УДК 378
DOI 10.55355/snv2022113316
Статья поступила в редакцию / Received: 03.05.2022
Статья принята к опубликованию / Accepted: 29.08.2022

TECHNOSPHERE OF THE UNIVERSITY: AN ENVIRONMENT FOR THE TEACHER'S INFORMATION CULTURE DEVELOPMENT

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Abstract. This study is an attempt to analyse the university technosphere capabilities to develop the teacher's information culture. The university technosphere is considered to be the most important condition to develop the university teacher's information culture. Having analyzed the essence and structure of the teacher's information culture, the following hypothesis is put forward: the effectiveness of the university technosphere development has an impact in the development of the teacher's information culture; the effectiveness of the university technosphere development is also reflected in the teacher's readiness to apply the information technologies in practice in the educational process. This hypothesis indicates the purpose of the study: to substantiate the model of the teacher's information culture development in the conditions of the university technosphere creation and functioning. Having substantiated this model theoretically, the authors have built upon the ideas of information and communication, competency-based and cyber-ontological approaches, which are especially relevant in the context of modern cyber socialization. A pedagogical experiment involving 32 teachers from the Immanuel Kant Baltic Federal University (Kaliningrad, Russia) has been organized to test the hypothesis. The experiment has been carried out in three stages: at the first ascertaining stage the teachers' attitude to the development of their information culture has been diagnosed. The adoption of the teacher's information culture development model, which has no analogues in modern pedagogy of higher education (implemented on the basis of the self-developed special course, which is held as a series of training seminars) has been carried out at the second formative stage. The re-diagnostics of the developed components of the teacher's information culture has been carried out at the third control stage. The dynamics has been observed in all information culture components. The most significant changes have occurred in the indicators of the information culture operational component development (from 5,8 units to 9,1 units), which has indicated the effectiveness of the developed model. Hence, it can be used in the organization of work how to develop the university teacher's information culture. The novelty of the study is related to the introduction of the developed model into the university educational space, which develops the teacher's psychological readiness to master the information products and professional competence in the implementation of the innovative information technologies.

Keywords: cyber-ontological approach; information culture; components of information culture of university teachers; model of information culture development of university teachers; techno-sphere; university educational space.

ТЕХНОСФЕРА ВУЗА: СРЕДА РАЗВИТИЯ ИНФОРМАЦИОННОЙ КУЛЬТУРЫ ПЕДАГОГОВ

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Аннотация. В статье представлены результаты исследовательской работы по развитию информационной культуры педагогов как важной составляющей профессиональной культуры. Показано, что техносфера вуза является важнейшим условием для развития информационной культуры преподавателя университета. На основе анализа сущности и структуры информационной культуры преподавателя была выдвинута гипотеза о том, что эффективность развития техносферы образовательного учреждения будет влиять на развитие информационной культуры педагогов и отразится на их готовности к практическому применению информационных технологий в педагогическом процессе. Данная гипотеза обозначила цель исследования: обоснование модели развития информационной культуры у преподавателей в условиях создания и функционирования техносферы вуза. При теоретическом обосновании данной модели авторы опирались на идеи информационно-коммуникационного, компетентностного и киберонтологического подходов, особо актуальных в условиях современной киберсоциализации. Для проверки гипотезы был организован педагогический эксперимент, в котором участвовали 32 преподавателя Балтийского федерального университета (Калининград, Россия). Эксперимент проводился в три этапа: на первом констатирующем этапе была проведена диагностика отношения преподавателей к сформированности своей информационной культуры; на втором формирующем этапе была проведена апробация нашей модели развития информационной культуры педагога, не имеющая аналогов в современной педагогике высшей школы (реализована на базе собственного спецкурса, который проходил как серия обучающих семинаров); на третьем контрольном этапе провели повторную диагностику сформированности компонентов информационной культуры педагогов. Динамика наблюдалась по всем компонентам информационной культуры. Наиболее значительные изменения после внедрения предложенной модели в образовательное пространство вуза произошли по показателям сформированности операционального компонента информационной культуры (с 5,8 ед. до 9,1 ед.). Это свидетельствует об эффективности разработанной моде-

ли. Ее можно использовать при организации работы по развитию информационной культуры преподавателя вуза. Новизна исследования связана с внедрением разработанной модели в образовательное пространство вуза, которая формирует у преподавателей психологическую готовность к овладению информационными продуктами и профессиональную компетентность в реализации инновационных информационных технологий.

