap, this study used mental model theory [9] to investigate the viability of mental models of pointers in novice programmers (considering pointer value and address assignment); and evaluate the impact of combining follow-up questions and worked

examples in PV tool on improving students' held mental models of pointers' value ad address assignment, hereafter referred to as the mental models of pointers.

Literature review

Mental Model: Theoretical framework

Students who learn basic programming concepts have problems in formulating a correct mental model of program execution [10, 11]. In programming learning, the term mental model is often used to describe how knowledge is organized in people's minds. Essentially, a mental model is a person's internal (mental) representation of real-world objects and systems [12]. It is the learner's understanding of the hidden information process underlying the code and operations in the computer.

Mental model studies are widely used in introductory programming. According to Ma [10], students constantly face the challenge of creating a new mental model when learning new concepts [10]. Studies have shown that most students, when learning to program, lack viable mental models when learning other threshold programming concepts. For example, in one study, McCauley et al. [13] found that students learning data structures tend to build an incorrect or inconsistent mental model of recursion and iteration when implementing a linked list.

Danielsiek et al. [14] also found that some students had the misconception that every binary tree is a search tree. In addition, some students were found to have a false mental model of assignment (i.e., they confused = in mathematics with that in programming. The term "false mental" model implies that the way a student thinks about code may differ from that of the notional machine [16]. It is well known that students with false mental models cannot understand programming [10]. To help such students build a viable mental model of the key programming concepts and gain programming competencies, previous studies have suggested the use of visualization tools [14, 22, 26].

Mental Model Theory

The term mental model refers to the mental representations or beliefs of real things. It refers to how people understand the world and things around them, how they work, and how they are used and operated [17]. They are representations of reality that people use to understand certain phenomena. According to Johnson-laird [9], when the mind is confronted with a new learning task about a particular phenomenon or entity, the object or concept to be learned is represented by a token in the model. Depending on the phenomenon or concept under study, multiple models are usually created in the mind when learning a particular phenomenon. The properties of its tokens represent the properties of a particular entity, and the relationships between tokens represent the relationships between entities in people's minds (memory). When the learner needs to apply the model to solve a new problem, his or her cognitive system must create one or more models that represent states or situations consistent with the premises and "read" the inference from the model(s). If a conclusion is successfully read, a deception phase follows in which an attempt is made to construct a mental model that contradicts the proposed conclusion. If this is unsuccessful, the conclusion is accepted, and the mental model is updated [9].

It follows that when we learn a new concept or experience an event, the degree of accuracy of what we express to others depends on how correctly or incorrectly we have initially internalized the original knowledge and how we succeed in retrieving the "correct" mental models from several held models we have in our minds. However, the quality and accuracy of the mental models we hold are not always consistent and static. They are constantly changing and depend mainly on how they are stored and organized in our long-term memory. According to Norman [12], their modification and evaluation are inevitable to ensure that the mental models we possess remain useful for learning [12].

Mental models and learning

Mental model theory helps us understand our learning environments in several ways [18]. According to Edwards-Leis [18], mental models help us explain, predict, control actions and thoughts, diagnose, communicate, and remember. The explanatory function enables understanding and strategy selection because mental models "facilitate cognitive and physical interactions with the environment, with others, and with artifacts." The predictive function enables problem-solving in new situations. The control function provides a platform from which decisions can be made. The diagnostic function of mental models enables students to develop metacognitive awareness and assimilate new knowledge with existing knowledge. Finally, the communication function allows others to see, understand, and remember the externalization of a person's mental models. How well a person accesses or retrieves the desired mental model, or part of it, depends on the efficiency of the memory process and the relevance of the perceived relations [18].

Visualization in learning programming

According to Petre and de Quincey [24], the term visualization refers to the use of a graphical representation of information to assist human comprehension of and reasoning about that information. Wright & Laboratories [25] argue that visualizations are more useful in learning programming since they display information in a format that is closer to the user's mental representations of problems and will allow data to be processed in a format closer to the way objects are manipulated in the real world; they are easier to understand for novice programmers [25]. They are also useful for describing intricate programs that are difficult to describe with text languages, so graphical specifications may be more appropriate [26]. Through the use of visualizations, a learner can help a learner to understand the logic behind an idea by showing the intermediate steps and transitions [26].

Visualization in programming is grouped into two fundamental categories, namely, program visualization (PV) and algorithm visualization (AV), depending on whether they animate a code or algorithm under execution by relating to the code or not. PVs are used for visualizing either the construction or execution (and sometimes both) of a program [27]. They are used to depict the source code or the state of a program or its execution with the visual means. Examples of PVs are Jeliot 3 [28] and Jype [29]. AVs are used for visualizing data structures and their operations according to a particular algorithm and transition between those states during the execution of the algorithm. Examples of AVs are AP-SA [30] and SDA-TRAKLA2 [31]. Research shows that using PV/AV tools help beginners to develop a viable understanding of the notional machine that runs the programs that they write, thereby helping them to learn how to program and improve both programming and problem-solving skills. [26, 32]. Due to the benefits that visualizations have brought to learning programming, several studies have examined their usage in learning programming. Closest to our works are those of Ma et al. [10], Adcock et al. [4], Rørnes [19], and Almadhoun and Parham-Mocello [20].

Related works

Ma et al. [10] conducted a study to investigate the viability of novice programmers' mental models of basic programming concepts, focusing on value and reference assignments. The results showed that one-third of the students appeared to have "non-viable" mental models of value assignment, and only 17% held a viable mental model of reference assignment. To address this problem, Ma et al. [10] proposed a teaching technique that integrates PV and cognitive conflict strategies. A number of studies have found that using the cognitive conflict strategy is potentially effective in learning programming because it improves learner engagement and helps novice programmers develop a better understanding of key programming concepts.

Adcock et al. [4] investigated the impact of using a pair programming approach on undergraduate programming instruction. The approach combined instruction with hands-on exercises to allow beginning students to visualize these difficult concepts and understand how they work and why they need them. Results showed that using this approach reduced student frustration and improved retention in learning programming.

Kumar and Road [2] studied the effects of using software to learn pointers. The software helped students learn how to implement pointer programs. The effects of using the software teaching tool were evaluated using a pretest and a posttest. The results showed that the average performance of the posttest exceeded that of the pretest by 100%.

Rørnes [19] surveyed the different mental models associated with students' misconceptions in learning reference tasks and references in a Python programming course. The results showed that students had incorrect mental models related to reference assignments and/or calling a function. The results of this study were very useful because they helped instructors learn how students understand reference assignments and references when learning to program

Almadhoun and Parham-Mocello [20] conducted the study to investigate the status of conceptual and procedural mental models of eleven students who were engaged in creating programs with linked lists in the C programming language. The results showed that no participants held correct mental models of a simple linked list in C.

The reviewed studies have shown that the majority of students taking programming courses still hold incorrect mental models of threshold programming concepts. However, they have also shown that visualizations can help improve students' mental models of both basic and threshold programming concepts.

Overview of the proposed approach

The proposed approach involves the use of follow-up questions embedded in worked examples in a CeliotM (PV) tool [21]. CeliotM is a PV tool intended for teaching and learning computer programming in C++ for novice programmers. CeliotM supports the visualization and compilation of both data structures and basic programming concepts in the C++ programming language. The tool offers a code view and an animation view. The source code view provides a text editor for writing code. The animation view provides the dynamic view of the program. CeliotM allows the user to work with different examples of threshold concepts in programming. Once a user opens an example, it appears in the source code view. Follow-up questions usually appear after each program example in the CeliotM. These follow-up questions were programmed into the tool to provide a natural interface to texts and other content in the PV tool, as recommended by Sorva et al. [22]. It follows that before a student compiles or runs the animations for any example program, he or she must answer the following questions:

1. Does this program contain any errors?
2. Can you predict the output of this program?
3. Can you simply sketch on paper, either with a memory diagram, a variable diagram, a state diagram, or some other way to illustrate how this program works?
4. Now click the animation button to compile the program
5. Play the animation. Watch how the program runs
6. Repeat the animation, but this time use the next step button.
7. Remove the specified static comments and write dynamic comments (explanations) for the selected code.
8. Run the animation. Observe the dynamic comments you wrote.
9. Discuss with your colleague how this program works
10. Work on other questions from this section.

Figure 1 shows the view of the source code view and follow-up questions in CeliotM

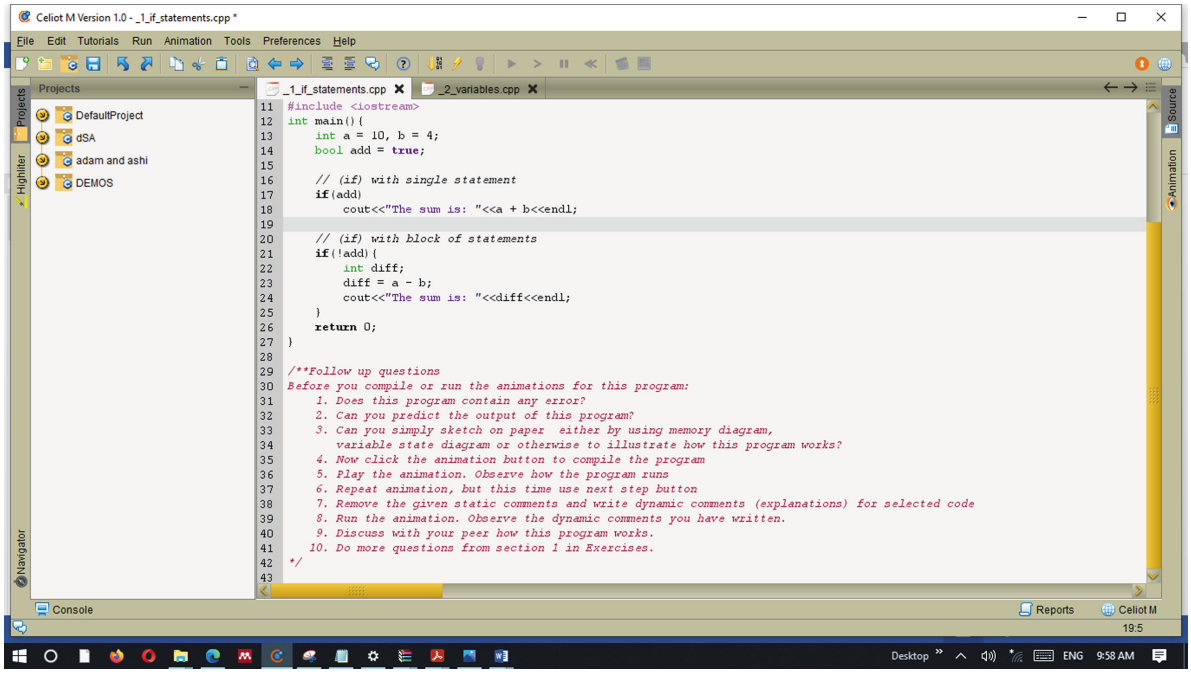


Fig. 1. Source code, animation views, and follow-up questions in CeliotM

Once a student has answered the follow-up questions, he/she can switch to view the animation. Figure 2 shows a visualization of a pointer program in CeliotM. The animation in the method area displays the visualization of lines of code by indicating the status of the memory (RAM), whether it is free, reserved, or already assigned, as the program runs. For example, the program shown in the CeliotM source code view in Figure 2 has currently been executed from line 1 to line 7. Meanwhile, variable *x* is now assigned int 50, while pointer *p** has not been assigned to any value, so its memory location is reserved.

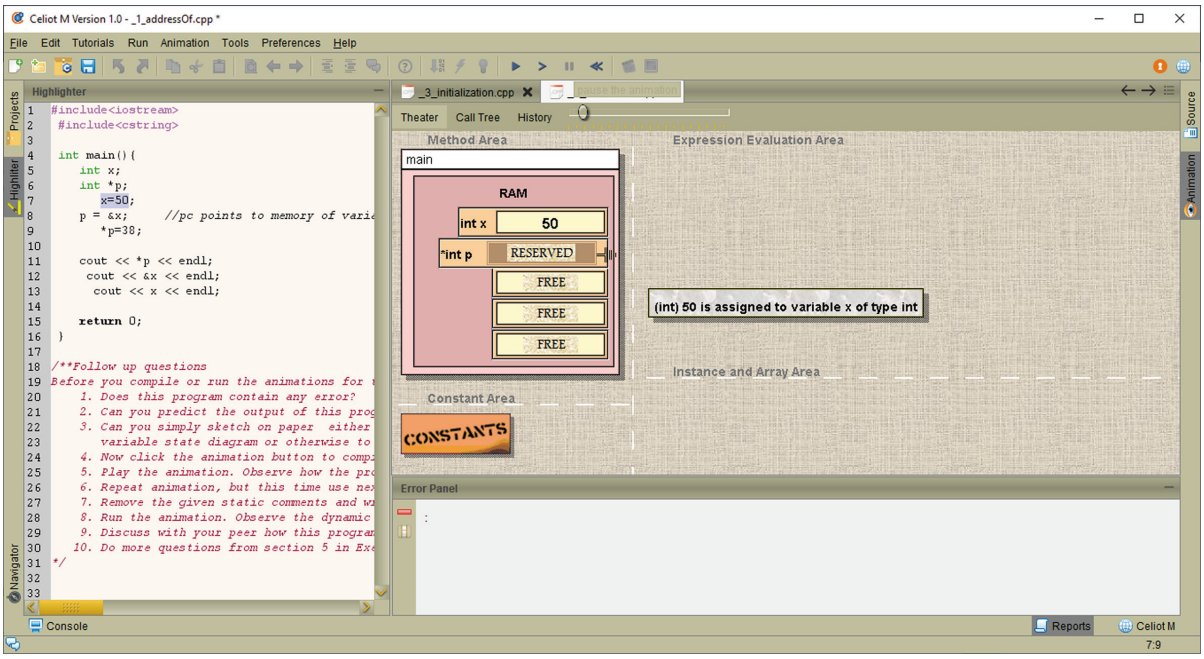


Fig. 2. The visualization of a pointer program in CeliotM

Thus, through the use of animation, system-defined explanation, and other features, the learner understands the programming logic and improves programming comprehension. Figure 3 shows the final state of the animation of a given pointer program. It also displays the output of the program.

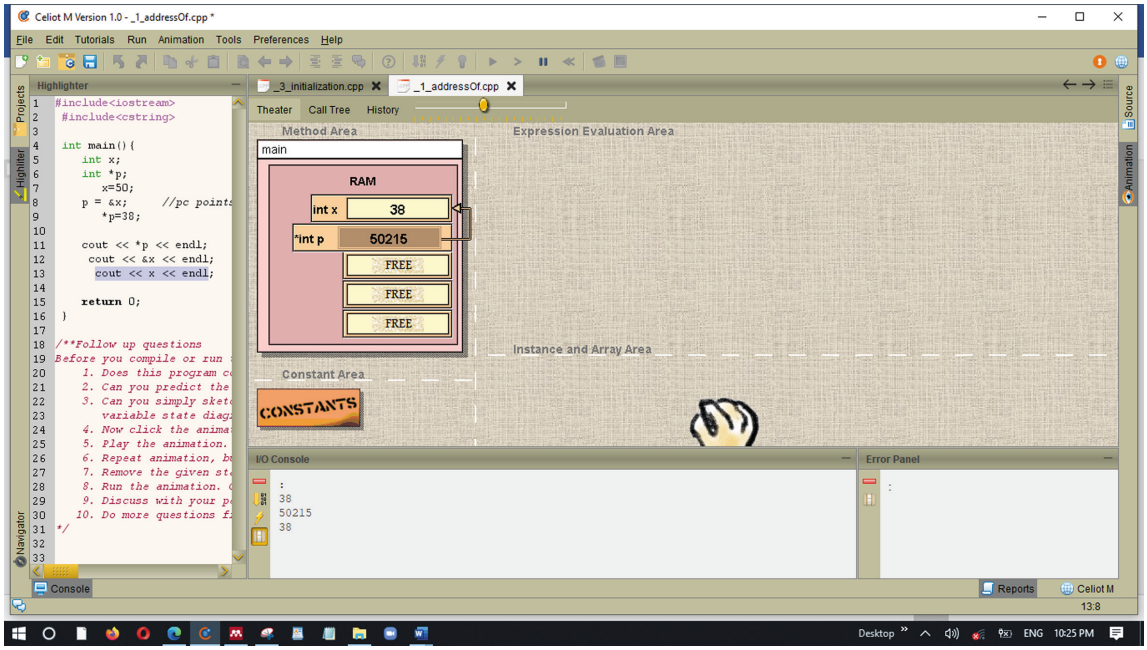


Fig. 3. The final animation state of a pointer program in CeliotM

Materials and methods

A mixed research design was used in this study. The pretest and posttest questionnaires were used to examine the status of the mental pointer models that the students held before and after the intervention. The experimental method was used to examine the effect of the proposed approach on the improvement of students' mental pointer models.

The structure of the pretest and posttest questionnaires

The structure of the pretest and posttest questionnaires

The pretest questionnaire was used to examine the status of students' held mental models of pointers. It consisted of a multiple-choice question with a set of options for the mental models and an option to indicate the correct mental models if the participant did not find a correct option in the given ranges. The researcher's first work was to conduct an independent analysis of students' possible (a-priori) responses to the questions in the questionnaire that would correspond to a student's mental model type. These priorities are listed in Table1. Each student was assumed to have a latent cognitive structure underlying his or her responses to the questions in the questionnaire, referred to as "mental models." This method was adopted by Dehnadi and Bornat [23]. Before the pretest questionnaire was given to the participants, it was first validated. Then, a small pilot test was conducted in which students completed the questionnaire and expressed their opinions about the usefulness of the instruments. The comments given were processed by changing some options of the questionnaire. The posttest was constructed to measure the same cognitive level of mental models as the pretest. However, the format of the posttest questions and the level of cognitive ability measured remained the same as in the pretest. What was changed were the variable names and assigned values, but the programming logic remained the same. The maximum duration of the test was 20 minutes. After the posttest was administered, students' responses on the status of their held mental models were collected and analyzed using descriptive statistics.

