

ТЕОРИЯ И МЕТОДИКА ПРЕПОДАВАНИЯ

UDC 378.4

DOI: 10.17223/19996195/51/6

TEACHER'S READINESS FORMATION FOR DEVELOPMENT OF SYSTEMS THINKING ON THE BASIS OF CONCEPTUAL PEDAGOGICAL MODEL

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Abstract. The goal of the paper is to argue and to develop a conceptual pedagogical model of formation of teacher's readiness for the development of systems thinking. The challenges of this paper are to analyze domestic and foreign psychological and pedagogical literature on the problem of teacher's readiness for the development of systems thinking, to summarize the results available in domestic and foreign literature, to argue methodological approaches and principles in the process of training a conceptual pedagogical model. The systems state of modern science has a theoretical potential for serious enriching and developing the priority trends in the field of science, technology, Economics and education are characterized by a number of specific features, the need to understand the complex economic processes initiated by scientific progress. The center of integrative approaches in connection with the globalization of education is the training of a new format teacher. This is primarily due to the lack of relationship between the requirements of the FSES and the problem of teacher's readiness to work with a huge amount of information, the ability to identify practice-oriented professional information in terms of incompleteness and inconsistency, to systematize it for the goal of its further realization in the educational process. Since natural sciences have a huge potential aimed at the development of systems thinking as a personal quality of a teacher, it leads to the need to investigate the problem of teacher's readiness for the development of systems thinking. In modern conditions it is impossible to imagine professionally, culturally and psychologically adapted teacher for professional work and vital activity with minimal cost, clearly expressed knowledge, awareness of perception of professional knowledge, independence, and depth judgments, ability to establish comfortable relations of the subjects of education, to work in a team.

Keywords: to develop; teacher's readiness; systems thinking; formation; conceptual pedagogical model.

Introduction

In the context of modernization of education systems, changes in the educational paradigm (transition from knowledge paradigm to competence one) the problem of teacher's training of a new format aimed at the disclosure and realization of the potential of the teacher's personality occupies a

special place. The solution of this problem is confirmed by the “Concept of the Federal target program for the development of education for 2016–2020”, in which the most important advantage is the orientation to the realization and activation of the potential of the teacher's personality. In this regard, there is a need to find the best ways to train a competent specialist ready for the development of systems thinking in accordance with the requirements of *FSES*. The research of the problem of teacher's readiness for the development of systems thinking, as a component contributes to the training of a teacher able to solve complex problems, to evaluate the non-standard situation, to make decisions in complex situations, in the conditions of incomplete and contradictory information, to predict the consequences of a rapidly changing situation. This situation has led to the formulation of new tasks, changing ways of thinking, to the formation of teacher's readiness of teachers for development of systems thinking as a personal quality that will allow them to overcome difficulties in teaching and making optimal decisions.

Methodology

The problem of “readiness” has been the subject of research by scientists since the middle of the nineteenth century, initially it was considered as a setting (D.N. Uznadze [1]). The concept of “readiness” was introduced by B.G. Ananyev [2] in the middle of the twentieth century. The analysis of psychological and pedagogical literature allowed to identify studies of readiness, which examine: theoretical foundations (L.S. Vygotsky [3], A.N. Leont'ev [4], K.K. Platonov [5]), readiness activities (A.A. Derkach [6], M.I. Dyachenko, L.A. Kandybovich [7]), readiness for pedagogical activity (K.M. Durai-Novakova [8], M.I. Dyachenko, L.A. Kandybovich [7], N.V. Kuzmina [9], V.A. Slastenin [10]), conditions of readiness formation (A.A. Verbitsky [11], N.I. Vy wholeova [12],) are considered. Different aspects of the development of systems thinking are investigated in the works of both domestic scientists [13], and foreign ones (J. Richmond [14], P. Senge [15]).