Ключевые слова: киберонтологический подход; информационная культура; компоненты информационной культуры преподавателей вузов; модель развития информационной культуры преподавателей вузов; техносфера; образовательное пространство вуза.

Introduction

The successful professional activity in the context of constantly changing requirements for its quality is largely determined by the developed level of the information culture. In addition, the non-professional activities, which are supported by the information knowledge and skills, contribute to social security and personal confidence in the information society [1; 2]. Nowadays, the problem of the new information culture and its development is being actively studied all over the world [3; 4]. In a wide socio-cultural context, such phenomena as information, information products, information environment, information society are considered. The information culture is scrutinized as a basic person's characteristic in the modern social situation [5]. Such concepts as the information and communication technologies, the information competencies and the information and educational resources are studied in the applied aspect [6]. The term «technosphere» occurs when describing the information achievements of a modern society, with a high level of technology development and methods of transforming the surrounding reality [7, p. 15–20]. The term «technosphere» is most often used as a condition or a factor that determines the development of the society [8]. Consequently, the technospheric society development is a modern norm, and the use of the information and the communication technologies in the educational process is becoming a priority in the education system development [9–11]. In a number of studies, «technosphere» is an indicator of the modern information educational environment [12; 13]. Considering the technosphere as one of the conditions to develop the teacher's information culture, the authors are inclined to believe that the presence and the high-quality functioning of the technosphere infrastructure in a higher educational institution allow solving the following tasks:

– to implement the training of prospective university specialists in the context of modern requirements from the state, society and labour market demands (access to world databases; work in a highly professional environment that is attractive for leading the scientific and the pedagogical personnel; immersion of students in the information and the educational environment; new models of the information and educational activities; reformat the information and the educational activities) [14].

– to improve the university material and technical base in accordance with the modern level of equipment and technology development (optimization of resource allocation; information and resource base expansion).

– to develop technological processes and technologies of educational activities (permanent interaction between a teacher and a student; administration-faculty; transfer a part of the training to a virtual environment; increasing the faculty work effectiveness). It is important to understand that the technosphere design and development helps resolve the contradiction between the traditional education systems and the growing experience of the information society [15].

Having summarized the above, we have framed the problem of our research: the possibility of the university technosphere as an organizational and educational space to develop the teacher's information culture.

The aim of our study is to substantiate the model of the teacher's information culture development in the context of the university technosphere functioning as an organizational and educational space.

The study begins with a brief description of materials and methods.

Materials and methods

In a theoretical substantiation of the model while developing the teacher's information culture, we have relied on the ideas of the cyber-ontological approach [16, p. 159–162; 17, p. 29–31], taking into account the new university teacher's needs and abilities in the context of using the information and communication, computer and Internet technologies [16].

The modern society idea of cyber socialization, which reflects the acquisition of social interaction skills in cyberspace [17, p. 29–31], is laid down as a key idea of modelling the process to develop a teacher's information culture in a university environment [17, p. 29–31]. Hence, there is a need to increase the university teacher's readiness for successful mobile professional activity in a dynamically changing socio-cultural environment, in which the information culture is an indicator of the developed readiness [18].

The modelling method in pedagogical science is integrative, since it allows combining an empirical and theoretical research in the form of a model that adequately represents the studied aspects of an object or process.

The central object of the study is to determine the model capabilities to develop the teacher's information culture when introduced into the university educational process.