Table 1

Pretest Questionnaire

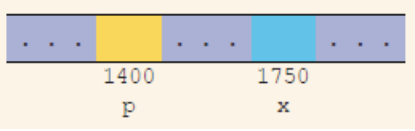
<table>
<tr><td colspan="3">Select one by putting a tick (√) in the option with a correct answer. If there is no correct option, specify yours</td></tr>
<tr>
<td>Consider the following code fragment: –
int *p;
int x;
Suppose that we have the memory allocation for p and x as shown in Figure 1 below:
 

Fig 1. Memory allocation.
Suppose that the following statements are executed in the order given:
x = 50;
p = &x;
*p = 38;</td>
<td>After the execution of statement *p = 38, the new values of *p, & x, and x are: –
☐ *p = 38, &x = 1750, x = 38
☐ (*p = 50, &x = 1750, x =50)
☐ *p=50, &x=1400, x= 50,
☐ (p=38, &x = 1750, x =50)
☐ *p = 88, &x = 1750, x=50
☐ *p = 50, &x = 1750, x=38
☐ *p = 38, &x = 3150, x = 38
☐ *p = 38, &x = 350, x = 38
☐ Any other values of
*p and x are:
*p = x =</td>
<td>Use this column for your rough notes, please</td>
</tr>
</table>

Two mental model categories were proposed to analyze the status of students' mental models of pointers: the Correct Mental models (CMM) and Incorrect Mental Models (IMM). In addition, the IMM was further categorized into eight other subcategories, namely IMM1, IMM2, IMM3, IMM4, IMM5, IMM6, IMM7, and IMM8. Table 2 provides more details on the categories of these mental models.

Table 2

Categories of Mental Models

MENTAL MODEL	DESCRIPTION	CATEGORY
p = 38, &x = 1750, x = 38	The value stored in variable x will be overwritten by the value assigned to a pointer *p. The two values will thus be equal. The addresses of the reference variables will not be affected during runtime	CMM
p = 50, &x = 1750 x = 50	Assigning the value to a pointer *p has no effect on its referenced variable x; instead, the value of the dereferenced pointer that has been assigned value will retrieve the value held by the referenced variable. The addresses of the reference variables will not be affected during runtime	IMM1
p = 50, &x = 1400, x = 50	Assigning the value to a pointer *p has no effect on its referenced variable x; instead, the pointer will indirectly access the value stored in variable x. however, variable x will now use the address of the pointer *p during runtime	IMM2
p = 38, &x = 1750, x = 50	The value in variable x will not change. The pointer *p will hold the value assigned to it like a normal variable. The addresses of the reference variables will not be affected during runtime	IMM3
p = 88, &x = 1750, x = 50	The value assigned to the pointer will be incremented by the value from variable *x*, but the value of variable *x* will remain unchanged.	IMM4
p = 50, &x = 1750, x = 38	The value assigned to variable *x* and pointer *p will be swapped. The addresses of the reference variables will not be affected during runtime	IMM5
p = 38, &x = 3150, x = 38	The value stored in variable x will be overwritten by the value assigned to a pointer *p. The two values will thus be equal. The addresses of the pointer and reference variable address will sum up during runtime	IMM6
p = 38, &x = 350, x = 38	The value stored in variable x will be overwritten by the value assigned to a pointer *p. The two values will thus be equal. The addresses of the reference variables will be subtracted from that of *p during runtime	IMM7
Others	Undefined mental models. These are models that were difficult to define and interpret	IMM8

The experiment

This experiment aimed to investigate the impact of combining follow-up questions and worked examples in the CeliotM PV tool on improving novice programmers' held mental models of pointers. The subjects of the study were sixty-two (62) second-year undergraduate students taking the course PMT 221 (Data Structure) at the College of Natural and Mathematical Sciences (CNMS) of the University of Dodoma. These students had already learned the basic concepts of the programming course in C++. These students voluntarily participated in this study. The protocol for the test was as follows: Students were first informed about the purpose of the study. Then, students were asked to complete the pretest questionnaire within 20 minutes. After they completed the pretest questionnaire, it was collected for analysis. The results on the status of students' held mental models can be found in the next section. After completing the pretest, students were proportionally divided into two equal groups, Group 1 (G1) and Group 2(G2), based on the status of their held mental models. Both G1 and G2 were then given a similar set of pointers exercises to practice. The G1 students used the Borland C++ compiler for practice, while the G2 students used the CeliotM PV tool. After participating in the hands-on exercises for 12 hours per week for two weeks, all students completed the posttest. The duration of the test was 20 minutes. The students were not told if they could repeat the posttest. The results of the experiment are presented in the next section. It was hypothesized that students who used CeliotM would improve the status of their held mental models of pointers better than those who used conventional C++ compilers (Borland compilers).

Results and discussion

Results

Figure 4 shows the status of the mental models that the students were holding before applying the proposed learning approach. Figure 4 shows that of the 62 students who participated in the pretest, only 27 students (43.5%) held the CMMs of pointers, while 35 students (56.5%) held the IMMs. Figure 3 shows the status of the students' held mental models of pointers before the intervention.

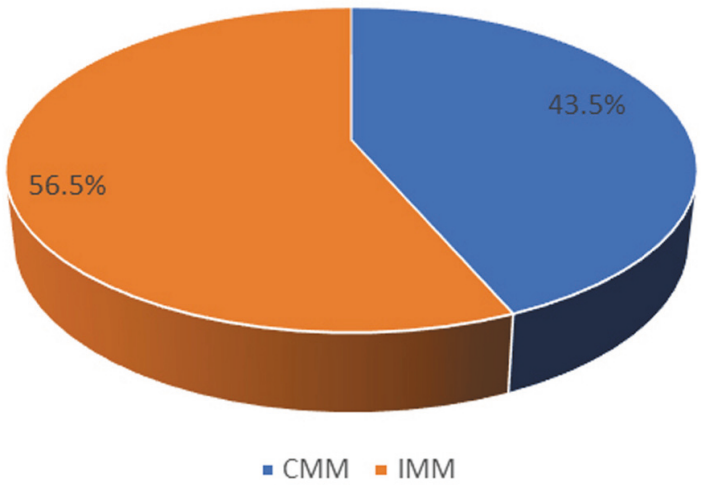


Fig. 4. The status of the students' held mental models of pointers before the intervention

As seen in Figure 4, more than half of the students (56.5%) had incorrect mental models of pointers. Table 3 shows the categories of IMMs that students had before using the proposed intervention.

Table 3

Categories of IMMs that students had before applying the proposed approach

MM TYPE	N (35)	PERCENTAGE
IMM1	5	8.1%
IMM2	3	4.8%
IMM3	18	29.0%
IMM4	2	3.2%
IMM5	3	4.8%
IMM6	1	1.6%
IMM7	1	1.6%
IMM8	2	3.2%

As shown in Table 3, the largest proportion of students with wrong mental models belonged to the IMM3 category. Such students had the misconception that assigning the value to a pointer **p* had no effect on its referenced variable *x* (**p = 38, &x = 1750 x = 50*). This misconception happened because when declaring a pointer, some students tend to confuse between the roles of memory address and variable location. Basically, when you assign a value to variable *x*, the value assigned to variable *x* will be stored to the address, say *FFFF* of variable *x*. It follows that if you assign address *FFFF to* the pointer **p* and then assign a value to the pointer **p,* the original value of variable x will be overwritten by the new value assigned to pointer **p*. The output values for both variable *x* and the pointer **p* will finally be the same.

Another category that performed poorly next to the IMM3 group was IMM1. This group constituted 8.1% of the total participants. Students with this category of wrongly held mental models had the misconception that any value that had been assigned to the pointer **p* would have no effect on its referenced variable x; instead, the value of the dereferenced pointer that had been assigned value would hold and output the value held by the referenced variable. These students are confused between variable assignments and address assignments.

Table 3 also shows that 4.8% of the students were holding IMM5. The majority of the students had the misconception that when you assign a new value to a variable (that was initially assigned a value) via a pointer, such values will be swapped. As shown from the code fragment in Table 1, since the only statement that exists between the statements in line 3 (i.e., *x = 50;*) and line 5 (i. e. **p = 38;)* is line 4 (i. e. *p = &x;*); these students might have confused the difference between the pointer' address assignment and swapping. Results from Table 3 further showed that some of the students (3.2%) were found to hold wrong mental modes that were difficult to classify.

The results of the experiment

Having identified a large number of IMMs in this study, it was decided to investigate whether using the newly proposed strategy that combines follow-up questions and worked examples in the PV (CeliotM) could help improve the status of students' mental models of pointers. Table 4 shows the results of the proposed approach on students held mental models of pointers between G1 (control group) and G2 (experimental group).

Table 4

The status of students held mental models of pointers after the intervention for G1 and G2

MM Type	Non experimented sample (N = 62)		G1 (N = 31)			G2 (N = 31)		
	N	%	N	%	Change	N	%	Change (%)
CMM	27	43.5	18	58.1	14.6	27	87.1	+43.6
IMM	35	56.5	13	41.9	–14.6	4	12.9	–43.6

As shown in Table 4, the students who used Borland C++ compilers (G1) slightly improved their held mental models by 14.5%., while those who used CeliotM (G2) to learn pointers improved the status of their held mental models from IMM to CMM by 43.6%, raising the percentage to 87.1%. This is a substantial number taking into consideration that pointer is one of the challenging topics for novice programmers to grasp. Table 5 shows the detailed distribution of the IMMs with reference to the preliminary status of the students held mental models before the intervention.

Table 5

Detailed distribution of the IMMs after the intervention

IMM TYPE	Non experimented sample (N = 62)		G1 (N = 31)			G2 (N = 31)		
	N	%	N	%	Change	N	%	Change (%)
IMM1	5	8.1	3	9.7	−1.6	1	3.2	−4.9
IMM2	3	4.8	1	3.2	−16.1	0	0	−4.8
IMM3	18	29.0	4	12.9	0	3	9.7	−19.3
IMM4	2	3.2	1	3.2	−1.6	0	0	−3.2
IMM5	3	4.8	1	3.2	1.6	0	0	−4.8
IMM6	1	1.6	1	3.2	1.6	0	0	−1.6
IMM7	1	1.6	1	3.2	0	0	0	−1.6
IMM8	2	3.2	1	3.2	1.6	0	0	−3.2

As indicated in Table 5, the IMM3 for the experimental group (G2) was largely affected by the intervention since the number of students who were holding IMMs decreased by 19.3% compared to other IMMs. It is also worth noting that whereas all IMMs were improved in G2, this was not the case for students in G1. For example, while mental model categories IMM6, IMM7, and IMM8 were all improved and eliminated for G2, they were not improved at all for G1. This implies that students the use of CeliotM helped to improve the status of the students' held mental models compared to the use of the traditional lecture method.

Discussion

This study had two main objectives: to analyze the status of mental models of pointers (focusing on value and address assignment); and to evaluate the impact of combining worked-examples and follow-up questions in the CeliotM PV tool in the learning of pointers.

The study findings show that more than half of the students (56.5%) in the Data structure course had an incorrect mental model of pointer assignment. Such students were holding a wide range of incorrect mental models of pointer value and address assignment. That misconception happened because students did not exactly understand the roles and functions of the pointer. In general, a pointer is a variable. When you declare a pointer, it is given both the memory address and location, just like other variables. But unlike a normal variable, the pointer contains only the address of the variable. When you assign a value to the pointer, that pointer does not actually store that value but points to the memory location to which it was referenced.

As shown from the code fragment in Table 1, the statement *x = 50;* is followed by the statement *p = &x,* which implies assigning the address of variable x to the pointer **p*. The symbol *&* is called the addressing operator and is used in particular to pass the address of a particular variable to the pointer variable so that the pointer can point to that variable. Also, the symbol (*) that precedes the pointer identifier p is called a dereferencing or redirection operator. It is read as "value pointed to by." The function of the dereferencing operator is to restore the memory location

pointed to by the value of the variable. More specifically, the dereferencing operator is used to indirectly access the data stored at the memory location pointed to by the pointer. Any change in the dereferenced pointer directly affects the value of the variable it points to.

Findings from the study have also shown that the use of the proposed approach that applies a combination of worked examples and follow-up questions in the CeliotM PV tool has managed to improve the status of students' held mental models of pointers up to 87.1%. The results suggest that using the proposed approach can greatly improve the status of students' held mental models of pointer threshold concepts. One possible reason that the proposed approach improved the status of students' flawed mental models of pointers was that, while the use of PV helped students understand the notional machine, follow-up questions helped students naturally engage in the learning process, explore deeper knowledge from their own minds and learn from others. In this way, students managed to construct and reconstruct their false mental models and hence, greatly improved their programming comprehension.

Conclusion and future research work

In this study, eight categories of students' wrongly held mental models of pointers were identified. To improve the mental models, a strategy that involves the use of worked examples along with follow-up questions within the CeliotM PV tool was employed. The results show that the use of the proposed approach largely helped to reduce the number of students with flawed mental models of the pointers compared to the use of the traditional lecture approach. The proposed strategy seems to have a positive effect on improving students' conceptual, program tracing, and problem-solving skills. Analyzing students' mental models is very important because it allows instructors to explore the overall picture of students' comprehension patterns. It also allows instructors to identify the type (s) of student misconceptions and thus determine the best strategy to help students understand programming. This study identified several misconceptions that students have when learning pointers. However, it only examined the status of the students' held mental models of pointers within a short period of time and with a small sample size. Future studies should examine the effectiveness of using the proposed approach with a larger sample in longitudinal studies. In addition, the study focused on static pointer´s address and value assignment. It did not go so far as to try to investigate the status of students' mental models of dangling pointers, dynamic pointer declarations, and the use of pointers as reference parameters in function calls. Future studies should also investigate the status of students' held mental models with respect to these aspects.

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Submitted July 7, 2022

UDC 159.9:37.015.3
DOI: 10.23951/2782-2575-2022-2-65-77

SOCIOCULTURAL ADAPTATION OF INTERNATIONAL STUDENTS FROM NEIGHBORING AND DISTANT COUNTRIES: INTEGRATING ANALYTICAL CONTEXTS

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Abstract. This article presents a comparative study of the sociocultural adaptation of international students coming to Russia from neighboring (former Soviet republics) and distant countries and studying at the universities of the South Russian region. The preliminary overview of the studies reflects the different contexts in which the problem of adaptation is studied: economic, political, ethno-cultural-differential, and socio-identitarian. It is noted that the Russian approach to the organization of the educational process in groups of international students is characterized by its integrative nature. The implementation of educational tasks includes communicative opportunities for adaptation. This increases the well-being of international students in everyday life. At the same time, concern for the quality of the educational process and advanced teaching technologies affects the prestige and, consequently, the economic competitiveness of the university and the international status of Russian higher education.

The study of various aspects of international students' adaptation – psychological (resources) and sociocultural (expression) – was conducted on a group of 397 individuals, mainly from countries with Eastern culture, 247 men and 150 women. Among them, 110 were from distant countries, and 287 were from neighboring countries. We used an express diagnosis method developed based on an adapted version of the method "Self-assessment of psychological adaptability" by A.L. Svensitsky and the scales "Social commitment to the country" and "Cultural commitment to the country" from the questionnaire by S.V. Frolova. Spearman rank correlation coefficient was used for statistical analysis of the obtained data. The psychological and sociocultural adaptation of respondents from both subgroups showed a similar correlation between adaptation resources and their expressions at $p < 0.01$. At the same time, significant differences between the samples were found in the indicators. The students who came to study from distant countries (Asian and African countries) showed low psychological (active and communicative) potential for successful sociocultural adaptation, while they had high expectations for successful adaptation. Improving their adaptation potential through educational means can be achieved by combining academic work with problem-solving activities in the educational, vocational, social, and communication domains. Students from neighboring countries (former Soviet republics) based their claims of successful adaptation on the social ties between the countries but simultaneously showed a distance from Russian cultural values. In this case, the work of educators would be effective

* Original Russian language version of the article: Chernikova T.V., Sokal'skiy E.A., Boluchevskaya V.V., Shutova O.I. Etnokul'turnyye osobennosti akademicheskoy adaptatsii studentov dal'nego i blizhnego zarubezh'ya [Ethnocultural Features of Academic Adaptation of Students of the Near and Far Abroad]. *Nauchno-pedagogicheskoye obozreniye – Pedagogical Review*, 2021, vol. 6 (40), pp. 178–189. https://doi.org/10.23951/2307-6127-2021-6-178-189

if they continued to develop positive dynamics for intercultural relations and incorporate the traditions of interethnic good neighborliness on the territory of the southern region of Russia.

Keywords: *analytical context, academic adaptation, ethnocultural characteristics, international students, psychological adaptability, sociocultural adaptation*

The psychological and sociocultural adaptation issues of international students studying at Russian universities are considered in a broad contextual field. However, a shift in priorities is evident – increasingly, economic and international political status factors are combined with issues of the well-being of those who come from other countries to study.

Nonetheless, the economic context of exporting higher education and the associated position in the global market for educational services are considered priorities. According to the state program "Development of export potential of the Russian education system," the number of international students is expected to increase to 3.5 million by 2025, which will not only increase the revenue of Russian universities but also attract talented, educated people from other countries to the national economy [1]. The presence of economic factors in the organization of student life is evidenced by the study of T. Bille on the impact of economic development on the determinants of love. Furthermore, the study of the main sociocultural origins of the behavior of student youth, who are in the age of the search for romantic relationships and true love ("the one and only," "true love"), leads to the question of educational emigration as a way to expand the contingent for partner selection [2].

The political context of educational exports is addressed in the seminal work Power in World Politics, edited by F. Berenskoetter & M. Williams. The book examines the nature of power through various Conceptual Lenses, focusing on the phenomenon of Soft Power in international politics where, on the one hand, there is a "battle for hearts and minds" and, on the other hand, forces are expended for empowerment between nations [3]. The results obtained by M. Muthukrishna & M. Schaller have shown that influencing populations with greater social sensitivity, a tendency to change cultural norms, and leveling cultural differences are effective within a short period of time [4].

The relationship between ethno-cultural differences in social norms in studying international students' adaptation has always been the focus of scientific interest, especially among the representatives of the neo-behaviorist branch of psychology. The psychological research of M. Gelfand, which had begun ten years earlier, was initially aimed at determining the cultural contrast (typology of everyday situations, tolerance of deviations) and its consequences [5]. Based on cross-cultural studies, M. Gelfand and his co-authors illustrated the multilevel social consequences that occur when a person comes into groups with different social norms [6]. This author and his colleagues used modeling the cultural dynamics of human behavior as a research tool to gain new insights into cultural adaptation processes [7]. M. Muthukrishna & M. Schaller studied cross-cultural differences in heterogeneous samples to predict long-term effects (stability or change) [4]. The discovered psychological effects of interpersonal influences allow modeling other variables to predict the content of cultural changes and the speed of their implementation [8]. The results help explain the statistically significant difference in the sociocultural adaptation of international students from neighboring and distant countries presented in this paper.

The context of social identity is perhaps as popular in cross-cultural psychological studies among students as the context of ethnocultural differences. The social identity mechanism

regulates interaction in the face of individual-group differences. However, it is argued that collective action (including learning) brings together individuals with different social identities, contributes to group responsibility, and serves to maintain morality and dignity [9]. The reconfiguration of identity in another culture occurs in the context of extended educational exchange. It broadly recognizes cross-cultural positions, promotes understanding between nations, and supports universal values [10]. Researchers who have studied student academic mobility have found little about the additional values that international students bring to the educational environment and work culture when they work in another country. However, it is undisputed that they enrich the learning environment with diversity and contribute to a tolerant acceptance of other cultures [11].

In Russia, the successful adaptation of international students is a task to strengthen international relations in education and public policy in general. This contrasts the emphasis on differences in sociocultural norms behind the economic competition and political aspirations of more countries. Young people from abroad who have received their education in Russia are an outpost in stabilizing relations between nations. International students are expected to be willing to accept a different lifestyle and culture with its values. Hosts are expected to empathetically activate and strengthen adaptation resources by overcoming language difficulties [12]. In this regard, the tasks of facilitating the adaptation processes of international students have become equal to the quality of their academic education at universities and the state orientation of socio-economic and international policies. In the South Russian region, these processes are complicated by the multicultural circumstances of the educational environment and everyday life. In this regard, it is necessary to study the peculiarities of psychological and sociocultural adaptation of students from neighboring and distant countries in order to implement a differentiated teaching approach that precisely meets the needs of the international community in psycho-pedagogical care

A total of 397 students from three universities participated in the study of psychological and sociocultural adaptation: B.B. Gorodovikov Kalmyk State University (Elista), Volgograd State Medical University, and Adygei State University (Maikop). They studied natural sciences (62.47% of the sample – future doctors, chemists, biologists, pharmacists) and exact sciences (27.96% – future mathematicians, physicists, and specialists in information technologies, engineering technologies). The ratio of men (247) to women (150) in the total sample was 5:3.

The conducted research aimed to determine the peculiarities of the relationship between psychological adaptability and sociocultural adaptation of students from neighboring and distant countries to specify the goals of the pedagogical work of teachers and their retraining with regard to different international contingents.

The theory of V.I. Slobodchikov about the correlation between the processes of separation and identification, which reflect two sides of adaptation, was taken as the basis for the content of the concept of adaptation. This theory emphasizes, on the one hand, the importance of strengthening and developing basic psychological foundations and, on the other hand, the identificational features of establishing external connections and relations in the course of identification of persons with a cultural environment. V.I. Slobodchikov claims that “the structure of any human association can be described by the concepts of ties and relationships” and says that “the driving force behind the process of development of objective reality lies in a common community of life.” According to the author, common everyday life consists of separation-identification processes [13, p. 17]. V.I. Slobodchikov concludes that “the unity and opposition of separation and identification is a constantly acting, living contradiction of coexistence, which

determines and directs the entire course of formation and development of human subjectivity, is the overall mechanism of this development. The development of new means in the one process becomes a prerequisite for unfolding the other."

The division of the adaptation process into internal and external factors is also relevant to contemporary foreign language research. The internal predictors of learning adaptation include communication skills, activity motivation, self-efficacy, and value orientations. External adaptation factors include a cultural distance between home and host countries, demographic characteristics, home circumstances, and different climatic conditions. It is expressly noted that much attention has been paid abroad to the issues of social well-being of international students-awareness, emotional, and instrumental factors [14].

The study of the adaptation peculiarities of international students at the universities of the South Russian region was carried out by the method of express diagnosis to obtain a general idea of the characteristics of the studied attribute. The aim of the study was to identify the differences between the samples of students from neighboring and distant countries in the characteristics of the relationship between internal psychological resources of adaptability and the successes of sociocultural adaptation in real-life circumstances in another country. The divergence of indicators provides a basis for the differentiation of teaching strategies with different international students and determines the choice of the content of specialized courses in the system of additional training for university staff and teachers.

The study of adaptation characteristics was carried out to get an overview of the connecting characteristics between general and detailed indicators of psychological adaptability and sociocultural adaptation of students from neighboring and distant countries. The obtained results formed the basis for formulating answers to the research questions:

1. How do psychological adaptability and sociocultural adaptation indicators differ in teachers' strategies, content, and forms of academic work with international students from neighboring and distant countries?

2. What issues are central to designing and implementing professional development programs for university teachers working with students from neighboring and distant countries?

The first part of the express diagnosis was based on an adapted version of the "Self-assessment of psychological adaptability" method by A.L. Sventsitsky [15]. The diagnostic judgments were divided into "Activity adaptability" and "Communicative adaptability" groups. The second part is based on the content of the scales "Social attachment to the country" and "Cultural attachment to the country" of the questionnaire "Attachment to the country" by S.V. Frolova [16]. The indicators of sociocultural adaptation are divided into two groups reflecting the consumptive-pragmatic (realization of personal interests by receiving an educational service) and the identificatory-consolidative (acceptance of the new environment with the possibility of transition to it) character. While in the first part, the psychological aspects of adaptation were considered as a generalized attribute characterizing the potential possibility of successful implementation of the process, in the second part, the sociocultural aspects were analyzed from the point of view of the meaningfulness of the attribute characterizing the actual outcome of the implementation.

The *rs* rank correlation coefficient by Spearman [17] was used to determine statistically significant relationships between the diagnostic indicators. Its application made it possible to determine the significance of the correlation relationship between pairs of attributes. IBM SPSS Statistics 26.0 software was used for processing.

The results of express diagnosis showed approximately equal correlation between the general indices of psychological adaptability and sociocultural adaptability in students from neighboring (r_s = 0.227; $p < 0.01$) and distant (r_s = 0.246; $p < 0.01$) countries. The correlation indices, which are not very high, reflect the differentiated content of the different sides of the adaptation process among international students. It should be noted that no correlation at the highest level of significance ($p < 0.001$) was found for any of the pairs of attributes studied.

Results of express diagnosis of adaptation characteristics of students from distant countries. The research sample of students from distant countries included 110 individuals, 76 men, and 34 women, who were admitted to study from 18 countries in Asia and Africa. The majority of the sample was from India (31.81%), Egypt (30.92%), China (6.36%), and Jordan (5.45%).

The overall measure of ***psychological adaptability*** was directly related to its activity (r_s = 0.709; $p < 0.01$) and communication (r_s = 0.777; $p < 0.01$) content. The high significance of the correlation between the general index of sociocultural adaptation and its components-consumption-pragmatism (r_s = 0.698; $p < 0.01$) and identification-consolidation (r_s = 0.776; $p < 0.01$)–proved to be logical. These correlations are three times higher than in similar indicators providing the statistical results of psychological adaptability when revealing their correlations with the components of sociocultural adaptation: r_s = 0.261; $p < 0.01$ and r_s = 0.215; $p < 0.05$, respectively. On the side of the general indicator of sociocultural adaptation, the correlations with the activity content of psychological adaptability proved to be significant but two times weaker than on the side of the general indicator (r_s = 0.347; $p < 0.01$), the correlation with the communicative component is absent (r_s = 0.074).

It turned out that the psychological adaptability of students from distant countries is significantly related to moderate interest in Russian national culture and art (r_s = 0.327; $p < 0.01$) and the experience of compatriots living in Russia (r_s = 0.263; $p < 0.01$). At the same time, psychological adaptability to new conditions is even more moderately related to motivation to learn (r_s = 0.210; $p < 0.05$) and willingness to expand contacts in Russia (r_s = 0.190; $p < 0.05$). When analyzing the probability of living in the country of education, there is a negative correlation with the overall index of psychological adaptability, but it is not statistically significant (r_s = –0.141).

The overall index of sociocultural adaptation of students from distant countries correlates significantly at the $p < 0.01$ with all its aspects and individual expressions. However, there are differences in the quantitative expression of this correlation. Thus, the most significant indicators characterizing the position of students from distant countries as tourists are in the first line of correlation relations: Interest in the peculiarities of another country (r_s = 0.633), positive perception of morals, habits, and lifestyle of representatives of another culture (r_s = 0.615), understanding and acceptance of traditions of another country (r_s = 0.609). In the second line, where the significance of correlation relations decreases, we find features of coping with a new educational and living environment: Positive attitude to study in Russia with a further stay in the country (r_s = 0.571), expression of intention to move to Russia as an opportunity to be close to important people in life (r_s = 0.562), concern for expansion of contacts in the country of education (r_s = 0.544), admiration for the cultural heritage of the country (r_s = 0.537), acquaintance with compatriots who have successfully settled in Russia (r_s = 0.530). Finally, the content of the third line of correlation relations, the most insignificant, was determined by the evaluation of the probability of living permanently in Russia (r_s = 0.392) and attitude towards studying the Russian language (r_s = 0.291).

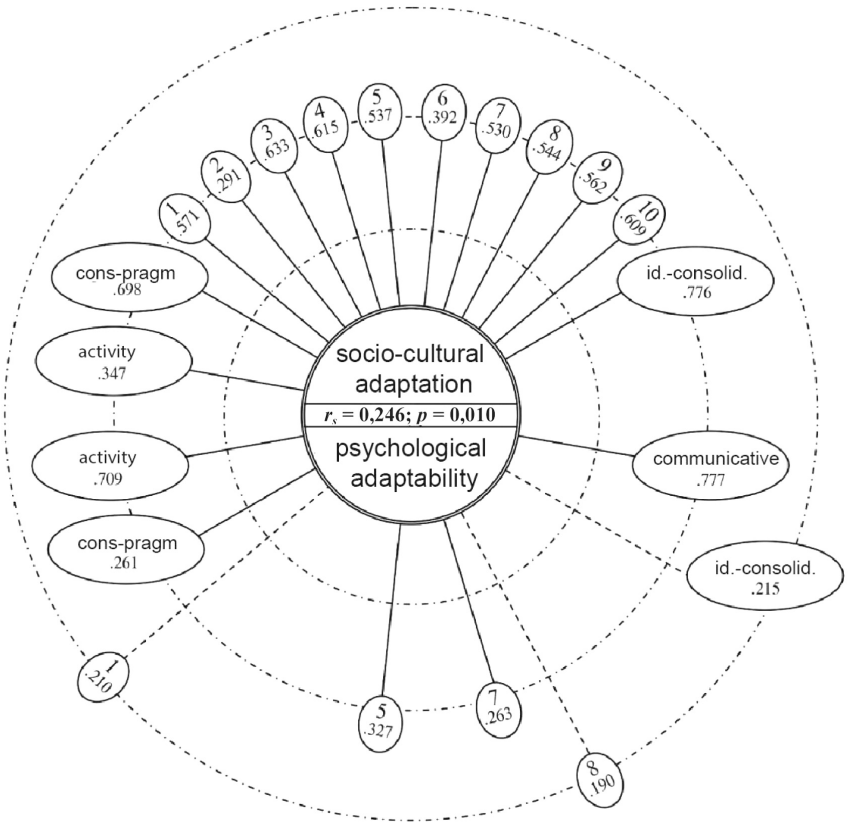

Fig. 1. graphical representation of correlations between indicators of psychological adaptability and sociocultural adaptation of students from distant countries

Legend:

cons-pragm. – the consumption-pragmatic character of sociocultural adaptation

id.-consolid. – the identification-consolidation character of sociocultural adaptation

1. *Study* – attitude towards further education in Russia (the country of education).

2. *Language* – attitude to learning Russian (the language of the country of education).

3. *Interest in the country* – attention to the peculiarities of Russian (other) culture.

4. *A different way of life* – acceptance of the customs and traditions of people in Russia (the country of education).

5. *Culture and art* – attitude to the achievements of national culture and art in Russia (the country of education).

6. *Consideration of moving to Russia* – analysis of the probable prospects of living in Russia (the country of education).

7. *Compatriots in Russia* – acquaintance with the experiences of compatriots who have emigrated to Russia (the country of education).

8. *Contacts* – expansion of the circle of acquaintances in Russia (the country of education).

9. *Emigration intentions* – plans to emigrate to Russia (the country of education).

10. *Identification* – becoming familiar with the habits of the inhabitants of Russia (the country of education).

The graphical representation of the correlation relationships in Fig. 1 shows an imbalance in the resources of the general indicators of psychological adaptability and sociocultural adaptation among students from distant countries. The correlated resource of psychological adaptability is weaker than the set of sociocultural connections. The basis of the resource of psychological

adaptability consisted of low requirements of a consumer-pragmatic nature (r_s = 0.261) and weak connections in the field of social communication with compatriots in Russia (r_s = 0.263) and other people (r_s = 0.190). Therefore, it can be assumed that psychological adaptability is rather superficial-communicative in nature, which probably does not provide sufficient resources for sociocultural adaptation in a foreign country.

The survey by T.V. Chernikova and V.V. Boluchevskoya showed that students from Asian and African countries identified problem areas and suggested ways to strengthen their adaptability [18]. First of all, young people insisted on learning together in groups with Russian students. They viewed learning to communicate as a means of mastering social space and expanding interpersonal and business relationships. At the same time, they missed extracurricular educational and recreational contacts with students and teachers (discussion forums, parties, celebrations, excursions). A quarter of the requests to teachers were requests for personal development and self-actualization, expressed in the need for support in improving soft skills – critical thinking, creativity, business collaboration, evidence-based thinking, and future-oriented design.

Research conducted by V.A. Fedotova and S.Y. Zhdanova on groups of Indian and Arab respondents showed that students from India most often expressed the need for this type of help [19]. They find it very difficult to anticipate situations and therefore seek social support. In comparison, Arab students are more adapted to the learning process due to their inclusion in the group. As a result, they are also more able to make personal-situational predictions. O.S. Pavlova, V.M. Minazova, and O.E. Khukhlaev have drawn attention to the importance of the relationship between religious parameters and social consolidation as an example in the study of religious identity among Muslim students [20]. The consequence of this situation is probably the more favorable microenvironment of students in the group of compatriots from Egypt.

The correlation indices obtained from a sample of students are clearly shown in Figure 1. They can be considered a guiding framework for selecting and developing teaching content and methods. The limited psychological resources for adaptation and the expectation of high academic and sociocultural outcomes challenge higher education organizers to intensify the learning process by designing learning and activity content in forms that motivate the expansion of the realm of social interaction. Thus, after studying the nature of the sociocultural adaptation of international students studying at a technical university in Kazan, the reasons why students from distant countries approach their compatriots instead of integrating into the Russian student community were revealed [21]. The level of Russian language proficiency, the authors emphasize, provides security and protects against discrimination. Therefore, new developments in language pedagogy and the organization of intercultural interaction are coming to the forefront of university teaching. Above all, work must be done to increase interest in learning Russian, for example, through creative tasks aimed at spontaneous dialogic communication. The experience gained will serve as a basis for discussion in several ways. First, cultural differences and their reasons will be recognized, which will increase interest in the livelihood of people in another country. Second, understanding the origins of unknown phenomena will broaden the field of communicative security and ensure the active exploration of the new social reality. Third, it will open up additional opportunities for building cooperative relationships with people in the country where the learning takes place. The last point is the most vulnerable, considering that there are no significant correlations with the questions that assess the likelihood of living in the country of education, moving there, meeting people who are intellectually close to you, and having an attractive lifestyle. Therefore, targeted work on improving psychological adaptability as a general attribute will strengthen the potential basis for implementing a holistic adaptation process. The main demand of students from distant countries (psychological and educational support through

gradual help in sociocultural adaptation to identify and consolidate with new people under new living conditions in another country) will be technologically secured.

The results of express diagnosis of adaptation specifics of students from neighboring countries. The research sample of students from neighboring countries comprised 287 people, 171 men and 116 women. They all came to study from former Soviet republics located mainly in Central Asia: Turkmenistan (86.40%), Uzbekistan (6.97%), Tajikistan (2.44%), and Kyrgyzstan (2.09%).

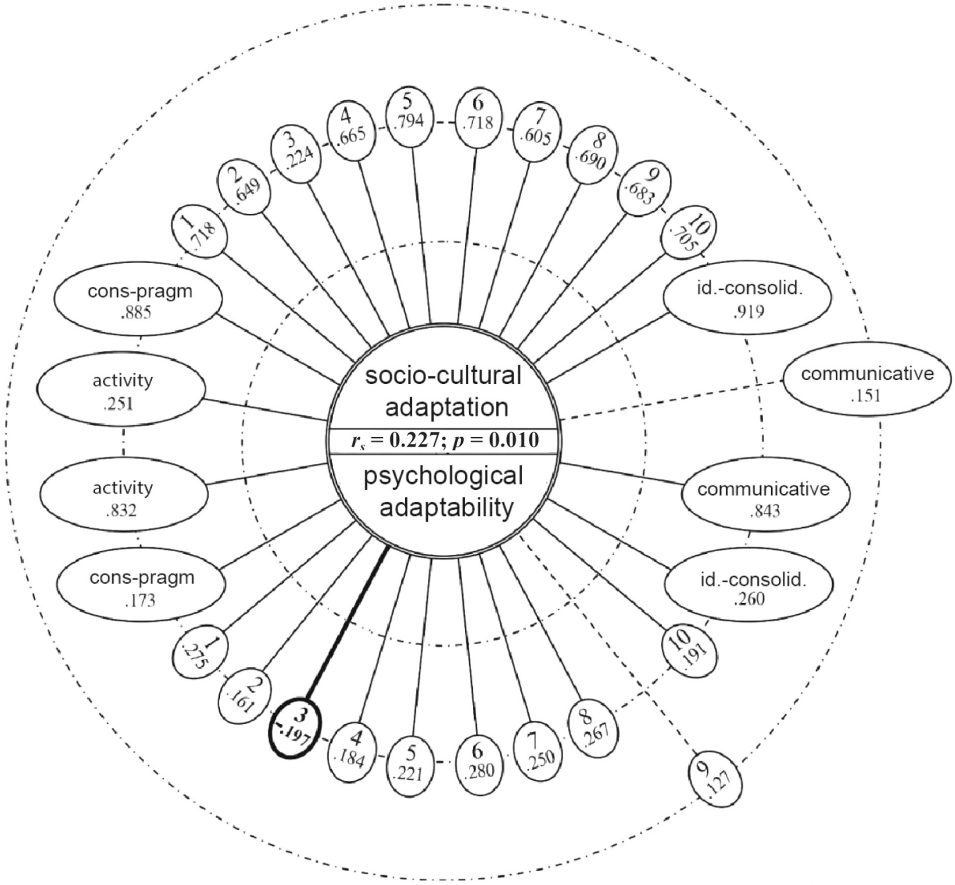

Fig. 2. graphical representation of correlations between indicators of psychological adaptability and sociocultural adaptation of students from neighboring countries. Legend: cons-pragm. – the consumption-pragmatic character of sociocultural adaptation; id.-consolid. – the identification-consolidation character of sociocultural adaptation

1. *Study* – attitude towards further education in Russia (the country of education).
2. *Language* – attitude to learning Russian (the language of the country of education).
3. *Interest in the country* – attention to the peculiarities of Russian (other) culture.
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9. *Emigration intentions* – plans to emigrate to Russia (the country of education).

10. *Identification* – becoming familiar with the habits of the inhabitants of Russia (the country of education).