The teacher's information culture developed model requires a consideration of the technosphere components, since these components together characterize the university organizational and educational space. The pedagogical, psychological, educational and sociological components are identified in our study (shown in fig. 1). The pedagogical component includes the knowledge and application of the pedagogical technologies that allow for the successful professional interaction «teacher – student»; the psychological component is focused on the awareness of the need to master the information culture, the enrichment of the teacher's personality as a result of information culture values awareness; the educational component is considered as a set of information and pedagogical tools that realize the goals, content and methods to develop the information culture; the sociological component determines the teacher's understanding how the information culture influences the success of being in the social space, the knowledge transformation into the effective practical use.

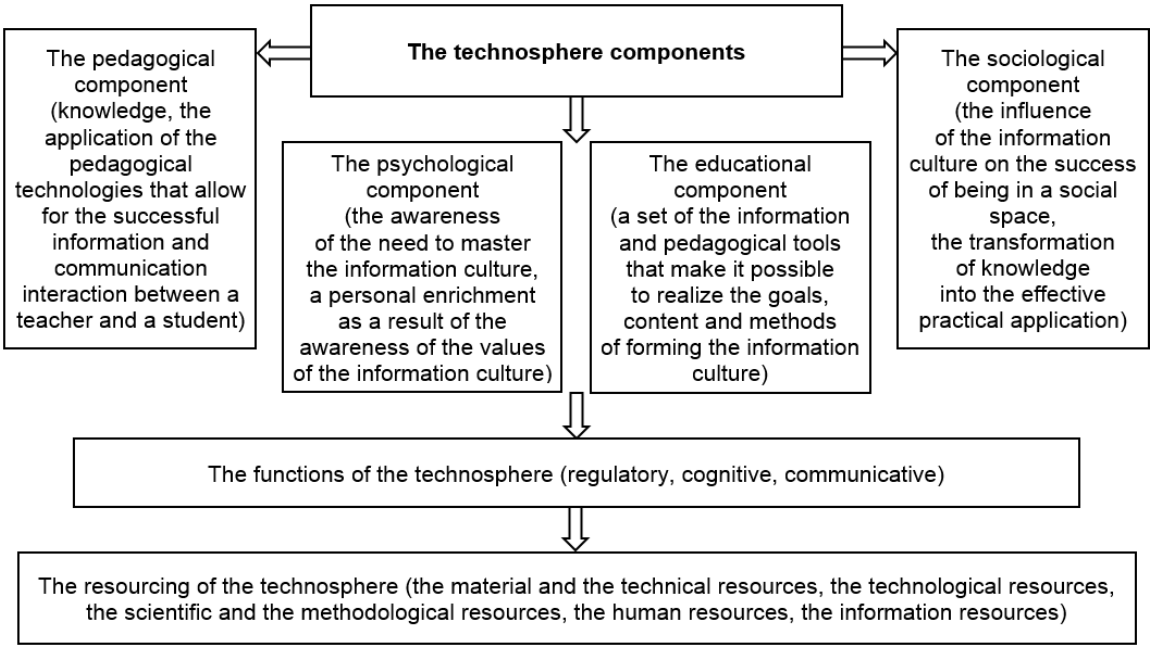

Figure 1 – The technosphere components

The authors believe that the effectiveness of the teacher's information culture developed components is determined through the functional purpose of the university technosphere. In the proposed model, we have outlined the importance of the technosphere regulatory, cognitive and communicative functions, since they are of the greatest relevance in the context of modern society cyber socialization.

The university technosphere regulatory function ensures flexibility and stability of the teacher's behaviour in the cyberspace; the cognitive function determines the teacher's ability to accumulate the necessary knowledge, to master the latest information and communication teaching aids in the information technology field; the communicative function assumes the development of moral traits and qualities that allow communicating in the cyberspace.

We have not singled out this function as a separate one, since we have proceeded from the understanding of the resourcing as a condition for the qualitative university technosphere functioning.

Results

At the stage of the formative experiment, we have developed a model to develop the teacher's information culture in the university technosphere conditions as an organizational and educational space.

Being one of the components of the general and professional university teacher's culture, the information culture can be considered as a person's complex ability who is able to master, assimilate, process information using the information technologies and practically apply these skills [19].

This interpretation of the information culture allowed us to single out the following components in its structure: cognitive, operational and reflexive-axiological (shown in fig. 2):

– the cognitive component includes the generalized ideas about modern knowledge in the field of the information technology;

– the operational component presupposes a system of specific practical skills and abilities to obtain, store, transfer and process information in the multilateral university teacher's activities;

– the reflexive-axiological component determines a creative direction and originality of the teacher's personality, the need for creative self-realization, the individuality manifestation, self-sufficiency and independence of judgment.

Investigating the problem of how the teacher information culture develops in the context of the university technosphere, we have identified the following indexes that indicate the level of this definition formation: the state of the teacher's information self-awareness; information technology skills development; creative activity and independence; emotional attitude to the information activities; success and effectiveness of information and pedagogical activities. These indexes are used to diagnose the development of the teacher information culture at the stage of introducing the developed model into the university educational space.

The developed model both systematises methodological approaches and principles to develop the university teacher information culture and determines the conditions and stages how to achieve the goal (shown in fig. 3).

The integrity of the developed model is ensured by a set of methodological approaches. Among the methodological approaches the leading one is a cyber-ontological approach. Developing this model, the ideas of competence and information and communication approaches are also used. The system of the following principles is the basis of the model to develop the information culture:

– the principle of focusing on the development of sustainable information competencies as the information culture basis;

– the principle of interactive interaction between teachers, the involvement in information and educational activities;

– step-by-step and variable principles of special training (from information knowledge and skills to information skills);

– the integration principle of information, design and reflective activities based on pedagogical experience.