The general indicator of psychological adaptability and its two aspects (activity and communication) show a similar correlation pattern in the students from neighboring countries as the sample of students from distant countries with the general indicator of sociocultural adaptation and its two components – consuming-pragmatic and identifying-consolidating (Fig. 2). Just as in the previous case, the general index of psychological adaptability is more closely related to the activity component ($r_s = 0.832$; $p < 0.01$) than the general index of sociocultural adaptation ($r_s = 0.251$; $p < 0.01$). The same is true for the relationship between the general index of psychological adaptability and the communicative component ($r_s = 0.843$; $p < 0.01$) compared to the strength of the relationship with it on the part of the general index of sociocultural adaptation ($r_s = 0.151$; $p < 0.05$). The opposite picture is easily observed: The correlations between the general index of sociocultural adaptation and two of its aspects are three to four times closer than those between the general index of psychological adaptability: with consumer pragmatism – ($r_s = 0.885$; $p < 0.01$) opposite ($r_s = 0.173$; $p < 0.01$) and with identity consolidation – ($r_s = 0.919$; $p < 0.01$) opposite ($r_s = 0.260$; $p < 0.01$).

At the same time, significant differences can be found when comparing the number and degree of correlations between the general index of psychological adaptability and the characteristics of sociocultural adaptation. First of all, at the significance level $p < 0.01$, the presence of correlations of the general index of psychological adaptability with all ten components of sociocultural adaptation (from $r_s = 0.280$ to $r_s = 0.127$) is found. Comparing Fig. 1 and Fig. 2, it is clear how poor the correlations between the indicators of students from distant countries look compared to the samples from neighboring countries. Nevertheless, two disturbing trends exist in this set of positive correlations among respondents from neighboring countries. First, the lowest significant positive correlation was found with the indicator reflecting low interest in Russian culture ($r_s = 0.127$; $p < 0.05$). Second, a significant negative correlation shows a lack of interest in anything in Russia that is significantly different from the culture of their home country ($r_s = –0.197$; $p < –0.01$).

As in the previous sample, the general index of sociocultural adaptation of students from neighboring countries is significantly correlated at $p < 0.01$ with all its aspects and separate expressions. When these correlations are quantitatively differentiated in the case of students from distant countries, they are mostly stable, high, and consistent in this case (from $r_s = 0.794$ to $r_s = 0.649$). An exception is the indicator of interest in the aspects of Russian culture. It turns out that even natives of the former Soviet Central Asian republics who speak Russian, receive higher education in Russia, and have favorable psychological conditions for adaptation tend to maintain a certain personal and cultural distance from the way of life in Russia. A recent comparative study by M.V. Apasova [22] on the learning motivation of Chinese, Turkmen and Russian students revealed the importance of adaptation indicators. It turned out that emotional well-being, which is more positive in Turkmen students than in Chinese students (with their great interest in cognition and IT technologies), during adaptation is determined not by their motivation to learn but by the content of social interaction with the immediate environment. Therefore, the conclusions of this article focus on strengthening the lost ties with the natives of the former Soviet republics of the once common country. The results are consistent with those of American researchers S. Basov & T. Gaugler [23], who investigated the possibility of a relationship between individual, social, and structural factors and the psychological adjustment of American students in Costa Rica. It was found that social interaction with natives leads to successful sociocultural adaptation.

The adaptation problems of international students in a different cultural environment manifest themselves in emotional instability, conflict, poor academic performance, and lower motivation to learn. The psychological state of poorly adapted students is based on dissatisfaction with the learning situation and general dissatisfaction with everyday life, reduced cognitive needs, passive behavior in the form of submission to external circumstances, and an avoidance coping strategy as a leading strategy [24].

This situation poses certain challenges to higher education institutions in the cities of Southern Russia that have received students from neighboring countries. The study by A.R. Gapsalamov et al. states that the adaptation of international students to the social and educational environment of a small town is more difficult than in a metropolis, which is partly due to the level of professional training of teachers who can develop effective strategies for integrating international students into the educational and sociocultural environment [25].

The most important factor in the successful sociocultural adaptation of international students is knowledge of the language of the country they are studying in. A well-established linguistic interaction with various representatives of other cultures and populations in a foreign country forms constructive survival strategies and acts as a preventive measure in case of psychological crises [26]. The authors L.A. Kamalova, M.Zh. Umbetova, N.S. Putulyan describe the most effective technologies and practices of linguistic and sociocultural adaptation tested at universities in Saint Petersburg, Kazan, and Arkalyk (Kazakhstan) in their work with international students. They successfully solved a complex task: overcoming academic performance problems and simultaneously improving psychological and sociocultural adjustment in the host country by mastering the Russian language in a tolerant university environment [27]. The development of information technologies and the popularization of online linguistic platforms positively impact international students' linguistic and cross-cultural adaptation. Online practice forms the readiness to overcome intercultural and cross-cultural communication problems [28].

Great expectations are placed on the use of active methods in the education of international students. The use of interactive tools helps increase cognitive motivation during classes and shapes and develops students' readiness for independent, intensive study of subject content. Ultimately, activating work contributes to the development of creativity, intellectual collaboration, and universal competencies: communicative, exploratory, and project-based [29]. The influence of physical education and sports factors on adapting international students studying at Moscow universities were studied in a series of interactive learning tools. It was proved that the combination of educational and sports activities is an effective tool to control the process of social adaptation. Furthermore, the formation of academic knowledge and life skills in the context of the host culture is supported by the development of moral and volitional qualities, which together constitute an extraordinary factor in the adaptation of international youth to the new conditions of student life [30].

In order to maintain the positive dynamics of educational, interpersonal, and comprehensive social relations, the educational environment at universities should be very attractive. Furthermore, regardless of its specific content, the educational process should provide students with sufficient opportunities to participate in Russian culture, science, and artistic achievements, which are of global significance and have significantly impacted other countries. To a large extent, this also applies to extracurricular work, the system character of which will determine the norms of national-cultural dialog and commonality.

The following conclusions result from the summary of the experimental part.

1. When comparing two samples of international students, a similar correlation of average level was found between the general indicators of psychological adaptability and sociocultural

adaptation. The low correlation level indicated the differentiated content of the internal (resources) and external (observed) sides of the adaptation process. The detailed analysis of the correlation indicators obtained on samples of students from distant and neighboring countries proves different teaching strategies. At the same time, the content of continuing education and retraining programs for academic staff will be different and should be designed considering the cultural distance created by language, national, and confessional barriers.

2. The limited resources of psychological adaptability of students from distant countries with high demands for successful sociocultural adjustment urge higher education organizers to support students' personal development – creative communication and flexible thinking in learning activities. Combining academic content with intensification of interpersonal and business communication in the real conditions of professional and broad social interaction is necessary. Within the framework of additional training, it is necessary to activate a creative group work of teachers to develop innovative technologies for personal development in educational work, using the resources of IT and online platforms.

3. With a rather solid resource of psychological adaptability and high requirements for sociocultural adaptation, students from neighboring countries show little interest in Russian achievements and express low intentions to communicate with and approach people in the country of education. The task of university teachers in working with students from neighboring countries is to ensure positive dynamics of academic and extracurricular intercultural relations in an educational environment where representatives of different nationalities feel comfortable. In this way, the traditions of Russia's multinational south, which testify to a long experience of cultural neighborliness, are activated and supported within the walls of the university. Interactive forms of experience sharing among faculty in the context of professional development will focus on gaining experience in organizing student participation in the cultural life of Russia through various forms of academic work.

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Submitted Juny 16, 2022

UDC 378.1
DOI: 10.23951/2782-2575-2022-2-78-87

PREDICTING CHANGES IN TEACHER PREPARATION FOR INTERCULTURAL INTERACTION IN REGIONS

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Abstract. *Introduction.* The article shows the relevance of the problem of changes in the preparation of teachers for intercultural interaction, taking into account the specifics of regions on the territory of Russia. Furthermore, the authors have identified the main tasks, the solution of which will contribute to the development of a predictive model of teacher preparation in the future.

Aim. To present an argument for the stages of development of a predictive model of teacher preparation for intercultural interaction.

Materials and Methods. The leading methods are the analysis of theoretical literature on the topic of the selected study. The choice of such research approaches as structural and structural-functional allows us to characterize the preparation process of teachers for intercultural interaction as multi-component, multistage and multi-phase in the context of interaction between the regional education system and the system of higher education in the Russian Federation.

Results. The steps to develop a model for predicting the content of teacher preparation programs for intercultural interaction are proposed, the essence of the concept of Teachers Preparation and Changes in Preparation is concretized, and strategies for organizing teacher preparation for intercultural interaction are identified (overcoming existing linearity, practice orientation and continuity, and strategies for proactive preparation). Clarification of the concept of Changes in Preparation and determination of the meaning of the predicted changes will allow us to identify in the future the factors influencing the process of teacher preparation for intercultural interaction: socio-political factors determine a new (possibly different) understanding of the strategy for the development of higher pedagogical education in the context of strengthening ethnocultural processes (e.g., legislation in the field of development of regional policy, the position of the state in the field of regulation of ethnic processes and dissemination of ideas on preservation of ethnic cultures; the growth of ethnocultural processes); regional factors - analysis of the processes that characterize the level of development of regional development (e.g., the demographic structure of the population, social mobility, dynamically changing requirements of the labor market); personal factors - adaptation of existing and definition of new goals of pedagogical higher education established and emerging in a particular university to preserve national culture and maintain ethnocultural diversity (e.g., teachers' readiness for intercultural interaction; pedagogical initiatives, a framework program to prepare teachers for intercultural interaction).

Conclusion. Based on the study, it was suggested that the next study should lead to the development of components of a predictive model for teacher preparation for intercultural interaction.

* Original Russian language version of the article: Bogoslovskiy V.I., Zhukova T.A., Klimova I.I. Izmeneniya podgotovki k mezhkul'turnomu vzaimodeystviyu: regional'nyy aspekt [Forecasting Changes in Teachers' Preparation to Intercultural Interaction in Regions]. *Vestnik Tomskogo gosudarstvennogo pedagogicheskogo universiteta – Tomsk State Pedagogical University Bulletin*, 2022, vol. 5 (223), pp. 58–66 (In Russ.). https://doi.org/10.23951/1609-624X-2022-5-58-66

Keywords: *regional education, intercultural interaction, changes in teacher preparation, strategies for organizing the educational process, comparative studies, predictive model*

Introduction

The processes of globalization and the intensification of the integration of cultures have confronted many multiethnic states with the problem of developing a multicultural society that develops according to the laws of cooperation and mutual respect, a society that is ready for the implementation of intercultural interaction. In this context, within the framework of this study, it is important for us to understand the essence of intercultural interaction, which is understood as the contact of two or more cultural traditions (canons, styles), during and as a result of which the participants of communication strongly influence each other (Kurylo O.V., 2019; Palakina G.V., 2007; Pevzner M.N., 1998; Stenishcheva A.A., 2020).

It is no less important to understand the new trends affecting education development. Referring to the works of the following researchers – V.N. Averkin, A.S. Akhizer, S.A. Pisareva, A.P. Tryapitsyna, and others – the following opposing tendencies in the development of regional education can be identified: the first is related to the desire to separate, to decentralize the educational system of the region from other regions; the second tendency is related to the fact that without an educational center it is impossible to independently solve a number of emerging problems in education, to solve the problem of teacher preparation fully. These tendencies, as practice shows, are present in different regions, which leads us to the conclusion that regionalization is one of the essential factors in the development of the educational space aimed at solving the following set of problems, the most important of which can be formulated as follows:

First of all, these are problems related to the need for teachers ready for intercultural interaction in the region, which is one of the bases for changes in teacher education.

Secondly, a significant difference in the development of the problem of content design and evaluation of the results of the preparation of teachers for intercultural interaction in different regions, taking into account the ethnocultural characteristics (the specifics of their culture, cultural identity). The discussion of this issue is of great importance for all multicultural regions, without exception. The common practice of preparation of teachers for intercultural interaction has a number of shortcomings: Preparation is carried out within the framework of individual disciplines; there are no disciplines that reflect the regional specifics of the education and the peculiarities of the organization of the educational process in each region. In this regard, it is important to look for holistic and unified strategies for the development of further models of teacher preparation.

And thirdly, the insufficient integration of scientific evidence between regions to identify the prospects for teacher preparation for intercultural interaction and to determine further trends in education development in the country. In this regard, comparative studies are helpful.

Given the above, we believe that the purpose of this study is to broaden the understanding of how to organize the preparation of teachers for intercultural interaction, taking into account the specifics in the regions.

Materials and Methods

In the context of this study, a systematic approach was adopted, an approach in which each system (object) is viewed as a set of interrelated elements – the process of preparing teachers for intercultural interaction as a multi-component, multilevel and multistage system, and a structural-functional approach, as the function is defined as the result of interaction between the regional educational system and the system of higher education in the Russian Federation, expressing

participation in the processes of improving the preparation of teachers for intercultural interaction), it reflects the value orientations of each region. The method of analysis of theoretical literature on the research topic was chosen as the leading method.

Results of the study

The first task of this study (following the identified first problem) is to justify the meaning of changes in teacher preparation and to understand the essence of the terms "teacher preparation" and "changes in teacher preparation."

Thus, the teacher preparation process is an ordered set of interrelated components: Goals, content, methods, means, and organizational forms of preparation and character building. The effectiveness of this process depends on engaging students in active, meaningful learning activities that are personally important to them. By organizing these activities, they acquire social and professional experiences, develop psychological functions and skills, and form a system of relationships with the world and themselves.

Various authors understand preparation as a process: "aimed at creating conditions for optimal self-realization in professional activity" (Kozyrev V.A.); "reflexive process of creating instrumental-technical knowledge and developing norms of action for the professional development of a teacher" (Bazhina I.A.); "a conscious systemic process of interaction between subjects of distance education in the informational and educational environment" (Vladimirova S.A.); "a specially organized and controlled process of introducing subjects of the educational process into interaction" (V.I. Bogoslovsky).

Many researchers consider it as a system of actions: "a system of interrelated functions, actions, procedures, methods, techniques, measures, implemented in various forms and technologies, ensuring qualified support of the teacher throughout their professional career" (M.N. Pevzner); "having a productive impact on the use of the pedagogical process and the optimal achievement of objectives" (V.I. Bogoslovsky).

A number of scientists also define preparation as a method: the pedagogical method of "teaching a person the art of solving independently and with the greatest efficiency the problems (professional and personal) that have arisen in their life" (Glumova E.P.); a method that "ensures the creation of conditions for the subject of development to make optimal decisions in various situations of life. Here the subject of development is defined both as a developing person and a developing system. The situation of life choice is a variety of problematic situations, in which the subject determines the path of progressive or regressive development" (V.I. Bogoslovsky).

Nowadays, in the conditions of active development of education, its modernization, and reform, the scope of understanding of preparation has widened – the concept of preparation is understood as a multilevel interaction of the subjects of the educational process, which contributes to the professional development of the future specialist, their personal and professional development.

It is considered "a complex method based on the unity of four stages: Diagnosis of the essence of the problem encountered, information about the nature of the problem and ways to solve it; consultations at the stage of adoption and development of a plan to solve the problem; organization of primary care at the stage of implementation of the decision plan and decision-making in difficult situations based on the study of their interests, features of interaction, needs" (V.I. Bogoslovsky). This approach allows us to organize the preparation process from the Student and the Educational Environment.

For our research, it is essential that the structure, characterized by the composition of the elements of the system, the set of connections and relationships between them, can be considered both horizontally and vertically. In this regard, the vertical structure leads to the concept of levels, their subordination, and hierarchy, and reflects the system's movement, while the horizontal structure reflects its content.

The next question, no less essential for us, relates to the types of the concept of Change that can be viewed through the prism of ethnocultural processes. Doug Reeler identifies three types of change that underlie most social development processes: Emergent Change, Transformative Change, and Projectable Change.

The assignment of these types is conditional, and one of the types may dominate in a given period, but they all coexist and are mutually dependent.

"Emergent change describes the day-to-day unfolding of life, adaptive and uneven processes of unconscious and conscious learning from experience and the change that results from that. This applies to individuals, families, communities, organizations and societies adjusting to shifting realities, of trying to improve and enhance what they know and do, of building on what is there, step-by-step, uncertainly, but still learning and adapting, however well or badly.

This is likely the most prevalent and enduring form of change existing in any living system. Whole books, under various notions of complex systems, chaos theory and emergence, have been written about this kind of change, describing how small accumulative changes at the margins can affect each other in barely noticeable ways and add up to significant systemic patterns and changes over time".

The next type of change is Transformative Change (change Through Crisis and Unlearning). "Crises may also be the product of a social beings entering into tense or contradictory relationships with their world, prompted by shifts in external political, economic, cultural or environmental contexts.

Crisis or stuckness sets the stage for transformative change. Unlike emergent change, which is characterised as a learning process, transformative change is more about unlearning, of freeing the social being from those relationships and identities, inner and outer, which underpin the crisis and hold back resolution and further healthy development".

Another type of change is *Projectable change* (Working with a Plan) "As human beings (in or out of the development sector) we pursue projectable approaches to our own development, individually or collectively planning and undertaking projects, from small to large. Projectable approaches, through projects, tend to succeed where problems, needs and possibilities are more visible, under relatively stable conditions and relationships, which are not fraught with crisis or stuckness."

In relation to our study, we consider it important to speak of projectable change, which allows us to predict the course of possible transformations due to dynamic changes in the regions.

The second task is to find strategies for organizing teacher preparation. The difference in the development of preparatory programs is largely determined by the chosen strategies used in the preparation for intercultural interaction (Khristoforova S.V., 2019; Shrenk M., 2016).

Firstly, it is entirely reasonable to speak of a strategy that refers to overcoming *the existing linearity* in the organization of preparation of teachers for intercultural interaction in the framework of strengthening ethnocultural processes, which manifests itself in the application of well-established invariable mechanisms of influence, without taking into account the cultural diversity in the region. The appearance of linearity of teacher preparation is reflected in the fact that it is manifested in the framework of the educational environment based on the functioning of

separate ethnic formations and their cultures, which are isolated and have little contact with each other, without considering the modern multicultural dynamics, aspects of which have been studied very intensively by researchers for several centuries. In fact, the organization of preparation in educational institutions goes through three stages of development: the inclusion of ethnocultural components in the curriculum; the transformation of the multicultural component into an integral part of the curriculum; the selection of content and teaching methods that correspond to the ideas of multiculturalism and polyethnicity.

We believe that the following strategy for teacher preparation can be linked to new strategies for organizing this process that is *more practical and individualized*.