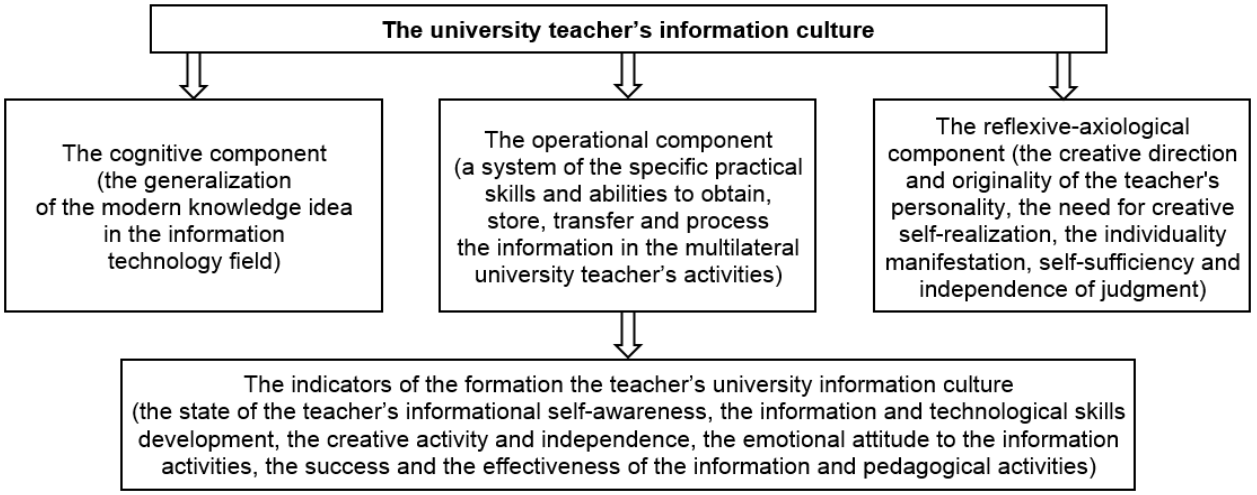

Figure 2 – The university teacher's information culture

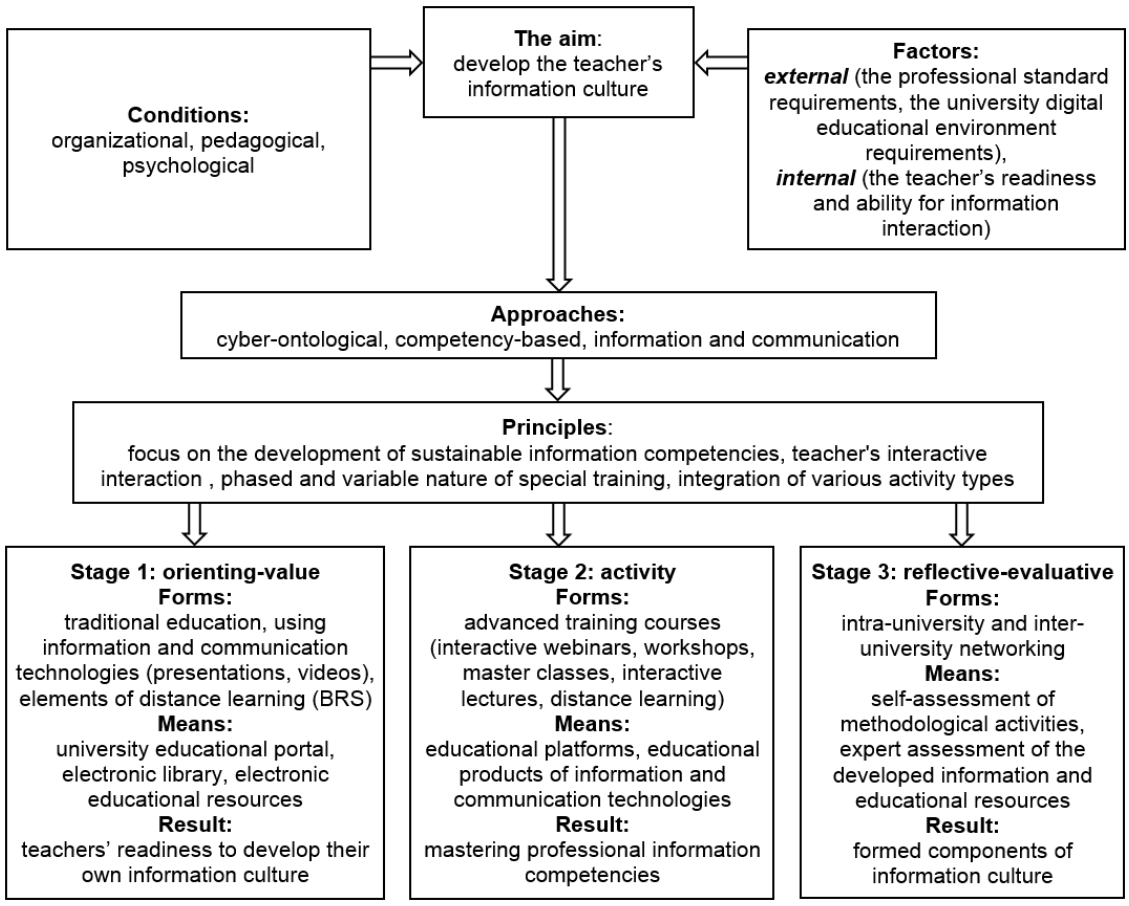

Figure 3 – The development of teacher's information culture

Having analyzed psychological and pedagogical literature, we have identified three groups of conditions that contribute to develop the teacher's information culture:

– organizational conditions include: both the acceleration of training, its compactness, flexibility and openness; a special organization of an information-significant environment (technosphere), which is focused on the integration of the information competence and professional activity;

– pedagogical conditions include: cooperation with the colleagues based on the information technology; the teacher educational process supported by a tutor; stimulating the teacher to receive a personally significant information and educational product;

– psychological conditions include: personal orientation of the teacher's learning process, taking into account an individual emotional orientation, creating a comfortable environment in the classroom, final results reflection.

In addition to the above-indicated conditions, it is also necessary to determine the factors that contribute to the development of the teacher's information culture. In our study, we have highlighted the external and internal factors. The external factors of the teacher's training include such social and professional requirements as: regu-

latory requirements of the professional standard and the requirements of the real university digital educational environment. The internal factors are subjective, which is due to the fact that the teacher's readiness and ability to interact with students and colleagues in the digital educational environment is determined by the teacher's personal properties and qualities. The development of information culture is a process, which is provided by external and internal factors.

The development of the teacher's information culture involves a certain sequence, which is comprised of three stages. The following stages are distinguished in our model: the orienting-value, activity-oriented and reflective-evaluative stages.

During the orienting-value stage, the respondents are immersed in the university information and educational environment. It (the university information and educational environment) is comprised of an educational portal, an electronic library, a learning management system (LMS system), an educational documentation in electronic format and the use of distance learning elements. The teacher's willingness to develop an information culture as an indicator of the mobile professional activity is the result of passing this stage.

The activity-oriented stage is aimed at developing the teacher's information culture. The following technologies are introduced as the main ones to organize the activities (information and communication technologies, technologies of social relations) and to develop professional competencies, which meet the requirements to develop the technological education. At this stage, new software appears, educational materials are transferred from paper to electronic, teachers are trained in the basics of information technology and their qualifications are improved in this area.

The developed model contains such organizational and pedagogical forms of work with teachers to develop the teacher's information culture in the university technosphere conditions as:

– scientific seminars (to form a pedagogical thesaurus in the field of modern society cyber socialization);

– practical classes on the topics «The information picture of the world», «The information security», «The information systems», «The information technology» and the consultations on the topic «The interactive whiteboard and document camera in the classroom at high school», which involves the execution of tasks to manage the demonstration of the visual materials, return to any stage of the lesson, handwriting recognition, recording and saving the happening thing.

The most productive ones are workshops how to develop and implement various information products («The automation of the editing and formatting text», «Modelling in spreadsheets», «Making computer presentations», «Creating a video lecture»). The active use of educational online platforms at Immanuel Kant Baltic Federal University also contributes to the development of the teacher's information culture.

Having mastered a set of competencies how to organize the educational process in accordance with the modern information requirements, the teachers are considered to have passed this stage successfully. We have noted that the level of the operational component has increased.

At the reflexive-evaluative stage the teacher's information culture level is determined through the self-assessment and expert assessment of his or her educational activities. A significant issue in the development of the information culture is a networking with foreign colleagues who have acted as experts in the developed information and educational resources.

The authors have noted that there has been a change in the forms and methods of organizing classes in educational process on the basis of new information technologies introduction. These changes have entailed a strengthening of the practice-oriented training nature, a design of students' individual learning curves, a use of integrative interdisciplinary connections, a change in the content of industrial practice, development of students' cognitive independence and their creative activity. The delivery mechanisms of knowledge-information from the teacher to the students have changed: self-education, distance forms and the network learning. All of the above changes are those changes, which allow students to translate their knowledge, skills and abilities into their professional experience.

The above-mentioned innovations have led to the appearance of a new task for the teacher: the management of students' educational and cognitive activity through pedagogical information and communication technologies, which has led to the need to develop the teacher's information culture as a necessary condition for a high-quality professional training in the university educational space.