This strategy was first reflected in the Melting Pot theory for national cultures, the genesis of which is associated with the name of American scholar James Banks. The researcher identified five levels or areas of action in preparing students: "(1) content integration, (2) the knowledge construction process, (3) prejudice reduction, (4) an equity pedagogy, and (5) an empowering school culture and social structure" (J. Banks). At the same time, he suggested consistent preparation such as: Redesigning curricula through "cultural additions" (first stage); including additional classes in curricula that describe cultural diversity (second stage); fundamentally changing the programs of all academic disciplines so that they are based on the presence and values of cultural diversity (third stage); engaging students in socially useful activities that simultaneously address the complexity and affirm the value of cultural diversity in the modern world; and expanding the cultural environment (fourth stage).

This strategy is closely related to the strategy of *anticipatory professional preparation* of a teacher (Lysenko V.G., 2021), who is ready for innovative changes in the field of their professional activity, based on a comprehensive analysis of the problems, conditions, prospects for the development of a modern school in the region and the country and the results of research in the field of modernization of education in a multicultural society. The anticipatory strategy of professional education "as a synergetic idea" reflects the orientation of the educational process and its content to the advanced development of the personality of a future professional, the formation of their readiness to model the future, to foresee options for their development, to set and solve innovative professional tasks.

The teacher is "primarily required to help students develop skills for self-knowledge and self-improvement. The teacher's position is being reconsidered as they become more of a coordinator of the educational process than a direct source of knowledge and information. A change in professional position leads to the student acting as a partner in the learning process, becoming mobile, and a partner with some life experience" (E.V. Piskunova). Mobility means agility, the ability to move, quickly navigate the environment and find suitable forms of activity.

The researcher lists the main features of the teacher preparation anticipatory strategy as follows: Reflects the orientation of the content and process to the readiness of students to model the future, predict options for the development of the studied phenomena that exist in the direction of the system, form the personal and professional qualities of students necessary for successful pedagogical activity in conditions of intense social changes and strengthening ethnocultural processes that require strengthening the role of the teacher in maintaining and strengthening intercultural interaction; Justifies the need to cover all levels of education from preschool to post-graduate education and non-formal educational processes and demonstrates the integrative role of the teacher in maintaining and strengthening tolerant relations between representatives of different cultures not only through the formation of a motor self-organization in the individual, but also through the education, stimulation and support of self-improvement processes in the person at all stages of life.

In conditions when "one of the most important requirements that society places on professionals in the field of education is the readiness to constantly search for information, the task of optimizing the possibilities of updating knowledge in order to adapt the professional activity to the requirements of the time" (V.I. Bogoslovsky) seems to be one of the most important, the dominance of individualization of the educational process, the ability and willingness of the teacher to build their educational path, i.e., to develop the ability to transfer the research interest to the object of study, to be ready for innovative transformations in the field of their professional activity, caused by the peculiarities of the regional educational environment, given its meta-activity character, the presence of situations of ambiguity and non-algorithmization.

The current situation, characterized by apparent gaps in the organization of teacher preparation in a multicultural society, serves as a specific impetus for the creation of a predictive model of teacher preparation *(possibly, in the future, a predictive model of the framework for teacher preparation)* that takes into account the characteristics of the region, is universal and is accepted by comparable countries, taking into account the methodological features of the comparative studies developed so far and reflecting the logic of their implementation according to the established parameters and the results of the analysis.

Such a model should aim to create the conditions for a "mitigated version of adaptation in a new space for the individual," expressed in terms of "restrained integration" and continuity, which means the preservation of the culture of the national majority and the acceptance of new minority groups integrating into a different culture that does not interfere with the mental, value blurring of the boundaries of the national culture of the state.

So, in summary, the predicted changes in preparation for intercultural interaction are related to the expansion of ideas about the concept of Preparation, which is "a comprehensive method based on the unity of four stages." Diagnosis of the essence of the emerging problems, information about the nature of the problem and ways to solve it; consultations at the stage of adoption and development of a plan to solve the problem; organization of basic services at the stage of implementation of the decision plan and decision-making under challenging situations based on the study of its interests, characteristics of interaction "(V.I. Bogoslovsky), needs. This approach allows us to organize the preparation process both from the "student" and from the "educational environment," implementing the strategy of anticipatory teacher preparation (teacher preparation is a purely individual process. It cannot be uniform or obligatory and should be organized through individual educational pathways, taking into account practice-oriented strategies, strategies for social interaction, and strategies for continuous preparation (preparation is always a process whose goal is to improve the professional competence of a teacher during their professional life, to monitor the readiness to carry out appropriate intercultural activities, to monitor the appearing courses for the preparation of teachers.

The third task is to find ways to integrate the experiences of different regions (in our study, such mechanisms are comparative studies).

An analysis of the positions of the above researchers concerning the nature of the phases identified shows that the organization of comparative pedagogical research is based on an inductive approach, which involves the construction and formulation of conclusions "from the particular to the general." Therefore, the use of the inductive approach served as our basis for selecting the following phases for the study:

The first phase is problem-oriented. "It involves a description and explanation of the characteristics of the subject of study, thus making it an object of knowledge" (B.L. Wulfson).

The second phase is critically oriented. "It involves a discussion and critique of the empirical results presented and compared" (B.L. Wulfson).

The third phase – constructively oriented – predicts and designs a predictive model of a framework for preparing teachers for intercultural interaction in the context of strengthening ethnocultural processes in the region that reflects Change.

By describing the methodology of modern comparative research, modern sociocultural factors determine the change in the understanding of education in a multicultural society, which is directly related to the sustainable development of society. "Education is seen as the set of ways in which people learn about the world around them, the accumulation of values and life skills that reflect an understanding of the realities of the world, and the assumption of responsibility as global citizens to ensure readiness for future change" (B.L. Wolfson). In studies based on a sociocultural approach, the Funnel of Causality methodology proposed by E. Campbell in 1960 is often presented to study the factors that influence political and social processes. The application of this methodology in relation to the problem we are interested in makes it possible to carry out a multifactorial analysis of the transformation processes in higher pedagogical education, consistently narrowing the focus of attention from the macro level to the micro level – taking into account the structural (objective) and procedural (objective) factors that determine the development trends of higher pedagogical education in a multicultural environment and influence the process of teacher preparation.

In accordance with the methodology of the Funnel of Causality described above, we believe that it will be possible to identify and justify the following factors that determine the general, the particular, and the singular (Golenkova O.V., Sverdlova G.A., 2021; Knyazeva V.A., Solovieva K.S., 2020), which influence the process of preparing teachers for intercultural interaction:

- Socio-political factors determine a new (possibly different) understanding of the development strategy of higher pedagogical education in the context of strengthening ethnocultural processes (e.g., legislation in the field of development policy, the position of the state in the field of regulation of ethnic processes and dissemination of ideas on the preservation of ethnic cultures, the growth of the scope of ethnic and cultural processes).
- Regional factors – analysis of the processes that characterize the level of development of the region (e.g., the demographic structure of the population, social mobility, dynamically changing demands of the labor market).
- Personal factors – adaptation of existing and definition of new goals of pedagogical higher education established and emerging in a particular university to preserve the national culture and maintain ethnocultural diversity (e.g., teachers' readiness for intercultural interaction; pedagogical initiatives, a framework program to prepare teachers for intercultural interaction).

In our work, we are concerned with studying the regional educational system. Therefore, it is extremely important to determine the place of the regional higher education system in a larger system (the system of higher education in Russia) and to identify functional interdependencies between them. Therefore, we considered it important to determine the possibilities of applying the structural-functional approach in the study. It is well known that the structural-functional approach is one of the most important research approaches to studying social phenomena. This approach gained the greatest importance in organizational theory – the concept of functionalism by Emile Durkheim, who was the first to formulate the problem of the interdependence of functions of individual system units. Subsequently, these problems were further developed by B. Malinovsky and A. Reginald Radcliffe-Brown, who considered society an adaptive system in which each part ensures its existence in the external environment. Therefore, the defining concept of the structural-functional approach is the function of a single component in relation to the whole system. In this sense, the Function defines the process, change, and development.

The result of successful integration is an effective organization, and it is important to pay attention not only to the positive experience but also to recognize the existing content and trends; to understand the qualitatively new provisions for the construction of the educational process developed in national and international theory and practice. In this regard, the importance of a systematic approach is obvious.

According to the researchers' understanding, a systematic approach is one in which each system (object) is considered a set of interconnected elements (components) that have an output (goal), an input (resources), communication with the external environment, and a feedback loop.

We believe that organizing comparative studies within these approaches will allow us to identify the most successful and effective precedents in each region studied, which will be important in the future for developing a predictive model for teacher preparation.

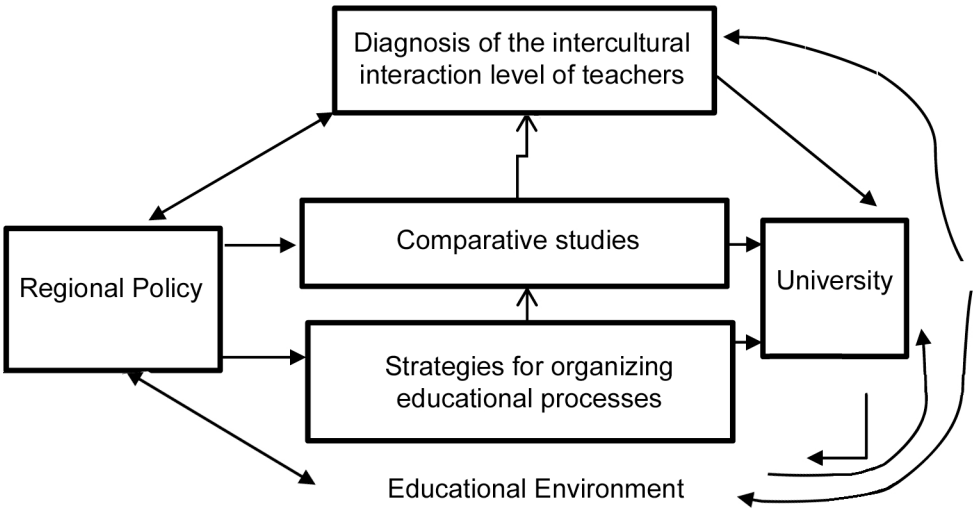

Figure 1. Stages of developing a predictive model for teacher preparation for intercultural interaction

Conclusion

In conclusion, we emphasize once again the importance of solving the following tasks – the solution of which will further contribute to the development of a predictive model of teacher preparation – to concretize the essence of the concept of Teacher Preparation and Changes in Preparation, to search for strategies to organize teacher preparation for intercultural interaction (overcoming the existing linearity, practice orientation and continuity, and anticipatory learning strategies), and to find ways to integrate the experiences of different regions through comparative studies. The next study will lead to the development of components of a predictive model for teacher preparation for intercultural interaction.

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Submitted May 16, 2022

UDC 378.02:37.016
DOI: 10.23951/2782-2575-2022-2-88-97

PSYCHODIDACTIC APPROACH TO THE CREATION OF TEXTBOOK TEXTS FOR THE PROMOTION OF INTELLECTUAL DEVELOPMENT OF STUDENTS (ON THE EXAMPLE OF SCHOOL MATHEMATICS)*

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Abstract. *Introduction.* The most important factor for students' intellectual development is the teaching content. A textbook text is a didactic unit of teaching content. Therefore, the question arises about the requirements for modern textbook texts in the framework of the psycho-didactic approach.

Materials and Methods. The study was conducted based on an analysis of the psychological features of the intellectual development of students within the psycho-didactic approach, which is based on the psychological and pedagogical rationale of the multifunctionality of modern mathematics teaching materials.

Results and Discussion. The concept of development-focused educational text, which should be constructed as a multidimensional semantic space (hypertext), is introduced. Classification of development-focused educational texts is presented (using school mathematics as an example) based on the ontological theory of intelligence, targeting the enrichment of the main components of students' mental experience – cognitive, conceptual, metacognitive, and intensional experience. Typology of pedagogical developmental texts of different types in teaching mathematics in middle school is given.

Conclusion. The use of developmental textbook texts contributes to understanding mathematical material and developing students' intellectual resources.

Keywords: *educational content, textbook text, psycho-didactic approach, intellectual development, comprehension, mental experience, typology of development-focused educational texts*

Introduction

The content of school subjects is an essential factor in the intellectual development of students. It requires the study of the psycho-didactic approach, according to which forms and methods of learning are developed based on a combination of subject-didactic, methodological, and psychological knowledge (Davydov, 1966; Zankov, 1990; Panov, 2004; Gelfman, 2004; Gelfman, Kholodnaya, 2018; Psychodidactics of modern textbook..., 2019; Kidron, 2010; Malara, Navarre, et al., 2003; Brousseau, 1997; Simon, Tzur, 2004; Hershkowitz, Schwarz, Dreyfus, 2001; Bikaner-Ahsbahs, 2004; Kholodnaya, Gelfman, 2016).

There are different views on the role of textbook texts in modern school education (using school mathematics as an example). According to one point of view, a textbook text is a

* Original Russian language version of the article: Gelfman E.G., Kholodnaya M.A., Podstrigich A.G. Tipologiya razvivayuschikh uchebnykh tekstov (na primere shkol'noy matematiki) [Typology of Developing Educational Texts (a Study of School Mathematics)]. *Vestnik Tomskogo gosudarstvennogo pedagogicheskogo universiteta – Tomsk State Pedagogical University Bulletin,* 2019, vol. 3 (200), pp. 27–34. DOI 10.23951/1609-624X-2019-3-27-34

presentation of mathematical knowledge adapted to the abilities of students of different ages (and then such a text is simply a statement of reference material or a mathematical learning task). The other position states that there is no need for specially designed textbook texts since the preparation of instructional materials and their presentation in class is the sole responsibility of the teacher, who organizes learning activities for students and is responsible for the quality of their acquisition of mathematical knowledge.

A textbook is a tool that organizes modern learning content. However, several studies have pointed out that traditional mathematics textbooks are closed in that they restrict the readership to very narrow activities (Love, Pimm, 1996). It is also emphasized that many students cannot effectively use their textbooks as learning tools (Weinberg, Wiesner, 2011).

In our opinion, according to the requirements of the psychoeducational approach, firstly, a textbook text should not contain prefabricated knowledge (as a reference or problem book, it should be a set of textbook texts in the form of a textbook for students), because mathematical knowledge will have a developmental effect only if it is designed in accordance with the mental (especially intellectual) development of students. Secondly, work with texts (analysis, highlighting of main ideas, interpretation, and creation of original texts) is an important factor in intellectual development, and ignoring it deprives students of the possibility of individual, silent intellectual work. It is important to emphasize that aligning mathematics instruction with the structure of children's thinking will reduce the sense of anxiety that children often experience in mathematics classrooms (Picker, Berry, 2001). Effectively analyzing the language of mathematics as it is used in mathematics textbooks will help make students aware of the importance of learning (O'Keeffe, O'Donoghue, 2015).

This article aims to introduce the concept of a "development-focused educational text" describe its characteristics and introduce the types of development-focused educational text based on the psycho-didactic approach (using school mathematics as an example).

Materials and Methods

The student's interaction with the various subject areas in the learning process is mediated by a *textbook text*. The text is the natural source that provides the learner with the necessary intellectual resources (new knowledge, new ways of thinking, new perspectives on this or that problem) for his or her life. In school education, the text is considered a prerequisite for productive learning, especially within the framework of "reading theory," according to which a student-reader actively constructs meanings (concepts) while working with texts (Weinberg, Wiesner, 2011).

A new generation of textbooks has evolving texts that can transform a textbook into an intellectual guide. An evolving textbook text is a kind of hypertext because several specific features characterize it.

1. Variety and nonlinearity – textbook texts contain texts of different genres and types (informative, problem-solving, paradoxical, action-oriented, gamified); they are divided into fragments of different complexity; they initiate different types of learning activities (students may engage in task-based, research-based, project-based, or creative activities); they provide different ways of implementing educational information (verbal, visual, hands-on, emotional).

2. Ambiguity and inconsistency – there are elements of uncertainty in textbook texts (tasks with incomplete or excessive data, alternative approaches to solving the same problem, and different analyses of the problem situation).

3. Focus on students' experiences – textbook texts are communicative and contain numerous direct and indirect questions and appeals to students. In addition, the narrative basis of the text plays a unique role as a prerequisite for providing emotional support to students and incorporating

their everyday experiences. Finally, the inclusion of personal experiences is ensured by the possibility of choosing the learning pace and method according to the student's level of preparation, cognitive preferences, and abilities.

4. Independence in conceptualization – in textbook texts, knowledge is not conveyed in a prefabricated form: First, the text creates motivation to learn a new concept. Then students are guided to consider essential and non-essential features of the concept, independently formulate definitions, use visual models of the given concept, and apply the new concept in different situations. Textbook texts are designed to teach the ability to self-monitor learning activities (including self-assessment of actions in search of errors, and independent planning of steps in studying the material). Of particular importance are texts that initiate the process of independent writing of original texts on specific topics of the school mathematics course. Thus, when working with this type of text, the mechanisms of self-regulation of students' intellectual activity are trained.

Emphasizing the role of textbook texts in the school mathematics classroom challenges the widely held stereotype that "teaching mathematics means teaching students to solve problems. The more problems they solve and the more complex those problems are, the more effective the learning outcomes will be." We believe that teaching mathematics means teaching students to work with the meanings of mathematical concepts and activities by focusing on the conceptual and procedural apparatus of mathematical thinking and learning mathematics as a particular way of looking at the world. The higher the level of theoretical understanding of a particular subject area, the more successful a person is in solving tasks relevant to that subject area.

In this work, the following theoretical research methods were used: systematic analysis of the problem (identification and formulation of the main contradiction, search for ways to solve it, systematization of existing research, and summary of arguments in the formulation of a new problem); and modeling, in particular, development of a logical-semiotic model (psycho-didactic classification of textbook texts of developmental psychology).

Results and Discussion

The creation of development-focused educational texts according to the requirements of the psychoeducational approach, is one of the main directions of the emergence of modern Developmental Learning. The novelty of our approach lies in the fact that developmental learning texts, on the one hand, represent a projection of the structure of scientific-mathematical knowledge and, on the other hand, enable the formation of psychological mechanisms of productive intellectual activity.

Accordingly, the following question arises: what can serve as a psychological basis for the design of developmental mathematical texts so that the textbook texts promote the formation of students' intellectual abilities?

The psychological mechanisms of the intellectual development of a personality are related to the processes of enrichment of "individual mental experience" described in the ontological theory of intelligence by M.A. Kholodnaya. According to the structural model of intelligence proposed within the framework of this theory, four levels (forms) of experience can be distinguished in the composition of mental experience, each of which has its own purpose (Kholodnaya, 2019):

● *Cognitive experience* – responsible for the reception, storage, ordering, and transformation of information.

● *Conceptual experience* – provides for generalization, abstraction, modeling based on a selection of essential features and patterns, interpretation, and construction of new mental content.

● *Metacognitive experience* – provides for self-regulation of one's intellectual activity and choice of strategy for self-learning.

● *Intentional (emotional and evaluative) experience* – characterizes individual preferences and inclinations in the selection of learning materials and problem-solving methods related to the unique personal experiences of a particular person.

The psycho-didactic typology of development-focused educational texts suggests the construction of different types of textbook texts that ensure the enrichment of the main components of cognitive, conceptual, metacognitive, and intensional (emotional and evaluative) experiences of students in the process of learning mathematics in grades 5-9 (see details: Gelfman, Kholodnaya, 2018). Each type of mathematical developmental text addresses and contributes to the formation of a particular component in the structure of the four forms of mental experience.

The following is a (using mathematics texts as an example) (Table 1).

Table 1

Psychodidactic typology of development-focused educational texts

Forms of mental experience	Components in the structure of mental experience	Features of learning and cognitive activity	Types of learning tests
Cognitive experience	Ways of information encoding	Verbal-symbolic way of information encoding	· Mastering mathematical symbols · Finding a formula · Getting definitions
		A visual way of information encoding	· Normative image formation · Image motivation · Image development · Image classification · Converting from a verbal-symbolic method of information encoding to a visual one · Initiation of individual imagery experience
		Subject-practical way of information encoding	· Laboratory work · Situation in practice
		Sensory-emotional way of information encoding	· Emotional impression · Metaphor · Game
	Declarative cognitive structures	Cognitive structures of mathematical concepts	· Introduction of a focus sample · Frame · Compendium
	Procedural cognitive structures	Cognitive structures of ways of mathematical activities	· Algorithm (procedure) · Operation
Conceptual experience	Semantic structures	The semantics of the mathematical language	· Term meaning · Systematization of term meanings · Translation from the language of mathematics into the native language
	Categorical structures	Identification of categorical features and formation of relations between categories	· Identification of concepts' attributes · Evaluation and selection of concepts' features · Establishing connections between concepts · Motivation of a new concept · Categorization of concepts' content · Concept enrichment · Application of a concept in various situations · Packing up a content of a concept
	Generative structures	Constructing concepts and creating texts	· Searching for and generalization of patterns · Modeling · Micro composition · Independent creation of originals texts · Invitation to the project

End of Table 1

Forms of mental experience	Components in the structure of mental experience	Features of learning and cognitive activity	Types of learning tests
Metacognitive experience	Involuntary and voluntary mental control	Planning	· Program · Choosing a goal · Making a plan
		Predicting	· Formulation of a hypothesis · Prediction under uncertainty · Predicting the end result of students' actions
		Self-regulation	· Ways to self-control · Selecting a method of self-control · Finding and analyzing errors
	Metacognitive awareness	Self-reflection on personal intellectual activities	· Reflection of the solution methods · Self-assessment of students' knowledge and skills · Learning self-diagnosis · Psychological feedback
	Open cognitive stance	Willingness to work with conflicting information	· Problematizing · Alternative · Clash of opinions · Impossible situation
Intentional (emotional and evaluative) experience	Preferences Beliefs Mindset	Choice of a way of learning	· Choice of activity method activity · Choice of cognitive position · Individual cognitive style
		Actualization of intuitive experience	· Guessing · Creative work
		Valuable attitude toward the learning material	· Mathematics in the surrounding world · Key lines in mathematical development · History of mathematics

As part of the educational project "Mathematics. Psychology. Intellect" (MPI), teaching materials with developmental learning texts of different types were developed and implemented (Enriching Learning Model in MPI Project, 2002; Gelfman, Kholodnaya, 2018; Gelfman, Dozmorova, Demidova, 2014; Gelfman, Podstrigich, 2006; Kseneva, 2006; Lopatkina, 2009; Prosvirova, 2006; Pustynnikova, Lisura, Sazanova, 2004; Smolyakova, 2006).

Let us characterize some types of developmental textbook texts and give examples of such texts.

"Text is an individual cognitive style." Texts of this type provide students with opportunities to manifest their cognitive style, master many other cognitive styles, and thus expand their cognitive abilities.

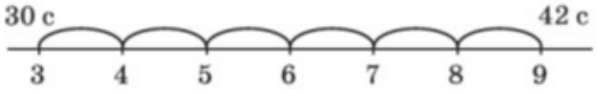
Textbook texts of this type usually contain characters that are carriers of a particular cognitive style, especially the style of information encoding (verbal-symbolic, visual, factual, sensory-emotional).

Here is an example of a textbook that promotes mastery of the ability to choose how to encode information.

1) Task. An athlete runs each successive lap 2 seconds longer than the previous lap. He ran the ninth lap in 42 seconds. What time did the athlete finish the tenth lap? The third lap?

2) Sasha read the task and said that the athlete ran the tenth lap in 44 seconds. How did he know that?

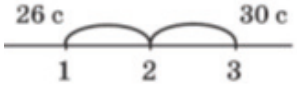
3) Volodya took notes to answer the question of how much time the athlete needed for the third lap:



$42 – 2 \cdot 6 = 30$ (s) – the third lap.

Explain these notes.

4) Sergey continued Volodya's reasoning and made the following entry:



Explain what this means.

5) Vasya said that the sequence of time values in which the athlete runs the first, second, etc. Lap is an arithmetic progression. How does he know that?

6) Natasha said that all the questions in the task could be answered with the formula for the nth member of an arithmetic progression. Check.

It should be noted that the use of the subject-practical way of information encoding, especially laboratory work, interests students, motivates them to learn new things, and creates a positive emotional attitude towards the learning material. As an example of the text, "text lab" is used a task in which students are asked to embroider a parabola. This subject matter experience becomes the basis for self-control by plotting a quadratic function.

Here is an example of a text that aims to enrich the conceptual experience, particularly to train the ability to highlight the essential features of the concept of "decimal fraction" and actively apply thinking operations such as analysis, comparison, and generalization.

Consider the table with the numbers

Thousands	Hundreds	Tens	Ones	Comma	Tenths	One-hundredths	Thousands	Tens of thousands
	4	0	0					
		4	0					
			4					
			0	.	4			

What pattern did you detect in the lines of the table? What purpose does the point serve in the table?

There is a number in the table that is not a natural number. For example, the number 0.4 is a decimal fraction that is "*Point four*." Explain how this number got into the number table.

How would you fill in the blank rows in the table?

Which numbers in this table are *natural* numbers? Which numbers are *decimals*? In what situations have you encountered decimal numbers? Make sentences about natural numbers and decimals using the highlighted words and expressions.

One of the characteristics of the formation of metacognitive experience is the ability to respond to one's intellectual activity and to take responsibility for its results. In this case, students' metacognitive awareness is important, which includes awareness of the nature of their own learning activity, self-assessment of their knowledge and skills, self-diagnosis of learning, and knowledge of the characteristics of their cognitive activity.

Of particular importance are textbook texts of the category "text – reflection on ways of solving." Working with such texts, students develop procedural knowledge about mathematical

activities and understand the internal "structure" of various mathematical actions. Such texts are structured as follows: they present several different ways of solving a mathematical problem and then discuss the special features (advantages) of a particular way; they provide an opportunity to evaluate the solution of "another student" from the point of view of whether a better way can be chosen.

Here is an excerpt from the text "Choosing a Way to Solve Quadratic Equations."

a) The equations are given:

1) $\frac{1}{3}x^2 - \frac{2}{3}x - 1 = 0$; 2) $x^2 - 5\frac{1}{5}x + 1 = 0$;

3) $7x^2 = 5$; 4) $0{,}06x^2 + 0{,}012x = 0$;

5) $0{,}7x^2 - 3 = 0$; 6) $x^2 - 4x - 5 = 0$;

7) $x^2 - 4\frac{4}{5}x - 1 = 0$; 8) $2x^2 = -6x$;

9) $x^2 - 2x + 1 = 64$; 10) $x^2 + 2x - 80 = 0$;

11) $x^2 - 10{,}5x + 5 = 0$; 12) $x^2 - x + \frac{1}{4} = 0$;

13) $x^2 - 40x + 111 = 0$; 14) $x^2 + 6x + 4 = 0$;

15) $x^2 + 2mx + q = 0$; 16) $ax^2 + 2bx + c = 0$;

17) $3x^2 - 10x + 3 = 0$; 18) $9x^2 - 20x = 24x$.

Which equations will you solve first? What are some ways to solve these equations? Solve them.

What methods will you use to solve the other equations?

Group the equations by the way you solve them. Can all of these equations be grouped together? Split into two groups? Split into three groups? Give these groups names.

b) Mark the possible solutions for these equations in the table with "+."

For each equation, mark the solution path that you think makes the most sense with "*."

Are all the solution paths for quadratic equations that you know included in the table? If not, complete them. Are there any methods in the table that you have not used to solve these quadratic equations?

Do you think these remaining methods are effective? If so, select the quadratic equations that could be solved using these methods.

Equations	Solutions						
	Using the root formula	Use of Vieta's formulas	Factoring a trinomial using decomposition	Reduced quadratic equation	Applying the Root Formula of a Quadratic Equation with an Even Second Factor	Representing a quadratic trinomial as a square binomial (if possible)	extracting a square root in partial quadratic equations
1) $\frac{1}{3}x^2 - \frac{2}{3}x - 1 = 0$ …							

Create a guide for choosing a rational method for solving a quadratic equation. You can use verbal instructions, diagrams, drawings, or examples for such a guide.

One of the main goals of modern teaching is to develop the ability to create various models. Text – modeling creates the conditions for developing the ability to conceptualize (to construct theoretical representations based on the abstraction of relationships that occur in a particular subject content).

The text type "text – choice of cognitive position" is necessary to activate students' learning and cognitive activity to preserve their identities. In addition, textbook texts of this type create conditions for actualizing personal life experiences and expressing a personal opinion on various aspects of educational activity. This goal is served, for example, by the epilog with which the sections in the textbook "The World of Quadratic Equations" are concluded. Here is an example of such a text.

"AFTERWARD In "Arithmetica Universalis," Isaac Newton wrote that setting up an equation for a problem is like translating from one language to another. Setting up such an equation is translating from an ordinary language into a mathematical one. Thus, the difficulties involved in setting up an equation are those of translation.

For example, to translate a sentence from English into Russian, we must first understand the sentence correctly and, secondly, be familiar with the means of expression of the corresponding terms in Russian.

Apart from that, sometimes we can break a sentence into its components and translate it word by word.

However, translation is not always so simple. Often it would be best if one did some preliminary work, paying attention, not to the meaning of individual words but the meaning of the sentence as a whole. In this case, one would need to restructure the sentence before translating it and put the idea expressed in it into different words.

Here is an example of two English sentences translated differently:

"Birds of a feather flock together." The literal translation is "Птицы с одинаковыми перьями собираются вместе – birds of the same feathers flock together." And the translation found by the author in Russian proverbs is: "Рыбак рыбака видит издалека – The fisherman sees the fisherman from afar."

Here is another example: "Do not count your chickens before they are hatched," the Russian equivalent is "Цыплят по осени считают – Chickens are counted in autumn."

What similarities and differences do you see between these translations?

Find common expressions, proverbs, and idioms from different countries and nations that have the same meaning."

We believe that developing and using developmentally appropriate textbook texts of different types will, first, expand the content area of mathematics instruction and, second, allow teachers to create more effective individualized learning pathways for students with different levels of education and thinking.

Conclusion

In our view, the psycho-didactic typology of development-focused educational texts is a valuable tool that can enhance the understanding of mathematics teaching material and promote the growth of students' intellectual resources by enriching the most important components of their mental experience. Moreover, our proposed approach to shaping the content of mathematics instruction in schools raises the urgent question of whether a modern mathematics textbook should be a reference (problem) book or an intellectual self-help book.

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Submitted May 16, 2022

UDK 81-13; 378.09
DOI: 10.23951/2782-2575-2022-2-98-113

CROSS-CULTURAL RESEARCH AS A METHODOLOGICAL RESOURCE OF MODERN LINGUODIDACTICS

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Abstract. Cross-cultural linguodidactics is considered a modern methodological tool that allows learning a foreign language not only in the context of immersion in the culture of the people – the native speaker of that language, but also to take into account the effects resulting from the interactive exchange of linguocultural information between all parties of multicultural communication. Based on the above positions, most linguistic facts acquire the status of units with a linguocultural and linguodidactic resource. Moreover, the acquisition and subsequent mastery of these foreign language units contribute to the formation of the secondary linguistic personality fragment of the worldview, which, in turn, allows for building and improving the competence base of an international student in the field of intercultural and multilingual interaction.

Material and Methods. The study was conducted on the basis of the material contained in lexicographic sources to investigate the didactic resources of lexical borrowings – Russianisms and Chineseisms. The main method is a comprehensive cross-cultural analysis combining a number of methodological procedures: Observation, etymological, componential and lexical-semantic analysis, associative linguistic experiment, elements of linguo-culturological, linguo-conceptual and discursive analysis.

Results and Discussion. The cross-cultural study was conducted in several steps. First, based on the analysis of available lexicographic information, the presence of borrowed units belonging to various thematic groups (socio-political, scientific, and technical vocabulary, words denoting natural and geographical objects, realities of national life, economy, historical and cultural phenomena) was established in Russian and Chinese as actively contacting recipient languages. Second, it was found that Russianisms quantitatively predominate and most of the borrowings are internationalisms. Third, an association experiment conducted in groups of Russian and Chinese speakers was used to determine similarities and differences in the interpretation of borrowings. The results of the comparative analysis are mainly determined by the factors of the informant's belonging to a certain linguistic culture and the level of foreign language proficiency. Finally, recommendations are formulated on how cross-cultural analysis can be used for linguodidactic purposes.

Conclusion. The didactic tool of cross-cultural analysis makes it possible to learn a foreign language thoroughly and comprehensively and to use it effectively as a means of intercultural communication. At the same time, the borrowed lexical units serve as valuable empirical material for the implementation of the methodological guidelines of a cross-cultural orientation.

Keywords: *cross-cultural linguodidactics, secondary linguistic personality, linguistic culture, worldview, lexical borrowings, loanwords, cross-cultural resource of a lexical unit*

The article was written as part of the implementation of the grant project "Model for Training Specialists in Non-Wide Used Foreign Languages directed to realize the One Belt, One Road initiative in the Field of Advanced Development of Humanities" (Heilongjiang, March 28, 2022) [本论文为省级教改项目新文科背景下的"一带一路"非通用语人才培养模式研究与实践的阶段性成果].

Introduction

The interaction of ethnic groups within the globalization processes in the modern world manifests itself, among other things, in the form of diverse intercultural and cross-cultural relations and multilingual interaction. "The discovery of the multiculturalism of the world, the realization that no culture can be understood without comparison with others" [1, p. 3], marked the search for new approaches to understanding and explaining the world. Today, one of the central tendencies in the development of science and education is to turn away from Ethnocentrism (A.P. Sadokhin) and focus on combining efforts in studying the problems of linguoculturology, linguocountry studies, ethnolinguistics, linguoconceptology, discourse linguistics, and intercultural communication in the format of the cross-cultural approach to communication (F. Boas, R. Benedict, A. Vezbicka, W. Wundt, J. Murdoch, L. Morgan, R. Naroll, A. Radcliffe-Brown, W. Rivers, G. Spencer, E. Tylor, G. Triandis, J. Fabian, J. Fraser, E. Hall, W. Eco). According to J. Murdoch, one of the main ideologists of cross-culturalism J. Murdoch, cultures do not exist in isolation from each other. We can observe "the transplantation of cultures through migration, the diffusion of cultural elements that occurs when cultures come into contact with each other and borrow, the parallel development of cultures from a common cultural source, their convergent development from different sources, the spontaneous unfolding of an inherited potential, or the supposedly determining influence of some or other factors" [2, p. 202].

Today, the cross-cultural approach can be considered interdisciplinary. The methodology of cross-cultural studies in modern linguistics is based on the identification of "universal cultural patterns" (K. Wissler) and specific features that distinguish a particular language culture from others, associated with the reflection of the world and national culture in language, in the context of their mutual influence and interpenetration. It is also important to take into account the factors that determine the presence of these linguocultural phenomena as markers of the corresponding fragments of the worldview and provide a deeper understanding of the cultural, mental, and linguistic identity of this or that nation. Therefore, cross-cultural studies can be defined as having at their core philosophical attitudes related to the ideas, including those of native thinkers, of open dialogical communication [3], of "wholesome synthesis" of different cultures complementing each other [4], of cultural-historical development in connection with the theory of ontogenesis of personality [5]. These and many other concepts reveal the content of the necessary conditions for the existence and development of culture and civilization as a whole.

The modern pedagogical paradigm, especially in the field of language teaching, is based on the principles of multicultural education (see, for example, [6, 7]). In this context, the task of translating and exchanging culturally significant meanings between different linguocultures in order to have these meanings interpreted by the speakers of these linguocultures and subsequently coming into contact with or even entering a foreign linguoculture is extremely important. Among the significant results of cross-cultural communication are the enrichment of national cultures and languages and the deepening and widening of the scope of universal meanings that enter national worldviews as individual fragments.

This task is particularly important in the educational field of *linguistics*. The study of a foreign language with its cultural and historical context and the incorporation of knowledge of cross-cultural equity contribute to the acquisition of quality educational outcomes. It should be noted that the goals of the cross-cultural method are not inconsistent with other approaches currently being implemented in linguistic pedagogy. In particular, the approach of considering a foreign learner as a *secondary linguistic personality* (see the works of I.Yu. Boteva, Z.M. Vetchinkina, N.D. Galskova, A.A. Guseva, M.G. Korochkina, L.A. Milovanova, E.V. Potemkina, V.V. Rizhov, I.I. Khaleeva, L.P. Khalyapina, T.K. Tsvetkova). In this case, the

speaker is perceived primarily from the manifestation of linguistic ability to interpret various facts of the studied language in correlation with the relevant fragments of the international worldview and, on this basis, to form a secondary worldview [8]. The essence and methods of implementation of the cross-cultural method are also close to *linguocultural analysis*, which is actively used in modern foreign language teaching: "The principles of linguocultural didactics consist in getting acquainted with the other (foreign) linguoculture, finding points of contact between the native and foreign world views, developing a tolerant attitude towards the cultural and linguistic peculiarities of other people." [9].

The cross-cultural approach is considered an effective methodological tool for learning. It is a pedagogical toolbox for the formation of an information thesaurus, which includes the implementation of peaceful coexistence and interaction of different ethnic groups based on the principle of tolerance and the creation of favorable conditions for the development of national languages and foreign language teaching. "Cross-culturalism is understood as the mutual influence of languages and cultures, combining the common and the different" [10, p. 8], is a polysemantic and multifunctional definition, which is interpreted as the most important content principle and methodological approach in modern linguodidactics. Cross-cultural analysis, combined with linguocultural and linguoconceptual analysis, is considered an effective pedagogical tool contributing to the achievement of significant pedagogical results in foreign language teaching.