At the ascertaining stage of the experimental study, a survey has been conducted among the university teachers in order to clarify their attitude to the need to increase the level of their own information culture (the sample consisted of 32 respondents). All respondents are the teachers of social sciences and humanities at Immanuel Kant Baltic Federal University. The questions have concerned the teachers' awareness about the possibilities of the information technologies, which help the teacher to form a holistic information picture of the world; the information technology software and hardware; the study and the use of various information resources and products, as well as the composition, the structure of knowledge and skills that determines the individual's information culture. In fact, the university teachers, having identified the list of the professional difficulties in the implementation of the information technology and the lack of the professional information culture awareness, have identified the most relevant areas in which it is necessary to increase the level of their own information culture. The data obtained have made it possible to develop a model how to develop the university teacher's information culture.

The introduction of the teacher's information culture development model into the university organizational and educational space (the formative stage of the experiment) has had an impact on the educational process of the management system, the system for managing the educational work results, scientific activities, the educational content and electronic educational resources to improve the teacher's skills. Such changes have taken place in the pedagogical, psychological, educational and sociological spheres of activity, being the components of the university technosphere.

The obtained results (2017–2019) have made it possible both to avoid the substantive and organizational risks, which could have arisen during the implementation of the model, and to correct the previously stated priority tasks.

The data on the information culture growth (shown in fig. 4) are diagnosed on 5 indicators, which have reflected the development of each given culture type component.

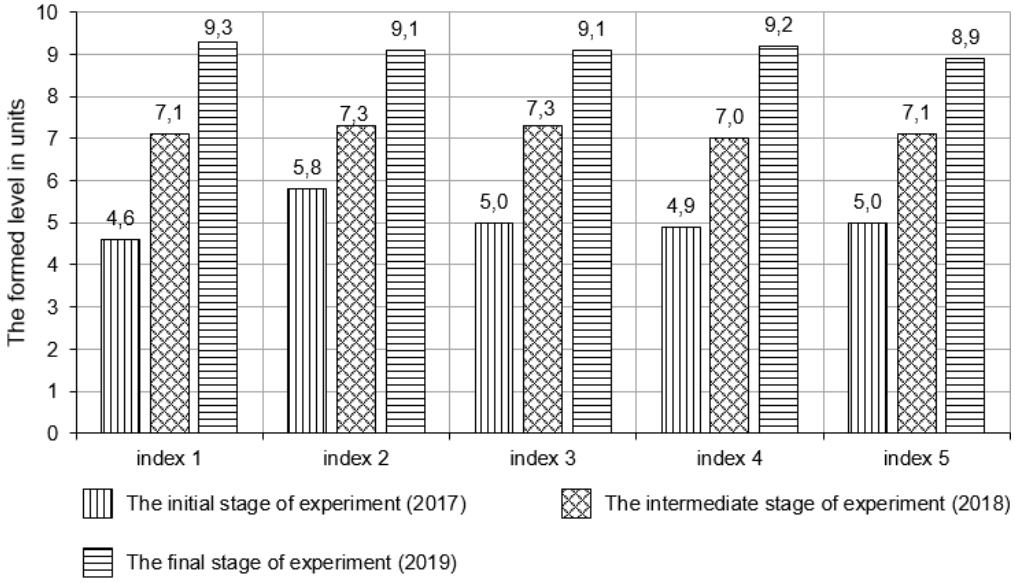

Figure 4 – The data on the information culture growth

At this experimental study stage, based on the use of mathematical statistics methods (T-Wilcoxon criterion), we have found that, according to the specified criteria for the growth of the information culture, the shifts towards the positive changes are observed.

Indicator 2 (the information technology skills development) is of particular importance for this study, since its dynamics testifies the information culture operational component formation. Since the operational component is responsible for the technological effectiveness to develop the teacher's information culture in the conditions of the university technosphere creation and functioning, it can be concluded that the knowledge transformation about the university e-science awareness into the professional skills, knowledge and professional subject competences are necessary. All this requires steps to improve the technosphere resourcing quality in order to fulfil the strategic and tactical requests for the university teaching staff.