The essence of the cross-cultural approach is to identify the relationship between the exchange of linguocultural information between speakers of different linguocultures. The exchange takes place at the following stages of linguistic activity: (1) reception of information, (2) introspective reception (perception, understanding), (3) interpretation, (4) expression of reaction as a result of "incorporation" of the received information into the secondary image of the world as a certain fragment of it. The difference between the cross-cultural approach and the methodological attitudes existing today (in linguocultural studies and in intercultural communication) is the obligatory representation of the foreign speaker's response in terms of inauthentic linguistic facts. This response not only demonstrates the foreigner's understanding of the semantic and functional-pragmatic nuances of the meaning of a given lexeme but also, by explaining various types of comments, shows the foreigner's ability to make connections between the facts in the target language and his or her native language. In comparison, the methodology used in research on intercultural communication usually covers the first two stages of the above-mentioned linguistic awareness activity of the secondary linguistic personality. In contrast, the methodology of the linguocultural approach, in most cases, focuses on the implementation of the tasks of the first to third stages.

The cross-cultural method in linguodidactics is connected with the use of the obtained information for foreign language teaching. Taking into account the requirements of the competency approach, which currently defines the main educational guidelines, we can pick out such competencies and skills that arise fromthe arsenal of loanwords, such as the following: 1) adequate understanding of the meaning of loanwords, taking into account the specificity of their functioning; 2) knowledge of the peculiarities of the semantics of loanwords as units belonging to different thematic groups; 3) ability to adequately perceive, understand, interpret and construct statements containing borrowed vocabulary, according to the norms and rules of the language being learned; 4) national and historical knowledge (about the functioning of loanwords in the mother tongue and in the foreign language, cultural and historical conditions for the transition of loanwords from the mother tongue to the foreign language and vice versa);

5) the ability to compare national and cultural features of loanwords in different linguistic cultures; 6) the ability to apply the above skills in the creation of texts with different topics [11].

Since the basic unit of any national language system is the word, this explains why linguists and specialists in linguistic pedagogy consider the cross-cultural (including cultural and conceptual) resources of lexical units as elements of the lexical level of national languages. We speak of the ability of a particular lexical unit/group of units to function not only "as a particular element of a particular language" but "as a phenomenon that passes through different cultures and, accordingly, is enriched with new cultural connotations" [12, p. 3].

Among the linguistic units actively studied under the above aspect are the words belonging to the group of *lexical borrowings*. The process of lexical borrowings is an indispensable indicator of the development of national languages and their realization of the central – communicative – function (A.A. Bragina, E.F. Volodarskaya, V.G. Demyanov, A.I. Dyakov, N.G. Komlev, L.P. Krysin, O.P. Sologub, O.G. Shitova, and others). Moreover, "loanwords carry an ethno-cultural component characterizing the peculiarities of people's livelihood and the territory they inhabit" [13, p. 9]. For a foreign language learner, the cultural component of a loanword is of great interest. First, the word may denote a phenomenon for which there is no equivalent in the native culture. Second, the corresponding words from different languages may be equivalent and easily translatable in the conceptual domain but fundamentally different in the nuances of meaning, especially in axiology. The presence of linguocultural resources in loanwords is noted by many researchers (Z.R. Agleyeva, M.A. Kalinina, L.Y. Kasyanova, I.P. Lysakova, V.V. Khimik, V.D. Chernyak). Due to this feature of loanwords, it is reasonable to use them as a linguodidactic tool: to include them in the learning process, to develop the ability to use them in communication, "provided that the principles of appropriate understanding of the loanword and interpretation of its meaning in a specific interaction situation are observed." [11, c. 52].

Materials and methods

This article studies lexical loanwords – *borrowings from Russian and Chinese* – as linguistic markers of cross-cultural interaction between Russian and Chinese linguocultures. This comparative analysis has a justified scientific significance. The Russian and Chinese ethnic groups are comparable according to various criteria: their geopolitical location on the world map, rich history and culture, multiethnicity, and multiconfessionalism. At the same time, there are obvious differences in national customs, traditions, value systems, and languages: Russian and Chinese languages do not resemble each other in structure, writing system, and intonation patterns. Linguistic – explanatory, etymological, associative, and translated – dictionaries of Chinese and Russian languages served as sources for the empirical material [14–26]

The methodological basis of the study has a complex cross-cultural character and includes a number of general scientific (including interdisciplinary and linguistic) methods and techniques: Observation, comparison and contrast, etymological and component analysis, elements of linguocultural, linguoconceptual and discourse analysis, lexical-semantic and contextual analysis, associative linguistic experiment.

Results of the research

The Russian and the Chinese culture have different histories of origin and different ontological statuses: The Russian culture was formed a long time under the influence of paganism and Orthodox Christianity, the Chinese mentality and culture under the influence of Buddhism, Confucianism, and Taoism.

Since the beginning of the 21st century, the interaction between the Russian and Chinese people has noticeably increased, which undoubtedly contributes to the expansion of interlingual contact, including the inclusion in the national languages and the adaptation of borrowed units to national usage (see works by S. Wang, Sh. Wang, Yu Wei, Ch. Dong, S. Li, N.V. Proshchenko, S.L. Savilova, S. Tian, Sh. Zhu). Borrowing has its roots in regional use, then partially spread over Russia and China's whole territory. Today, borrowings are the basis for many active processes in the lexicon and word formation of modern Russian and Chinese languages [27, p. 578]. Chinese and Russian borrowings, passing from the donor language to the recipient language, inform the speakers of both linguocultures about the features of national life in its most diverse manifestations. The most typical form of lexical borrowing is borrowing a term as a result of borrowing a thing, concept, or phenomenon. Thus, Chinese words (юань, шэн, чесуча, цы, фынь, ушу, сямисэн, му, сампан, каолин, кан, женьшень, джонка) appeared in Russian. Likewise, Russian borrowings appeared in Chinese (спутник, баян, бандура, берданка, ботвинья, большевик, меньшевик, домра, фунт, копейка, рубль, платье, капрон, лезгинка, марксизм, ленинизм, червонец, чечетка, самовар, шапка, суп, верста, ведро).

The study of the didactic resources of Russian and Chinese borrowings that became part of the Russian and Chinese languages has a sufficient research base. See, for example: [11, 28–31].

Given the above, we will define the following goals as the most important ones of this article: (1) to summarize the information on the qualitative and quantitative features of the content of Russian borrowings in Chinese and Chinese borrowings in Russian; (2) to study the peculiarities of their perception and interpretation by the speakers of the mentioned languages; (3) to compare the perception of borrowed units by the speakers of Russian and Chinese; (4) to describe the possibilities of using the obtained cross-cultural data in teaching Russian/Chinese as a foreign language.

1. A brief qualitative and quantitative characteristic of Russian borrowings in Chinese and Chinese borrowings in Russian.

Most Russian and Chinese borrowings are indirect borrowings by other languages. This may be due partly to the isolated existence of Chinese civilization and partly to the relatively late exploration by Russians of the Far Eastern territories bordering China. Some borrowings have a limited sphere of influence. Based on the analysis of dictionary data, we have selected 330 Russian borrowings and 100 Chinese borrowings.

Thematically, loanwords are associated with certain spheres of life. Thus, Russian borrowings in Chinese are represented by the following main thematic groups, denoting realia from different spheres of life: (1) natural and geographical (Байкал, омуль, мед, береста, ранетка); (2) scientific and technical (спутник, трактор, комбайн, солидол); (3) economic (комбинат, НЭП, паек, рубль, копейка); (4) socio-political (Петр I, Ломоносов, царь, комсомол, марксизм); (5) everyday (борщ, водка, хлеб, матрешка, сарафан, играть в дурака); (6) cultural-historical (Кириллица, Юрьев-день, балалайка).

Analysis of the lexical material shows that a considerable proportion (≈ 45%) of Russian borrowings in Chinese are Sovietisms, most of which are internationalisms. Thus, such Russian borrowings as большевик, Кремль, ленинизм are recognized by Chinese specialists of Russian philology as the most frequently used by speakers of Chinese [28, p. 203]. This fact shows a deep interest of the representatives of the Chinese linguistic culture – the citizens of the PRC – in the experience of creating a state of a socialist character. Let us also note that the list of popular

modern Russian borrowings includes units of different linguistic and stylistic affiliation: пойдем, как раз, нету, хорошо, плохо, здравствуйте.

The number of lexical borrowings from Chinese that became part of the Russian language is small. A large part of them entered Russian indirectly through other languages, for example, English (*soy, ketchup, typhoon*), French (*satiné*), and Turkic (*čaj*, *čini*) languages. The following words have entered Russian directly from Chinese: байховый, гаолян, гоминдан, даосизм, дацзыбао, женьшень, кан, каолин, кинкан, ли, локва, маоизм, му, тайпин, ушу, фанза, фынь, ханжа, ханшин, ходя, хунвейбины, хунхуз, чесуча, юань.

Chinese borrowings denote everyday objects (сатин, нанка, джонка, макао), Chinese money (юань), Measures of weight and area (ли, лян), cultural facts (фэн-шуй, инь-янь, даосизм, конфуцианство, Пекинская опера, Великая китайская стена, ушу, цигун), public persons and phenomena (богдыхан, бонза, мандарин, хунвэйбин), objects of the surrounding world (женьшень, чай, пекинес, чау-чау, тайфун, соя). Their entry into the Russian language is usually the result of the contact between the two nations in the boarding areas. For example, native Russian speakers in Vladivostok use Chinese borrowings such as чифань (take food), личжи, гуйюань (fruits growing in South China) [28, p. 203]. Some borrowings come from Chinese into Russian from books, for example, гохуа, гоминдан, дацзыбао, мандарин, тайпин, хунвейбин, цы. In the overwhelming majority, Chinese words are unambiguous, and polysemous words are not common: чай, шелк, фарфор, лун. Some Chinese loanwords are still considered exotisms – богдыхан, лан, фанза.

In 2006 (the year of Russia in China) and 2007 (the year of China in Russia), an increase in mutual borrowings in the two languages was observed.

2. The peculiarities of perception and interpretation of Russian borrowings in Chinese and Chinese borrowings in Russian by speakers of these languages.

The implementation of this task led to an experimental cross-cultural study. An association experiment was organized and conducted involving 30 native speakers of Chinese and 30 native speakers of Russian (undergraduate and graduate students of the Faculty of History and Philology of Tomsk State Pedagogical University, 2015–2018). The age of the participants – up to 30 years old – is an important parameter: At this age, the formation of the linguistic personality is completed, and therefore the formed linguistic ability of the experiment participants is reflected in the associations. However, the essential content of linguistic abilities and their formal-combinatory skills remain relatively stable for most people throughout their lives. The experiment was conducted orally with a simultaneous audio recording of responses, which minimized the time between the question and the answer in the interview to 5–7 seconds and allowed us to obtain the informant's response in the form of one or more word associations as quickly as possible. A partial description of the experiment can be found in [31].

The obtained results are presented in the table according to the method of constructing the articles in the associative dictionary: The information about the associations of the respondents of both groups to Russian borrowings is presented in Table 1, to Chinese borrowings in Table 2. The most popular loanwords from Russian and Chinese serve as trigger words (10 units per language) (in the table, this is the leftmost column). The middle and right columns show the respondents' responses to the trigger words – Chinese and Russian speakers, respectively. The number of repeated associations to a given trigger word can be found in the parentheses. The reaction words are included in the dictionary in the form in which the subjects speak them. Non-repeated associations are arranged in alphabetical order.

Table 1

Respondents' reaction to Russian borrowings

Russian trigger words	Reaction words from Chinese speakers	Reaction words from Russian speakers
Хлеб (Bread)	Еда (24), вкусно (21), мука (19), вода (18), молоко (16), черный (12), белый (12), торт (9), сыр (8), кухня (7), бублик (6), земля (6), рис (6), бутерброд (4), пирог (4), пицца (3), продовольствие (3), блюдо (2), быстрого приготовления (2), ветчина, гамбургер, голод, греться, духовка, жесткий, жито, закром, зерно, кетчуп, колбаса, кофе, магазин, мягкий, неглавные (неосновные), печенье, пикник, питания, пища, продукты, пшеницы, рабочий, салат, сахар, соль, тесто, хот-дог, чай	Еда (18), соль (15), пища (14), есть (11), булка (10), батон (8), крошки (7), кушать (6), масло (6), жизнь (5), тесто (5), вода (4), булочка (3), буханка (3), жратва (3), рожь (3), вкусный (2), голова (2), калач (2), свежий (2), урожай (2), ароматный, белый, бизнес, Бог, богатство, борщ, всему голова, выпечка, главное, глава семьи, главный продукт, голод, гостеприимство, дом, домашний, достаток, запах, зерно, злак, каравай, колос, комбайн, мягкий, мякина, мука, насущный, необходимая часть русского стола, нож, поле пшеничное, пшеница, с хрустящей корочкой, кромки, свежеиспеченный, серый, солнце, сухари, сытно, сытость, теплый, труд, утро, хлебороб, ценность, чай, черный
Суп (Soup)	Помидор (8), картошка (7), говядина (6), капуста (6), мясной суп (6), суп из овощей (5), рыбы (4), вода (3), здоровье (3), соль (3), соус (3), кастрюля (2), беженец, борщ, бульон с трепангами, креветками и рыбой, вид блюда, вкусный, горячий, завтрак, закуска, кисло-острый, консервы, майонез, масло, морковь, пить, свекла, семья, соя, суп, суп с яйцом, родные люди, укроп, уксус, черпак, чашка, щи	Горячий (14), вкусный (13), гороховый (12), вкус (11), аромат (10), любимый (8), жидкость (6), борщ (5), чашка (5), еда (3), морковь (3), варка (2), соль (2), бульон, гороховый суп и плов, грибной, есть, жидкий, жир, куриный, кушать, наваристый, обед, пар, первое блюдо с капустой, сметаной
Квас (Kvass)	Напиток (13), сок (12), чай (12), суп (9), вода (7), питье (6), пиво (5), бродить (3), магазин (3), кока-кола (2), молоко (2), морс (2), острый, кислый вкус (2), спрайт (2), бутылка, газированная вода, коктейль, крышка, лимонад, минеральная вода, напитки России, прохладительные, фанта	Кислый (11), жара (8), лето (8), вкусный (7), жажда (6), резкость (6), Русь (6), пиво (5), березовый (3), питье (3), сок (3), холодный (3), кружка (2), брожение, деревья, домашний, хлебный, дрожжи, закваска, коричневый, крошки, кружка, напиток, окрошка, освежает, очень редко встречается на березовом соке, прелесть, пить, сладкий, темный, утомляет, сахар, хмель
Водка (Vodka)	Русский национальный напиток (8), вино (6), «Пять озер» (5), мороз и солнце (4), спирт (3), пьяница (2), хмель (2), банкет, закваска, коктейль, коньяк, кофе, ресторан, рюмка, сок, трактир, чай, чистый, шампанское	Дорогая (6), русская водка (6), алкоголь (4), пьянство (4), пьяный (4), беда (3), плохо (3), напиток (2), Новый год (2), бутылка, веселиться, вино, Есенин, гадость, горько, градусы, графин, гулянка, жрать, застолье, крепкая, круговерть, напиток на русском столе, огурец, опьянение, праздник, привоз, событие, спиртное, стол, стопка, танцы, тост, частый способ согреться
Рубль (Rouble)	Копейка (26), русская денежная единица (22), деньги (18), валюта (3), банк, банкнот, бумага, доллар, евровалюта, золото, книгопечатание, ломбард, милостыня, фунт	Русская единица деньги (25), монета (20), копейка (19), доллар (3), деревянный, железная монета, круг, мало покупки, мелочь, орел, почти не ценная, решка, рупь, сталь, топор

End ot Table 1

Russian trigger words	Reaction words from Chinese speakers	Reaction words from Russian speakers
Колхоз (Kolkhoz)	Государственный дом (9), земля (7), крестьяне (7), производственная бригада Китая (6), СССР (5), социализм (3), деревня (2), коллектив, комбайн, лошадь, общий, сельское хозяйство, трактор	Россия (18), деревня (12), прошлое (9), СССР (8), комсомол (5), коллектив (4), комбайн (3), «Красный путь» (3), коммунизм (2), совхоз (2), животные, занятия скотоводством и земледелием, земледелец, имени Ленина, коллективизация, коровы, красный, навоз, народ, веселая работа, община, осел, поля, председатель, сарай, свиньи, село, совнархоз, социализм, стога, тракторы, упадок, урожай, ферма
Пушкин (Pushkin)	Поэт (26), писатель (24), великий (20), стихи (18), Россия (17), «Евгений Онегин» (15), дуэль (15), любовь (11), «Я вас любил» (8), известный (5), стихотворение (3), красавица (2), смелый (2), библиотека, музей, Золотой век, Институт имени А. С. Пушкина, романтизм, русский язык, улица	Великий (27), поэт (24), писатель (24), все считают его гением! (21), есть чем похвалиться (18), «Евгений Онегин» (17), стихи (16), 19 век (14), знаменитый (10), уникальный человек (9), стихотворения (6), кудри (3), школа (3), солнце русской поэзии (2), араб, город, дерево-анчар, «Капитанская дочка», няня, портрет, Россия, во всем мире
Космонафт (Cosmonaut – Astronaut)	Космос (13), космический корабль (9), Гагарин (7), Ян Ливэй (5), спутник (4), небо (3), КНР (2), Россия (2), США (2), космолет, сверхдержава, эфир	Гагарин (18), первый (18), земля (15), космос (15), звезды (13), полет (10), луна (8), небо (5), планеты (2), выносливость, галантный, день космонавтики, исследователь, костюм, невесомость, ракета, решительность, скафандр, Стрелка, сфера
Православие (Orthodoxy)	Главная религия России (10), собор (9), христианство (8), церковь (7), духовная опора человека (6), русские люди (3), католицизм (2), буддизм, верующий, дать людям утешение, ислам	Церковь (8), вера (7), священник (7), религия (6), духовность (5), золотые купола (5), христианская вера (5), бог (4), небо (4), ветвь христианства (3), Пасха (3), самодержавие (3), народность (2), вероисповедание, ветхо, в России, доброта, икона, крест, ладан, масленица, нравственность, пост, радостное, рождество, свет, светлое, смирения, спокойствие, хорошо, 998 год, юродивые
Матрёшка (Matryoshka)	Россия (16), игрушка (14), сувенир (12), березка (11), кукла (9), деревянная (8), украшение (5), художественное изделие (4), память (3), подарок (2), ребенок, вырезной рисунок	Символ (11), игрушка (9), дерево (8), кукла (8), рисунок (6), весело (5), русская (4), народная (3), одно в одну (3), девочка (2), русский менталитет (2), яркое (2), бабушка, выставка, детство, дура, замечательно, иностранцы, краски, красная, круглая, ментальность, Родина, румяные, Сувенир России, который не спутаешь с другими в мире, Хохлома