Discussion

Having analysed the indicators of the cognitive, operational and reflexive-axiological components how to develop the teacher's information culture in the context of the university technosphere creation, we have come to the conclusion that the presence and high-quality functioning of the developed university technosphere has had an impact in the level of the teacher's information culture. The pedagogical, psychological, methodological and sociological components of the technosphere have formed the content and technological support of the university organizational and educational space.

The analysis of the above data indicates that the university technosphere has great potential to develop the teacher's information culture:

– it creates conditions to develop a positive, value-based and active-creative attitude how to master the information products based on the motivation of personal and professional self-development;

– it provides knowledge in the field of modern education computerization;

– it develops basic research skills how to use and, if necessary, acquire new technological knowledge for an independent solution of learning problems rapidly and effectively in accordance with new constantly changing requirements.

The results of our study are of particular relevance during the pandemic (2020–2021), as they have identified problems how to develop the teacher's information culture in difficult conditions. The Russian and foreign researchers have noted that teachers are to acquire new skills in the use of information technology and the development of specialized digital skills in a short time [20; 21]. It should be noted that young teachers and students, who are better at using new educational technologies, have provided teachers with great help.

The forced emergency and massive shift to distance learning are difficult for the university as a whole. The authors have noted that the causes of difficulties are both objective (technical) and subjective (teachers do not have enough information and computer technologies knowledge; they are used to the format of live communication) factors [22].

During the COVID-19 pandemic, changes have been observed in the functioning of the university's technosphere. In particular, the level of the teacher's professional communication has increased, the number of communicational forms with the students, mutual consultations have also increased in developing new academic material. Foreign scientists have recorded an emergence of a self-efficacy competence [23].

The changes in the competencies have had an impact in all the teacher's information culture components (flexibility of thinking, creativity, entrepreneurial spirit, readiness for self-learning) [18]. Modern researchers have noted that during the pandemic, a new functional level of the teacher's information culture has appeared. It is claimed about the emergence of an «electronic» pedagogical culture. The author states that the «electronic» pedagogical culture is characterized by a deep awareness of the universal values, the role of the information in the modern world and the need to manage it [24].

The forced shift to distance learning has acted as a catalyst for the changes in the information culture, and also has showed the university technosphere readiness and ability to withstand a serious challenge.

Conclusion

The study is aimed at obtaining a scientifically based result, the essence of which is to implement the step-by-step model to develop the teacher's information culture in the context of the university technosphere creation and functioning. Having analyzed scientific literature on the problem of developing the teacher's information culture by the Russian and foreign authors, and the data obtained empirically, we have drawn the following conclusions.

1. The university technosphere is a technological solution in the field of professional training, a set of educational content, regulatory and educational support, resources and technologies, staffing, as well as communications and public relations. The effectiveness to develop the technosphere at an educational institution has had an impact in the teacher's readiness to apply practical information technologies in the pedagogical process.

2. The modern university technosphere development indicates that the problems, which have arisen during the pandemic, have the organizational, technical, socio-pedagogical and psychological aspects.

3. The development trends of the university technosphere indicate that, along with the traditional pedagogical technologies, the pedagogical technologies based on the latest achievements in the field of computerization are increasingly used in the educational process, which ensures the quality of the professional training. Moreover, the results of the study indicate the demand for these technologies on the part of the university teachers.

4. The changes in the university technosphere functioning in the context of the pandemic have determined a general trend in the development of cognitive, operational and reflexive-axiological components of the teacher's information culture.

Acknowledgement

This study has been completed with the help of the administration at Immanuel Kant Baltic Federal University, which have provided an opportunity to conduct the empirical research at the university.

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Для цитирования:

Potmenskaya E.V., Mychko E.I., Serykh A.B., Mazanova S.E. Technosphere of the university: an environment for the teacher's information culture development // Samara Journal of Science. 2022. Vol. 11, iss. 3. P. 315–322. DOI: 10.55355/snv2022113316.