Table 2

Respondents' reaction to Chinese borrowings

Chinese trigger words	Reaction words from Chinese speakers	Reaction words from Russian speakers
Инь-янь (Yin-yang)	Женское-мужское (20), суеверие (15), баланс (12), календарь (11), противоположность (10), жить-умереть (9), тай-ци (8), положительное-отрицательное (7), черное-белое (7), фэн-шуй, китайское философское учение (6), пять стихий (основных элементов природы по древнему китайскому учению – металл, дерево, вода, огонь, земля) (6), восемь триграмм (комплекс символистических знаков для гадания в древнем Китае) (5), даосизм, астрология, дао си (2), антитеза, астрология, ворожея, двойственный характер, китайская медицина	Мужчина-женщина (15), два начала (6), темно-светло (5), добро-зло (2), фэн-шуй (2), черное-белое (2), гадания, гармония, истина, слабое-сильное, противоположность, популярная эмблема в виде круга
Женьшень (Ginseng)	Лекарство (18), полезно для здоровья (16), дорого (13), долголетие (10), растение (8), северо-восток Китая (4), панты (3), укрепляющее средство (3), волшебный, китайская медицина, косметика, можно лечить человека, можно положить в водку, на горе, народная сказка, панты, многолетнее травянистое растение, хорошее лекарственное сырье, чудесный	Трава (20), растение (17), лекарство (10), цветок (8), лечение (7), здоровье (6), долголетие (4), польза (3), Китай (2), корень лечебного и полезного растения (2), Дальний восток, дерево, земля, корень жизни, куст, лекарственное средство, лес, мелкое тонкое древо, настойка, отвар
Кунг-фу (ушу) (Kung-fu (wushu))	Укреплять здоровье (22), вид спорта (14), долголетие (10), Джекки Чан (9), китайская национальная гимнастика (8), сила (7), гордость (5), борьба (5), монастырь шаолин (в пров. Хэнань) (5), монахи (4), фильм «Хо Юаньцзя» (3), цигун (2), акробатика, борьба и положение, герой, крепкий, оружия, оздоровительное мероприятие, самозащита, храбрый	Борьба (15), Джекки Чан (6), единоборство (5), боевое искусство (4), бой (3), вид спорта (2), джиу (дзюдо) (2), каратэ (2), особое искусство (2), ловкость, монах, Шао-линь, шаолиньский
(Конфуцианство) Confucianism	Конфуций (22), учение (13), широкое и глубокое (9), заповедь (6), Мэнцзы (5), Четырехкнижие («рассуждение и беседы», «великое учение», «соблюдение середины», «Мэнцзы») (4), конфуцианская школа (3), строгая иерархия (3), Пятикнижие («книга песен», «книга перемен», «книга ритуала», «книга истории», «весна и осень») (2), философское учение о нормах поведения (2), великий, воспитание, город Цюйфу, заложено в 6 в. до н.э., идея, история, культура, мысль, наставление, человеколюбие и гуманность («жэнь»), просвещение, ритуал («ли»), скромность, учитель, этико-политическое учение	Конфуций (15), философия (14), Китай (10), религия (6), учение (6), направление (4), буддизм (2), вера (2), братство, гармония, мировоззрение и жизнь, вероисповедание, Восток, движение, древность, заповеди, история, объединение, преклонение, справедливость, течение

Continuation of Table 2

Chinese trigger words	Reaction words from Chinese speakers	Reaction words from Russian speakers
Пекинская опера (Peking opera)	Традиционная китайская опера (15), национальное наследие (14), китайский музыкальный театр (12), китайская культура (9), Мэй Ланьфан (артист) (9), разноцветное лицо (8), китайское искусство (7), образцы грима (7), дуэт песен и танцев (6), мелодия (5), местная опера (5), музыкальная драма (3), акробатика, длинный театральный костюм, куньшаньская опера, маски, на сцене, отличительный, под музыку, скетч с краткими диалогами, пять постоянных амплуа в пекинской опере, инструменты, сценическая подходка, новые пекинские оперы на исторические темы, репертуар, шаньдунская опера, шанхайская опера, шаосинская опера, хэбэйская опера	Театр (8), музыка (6), опера (5), песни (4), Китай (3), китайские костюмы (2), танцы (2), веера, в Пекине, выступление, гимнастика, грим, искусство, краски, красиво, культура, макияж, маски, наша не хуже, носки, опера с определенной национальной культурой Китая, петь, слова не понятно, стагнация, утка
Юань (Yuan)	Китайская денежная единица (25), монета (10), рубль (6), доллар (3), евро (3), банкнота (2), английский фунт, банк, валюта, золото, серебро, счетные слова	Деньги (10), монеты (8), солнце (2), Китай, мелкий
Фэншуй (Feng shui)	Суеверие (15), ветер и вода (12), выбор места для жилища или кладбища (8), инь-янь (5), наставник (5), учение 5), гадание (4), могила (3), дом (3), дао (2), даосизм (2), пеленг (2), восемь триграмм, ворожить, гора-река, доля, дракон, иметь широкое распространение в южном районе Китая, миф, примирение и размолвка, природа, пять элементов, сторона, судьба, тигр, участь, удача и беда, черепаха, фальшивый, феникс, хорошо-плохо	Ветер-вода (7), гармония (7), книги (5), Китай (3), интерьер (3), учение об устройстве дома (2), философия бытия человека (2), благосостояние, голова за дверью, деньги, здоровье, инь-янь, квартира, мебель, модное увлечение современных людей, надо жить правильно, нож в форточке, образ жизни, окружающая обстановка, расположение предмета, рассмотрение, света, стороны, суеверие, счастье, традиция
Чай (Tea)	Зеленый (13), цветочный (12), Лунцзин (9), черный (9), Билочунь (8), Китай-родина чая (5), чайная церемония (5), здоровье (4), самовар (4), маофэн (3), польза (3), гунфуча (2), напиток Китая (2), пуэр (2), хуаншань (2), цихун (2), чайник (2), варить, горячая вода, дорогой, кофейный чай, крестьянин-чаевод, кусты чая, посуда, пищеварение, повышать иммунитет, растение, улунский чай, утолять жажду, хризантема, чаепитие, чайная, чайный стакан, Шень нун, юг Китая	Зеленый (16), напиток (9), черный (7), Китай (5), крепкий (5), ароматный (4), чаепитие (4), церемония (3), варенье (2), самовар (2), сахар (2), без сахара, беседа, бублики, вкусный, вода, в пакетиках, вприкуску, горячий, жидкость, заварка, здоровье, каркадэ, конфеты, коричневый, кухня, лепесток, лимон, листья, настоящий китайский в России редко встретишь, отдых, пироги, помойка, разговор, разнообразие, с бергамотом, с жасминным, с медом, с молоком, тепло, травяной, третье блюдо, Улунский, фито-чай, целебный
Цигун (Qigong)	Ушу (15), здоровье (12), долголетие (10), кунг-фу (8), лечебное и оздоровительное мероприятие (5), вид спорта (3), дыхание (2), живительные силы духа, китайская медицина, монах, пожилой, силы, способ укрепления, тайцзицюань, цигунотерапия, чудотворная сила	Сила (2), волшебный, гимнастика, лечебная процедура китайской медицины, самурай, спорт, правильное дыхание, чудо, энергия

End ot Table 2

Chinese trigger words	Reaction words from Chinese speakers	Reaction words from Russian speakers
Маоизм (Maoism)	Мао Цзедун (14), учение (12), лидер Китая (11), великий (9), Дэн Сяопинь (8), Ленин (7), Маркс (7), Коммунистическая партия Китая (6), создание нового Китая (6), коммунизм (4), культурная революция (3), политика (3), воспитание (2), великий (2), великий поход, история Китая, Красная армия, политический проект, плохо, престиж, социализм	Учение Мао (11), направление (5), Китай (3), коммунизм (2), Мао Цзедун (2), последователи (2), лидер, государственная идеология, как ленинизм, сталинизм, фашизм, франкизм, теория, философия

3. A comparative analysis of the perception of Russian and Chinese borrowings by speakers of Russian and Chinese.

Based on the cross-cultural comparison of the experimental data, some conclusions can be drawn.

The analyzed Russian borrowings contain lexemes expressing significant fragments of both worldviews: Russian national cuisine (хлеб, суп, квас, водка), political and economic life (колхоз, рубль), outstanding personalities and cultural figures (Пушкин), national achievements and identity markers (космонавт, матрешка, православие). Each of these fragments contains important information about the identity of the Russian people, its history, and the richness of the national culture expressed in traditions, customs, behavior, and mentality.

As an example, let us consider the variants of the respondents' answers regarding the Russian loanword хлеб (bread).

A characteristic feature of any national culture is its national cuisine. A special place in the theme group National Russian Cuisine is occupied by the word хлеб (bread). In Russian, the word хлеб has many meanings: 1. A food baked from flour. 2. (Plural хлебы) a product in the form of a large pastry. 3. The seeds of grain that are ground into flour. 4. (Plural хлеба) grain. 5. (Plural хлеба) the figurative meaning of food. 6. Livelihood, income [21, p. 862–863]. In Chinese, each meaning of this word corresponds to a special Chinese word: the first and second meanings of the Russian word хлеб correspond to Chinese – mian bao, but others are as follows: 3 – liang shi, 4 – zhuang jia, 5 – kou liang, 6 – sheng huo fang shi. Thus, the semantic scope of the Russian word хлеб is much larger than that of its Chinese counterpart. It should be noted that the word хлеб has a symbolic meaning in the Russian language and culture, and this lexical unit is correspondingly rich in cultural connotations. Bread occupies an important place in the life of the Russian people. It is a daily meal symbolizing friendship, welcome, recognition, and reward. In the Russian language, there are many fixed expressions and phrases containing this word: хлеб-соль водить (it means to be friends with someone, to maintain friendship), хлебосольный дом (hospitable house), хлебосольный хозяин (the greatest praise for a person who is a wonderful host), хлеб – всему голова (this is the folk wisdom: respect for bread as a result of hard peasant work, which supports national customs and expands the meaning of the word), хлеб насущный (something necessary for subsistence, existence), свой хлеб есть (earning one's own living (colloquial)). The answers of the Russian respondents convincingly proved the wide semantic range of this borrowing.

In the linguistic consciousness of Chinese students, the associative links that arise in understanding the Russian borrowing хлеб exist in a considerably narrowed form. This is most

evident in the most popular responses: еда (food) and, curiously, вкусно (delicious). Incidentally, if the experiment had been conducted in China, these words would not be at the top of the associations: Bread sold in China, unlike Russian bread, is not so tasty and not in great demand (Chinese people living in Russia, like Russian bread very much). Among reaction words, there are many referring to flour (торт, бублик, пирог, пища, гамбургер, печенье, тесто, хот-дог) or bread-based sandwich products (ветчина, кетчуп, колбаса, салат). There are also generic names for the product (продовольствие, блюдо, питание, пища, продукты). All this shows that the word хлеб has been adopted into the Chinese language, but for the Chinese, including those who live in Russia, bread is only one of the types of food, which in their minds are associated only with the names of various products. The axiological value component of the meaning of the word хлеб in the secondary worldview loses its relevance. In comparison with the corresponding fragment of the original worldview: bread for Russians is a symbol of warmth, home, food, and goodness, and it has great value.

As for the peculiarity of cross-cultural analysis of Chinese borrowings, we note that there is an overlap between Russian and Chinese cultures in the interpretation of some borrowings (e.g., the words чай and жень-шень). The results of the interpretation of the Chinese word жень-шень are as follows: Russians interpret it as medicine (10), treatment (7), health (6), useful (3), longevity (4), Chinese interpret it as medicine (18), remedy, for health (16), useful (16), longevity (10). The word is popular and well-known in Russia, although the reactions show that many Russians have never seen this root. Reactions to the word чай (tea) are more varied among Russian students than among Chinese. Besides the usual ones (green (16/13), black (7/9), tea ceremony (3/5), herbal/flower tea (1/12), samovar (2/4), water (1/1)), Russian responses showed national and cultural specificities (tea with sugar, tea without sugar, tea with bun, tea with lemon, tea with milk, tea with honey, tea with sweets, tea with cake): пить чай вприкуску с чем-то (drinking tea with a little sugar or something sweet). The Chinese drink tea without any additives such as sugar or milk. The answer words conversation and relaxation indicate that tea drinking is accompanied by cordial conversation, exchange of opinions, and chatting. Although чай (tea) is not a native word of the Russian language, many Russians are still convinced that it is native. The Chinese have shown that the homeland of tea is China: in their answers, there are many names of different kinds of tea, unknown to the speakers of Russian language culture: *maofeng (3), gongfu cha (2), puer (2), Huangshan (2), keemun (2).*

Another example. Фэншуй (Feng Shui) is a Chinese borrowing that became unusually popular in Russia at the turn of the 20th and 21st centuries. The list of reactions proves this – there are about 30 of them. The discrepancy between the fragments of Russian and Chinese linguistic images in terms of ideas about this phenomenon is obvious. Russians associate Фэншуй (Feng Shui) with geomancy (the influence of cardinal directions and local terrain on our destiny), while Chinese responses showed us a multidimensional interpretation based on such variants of understanding: 1) Feng Shui is based on natural elements: Earth, Metal, Water, Wood, Fire (five elements); 2) Feng Shui refers to the world of the dead: the cemetery (8 answers), the tomb (3 answers). According to the ancient belief of the Chinese, a person should live in a harmonious place and rest properly after death. It is believed that this will positively affect the living family members. 3) Feng Shui is connected with mythology – the four sacred animals: Dragon, Tiger, Phoenix, and Tortoise. They try to place the house (represented by the Phoenix) in the center to have a pleasant view from the front of the house. The neighboring houses or small architectural shapes on the property symbolize Tiger, Tortoise, or Dragon; 4) Feng Shui is associated with the wisdom of the ancestors, which is reflected in answers such as Teach (5), Tao (2), and Taoism (2). Both branches of Chinese philosophy, Confucianism and Taoism, have the same root, the Yi

Ching, which contains basic information about the Eight Trigrams used in Feng Shui (divination (4), direction (2), fortune telling, elements (wind and water, mountain and river, nature)) and in many other ancient Chinese techniques. 5) Feng Shui is related to the method of the Eight Aspects of Life: Luck, Career, Wealth, Destiny, Fate, Fortuna, Trouble, and Knowledge.

Even a superficial cross-cultural analysis shows that loanwords in Russian and Chinese language and culture carry elements of national identity, deepen the thesaurus of language personalities, help improve their competence in cognitive and communicative aspects, expand the boundaries of linguistic and conceptual worldview – both native and secondary, which in general mutually enriches the contacting linguocultures.

4. The possibility of applying the obtained cross-cultural data in teaching Russian/Chinese as a foreign language.

The Russian loanwords used in Chinese and vice versa have already become part of the linguodidactic base in Russia and China. The linguodidactic potential of Russian and Chinese borrowings can be used in the lexicology of national languages, cultural studies, country studies, linguocountry studies, translation and translation studies, and linguocultural studies. In addition, the illustrative materials we have shown can be used in elective courses for international students, such as Linguocountry Studies: National Cuisine, Customs, Beliefs and Culture, Cultural Symbolic Meanings in the National Language; National Linguoculture: Universal and Differential Features. An example of a methodological outline for teaching Russian as a foreign language, which includes the Russian borrowings of the words хлеб (bread) and квас (kvass), can be found in [11].

In general, we believe that the effectiveness of using loanwords in the process of foreign language learning is achieved through the use of appropriate teaching methods and techniques that correspond to the cognitive abilities and level of the foreign language being learned. Therefore, further study of this topic is related to the perspectives of the problem mentioned in the article.

Conclusion

It is well known that borrowings are foreign elements transferred from one language to another during cross-cultural interaction. Therefore, studying the process of lexical borrowing from the point of view of cross-cultural analysis allows us to penetrate deeper into the linguistic consciousness of native speakers to get in touch with the features of national culture.

In modern linguodidactics, one of the most important tasks is developing a secondary linguistic personality capable of participating in cross-cultural communication. In order to achieve successful results in this task, it is necessary to include elements of the foreign language and fragments of national values in the fund of general knowledge of foreign language learners. From these points of view, teaching a foreign language should be inseparable from immersion in the culture of the people of a given language. From these points of view, teaching a foreign language should be inseparable from immersion in a particular foreign culture. Today, the improvement of the methodological system of linguodidactics is connected with the consistent inclusion of the national and cultural components in a foreign language course. Knowledge and understanding of social, historical, and cultural processes that have taken place and are taking place in a society whose members are representatives of a foreign linguoculture provide international students with the opportunity to delve deeper into a foreign national culture and form axiologically significant fragments of the secondary world view.

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Submitted May 7, 2022

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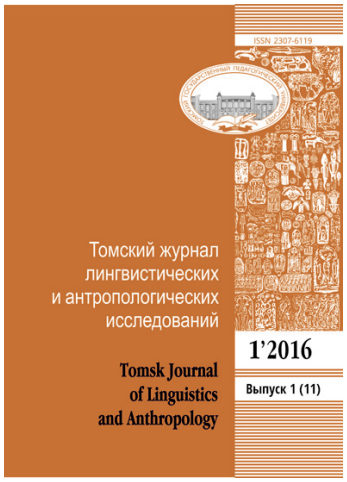

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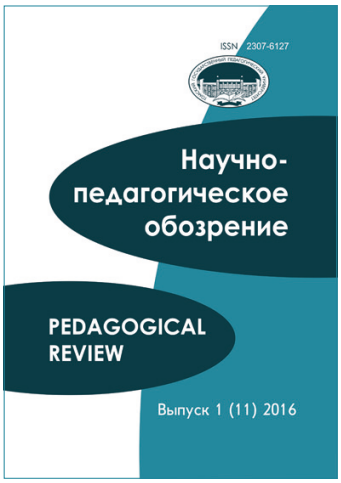

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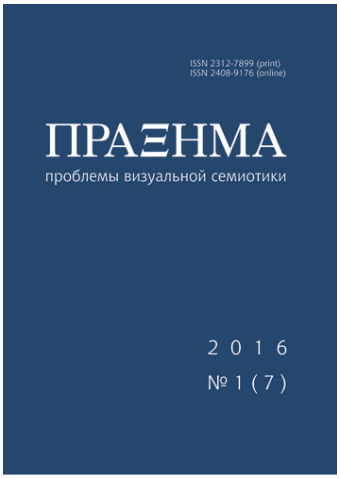

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ISSN 2782-2575

Education & Pedagogy Journal