The analysis of psychological and pedagogical literature allowed to consider formation of systems thinking of a teacher as quality of his personality using conscious principles of the systems approach at performance of mental actions and operations, at research of the objects directed on getting the systems knowledge [16]. Readiness of a teacher to development of systems thinking is considered as the integrative quality of a person revealing all its parties directed on acquisition of valuable orientations, knowledge, abilities and experience, allowing to carry out activity at sufficient level [16, 17]. Formation of readiness for developing of systems thinking of a teacher is considered as process of interpersonal interaction of subjects of education directed on increasing the level of their readiness for developing systems

thinking in professional and pedagogical activity, allowing them to be successfully realized in this activity [16].

To solve this problem, it is necessary to argue theoretical and methodological approaches and principles in the course of development of conceptual model of forming teacher's readiness for the development of systems thinking.

The methodological base of the model of forming teacher's readiness for the development of systems thinking includes:

- *system approach* (A.N. Averyanov [18], V.P. Sadovsky [19]), considering forming readiness of the teacher to development of systems thinking as the complete systems including interaction and mutual influence of links, and dynamics of its development;

- *synergetic approach* (V.I. Andreev [20], E.N. Knyazeva [21]), allowing to consider forming teacher's readiness for development of systems thinking as the open, self-organizing system complex providing the accurate organization of educational process;

- *personality-activity approach* (L.S. Vygotsky [3], A.N. Leontiev [4]), contributing to the formation of teacher's readiness for the development of systems thinking in the process of mastering various activities and interaction of subjects of education;

- *contextual approach* (A.A. Verbitsky [11], E.P. Komarova [22]), ensuring the realization of the process of formation of teacher's readiness for the development of systems thinking in the conditions of maximum "immersion" in the context of future professional activity;

- *competence approach* (N.I. Vy wholeova [12], I.A. Zimnaya [23], E.P. Komarova [23]), realizing the formation of teacher's readiness for the development of systems thinking in the process of revealing his professional and personal qualities that allow successfully solving professionally-oriented tasks.

In the process of development of the model of formation of teacher's readiness for the development of systems thinking the following **principles** are used:

- *professional orientation* (A.V. Barabanshikov [24]), providing the integration of knowledge in the field of systems thinking in the process of formation of teacher's readiness for its realization;

- *integrity, consistency imply* (G.P. Shchedrovitsky [25], A.N. Averyanov [18]) the consideration of the formation of teacher's readiness for the development of systems thinking, as an integral complex of interrelated elements that affect the structure, functions and dynamics of the development of this complex;

- *variability* (A.G. Asmolov [26]) assumes in the process of formation of teacher's readiness for the development of systems thinking to use variety of means, forms, methods of training;

– *personality-centered orientation* (E.V. Bondarevskaya [27], K.R. Rogers [28], providing conditions for active activity, self-development and growth in the process of formation of teacher's readiness for the development of systems thinking;

– *problem solving* (M.I. Makhmutov [29]) promotes the creation of problem situations and conditions for searching their solutions in the process of formation of teacher's readiness for development of systems thinking.

The following research methods are used: theoretical: analysis and synthesis, comparison and generalization, modeling; empirical: questioning, testing, interviewing, pedagogical experiment; methods of mathematical statistics (using the U-test Mann-Whitney and the two-sample Wilcoxon test).

Results

Based on the research of M.I. Dyachenko, L.A. Kandybovich [7], N.V. Kuzmina [9], V.A. Slastenin [10], the structural components of the formation of readiness for the development of systems thinking are determined: motivation-valued, cognitive, activity and reflective-estimative.

While developing a model of forming teacher's readiness for the development of systems thinking the criteria, indicators and levels of forming teacher's readiness for development of systems thinking have been defined. The indicators of the motivational criterion (*motivation-valued component*) are a positive attitude (*systems of interests of valued orientations*) to the teacher's readiness for the development of systems thinking; the systems of needs, incentives for activities to form readiness for the development of systems thinking; the ability for goal setting activities for forming readiness for the development of systems thinking. The indicators of the knowledge criterion (*the cognitive component*) represent the level of development of knowledge in the areas of professional and pedagogical activity, formation of readiness of teacher to the development of systems thinking, the disciplines of science. The indicators of a praxeological criterion (*active component*) include different types of activities in the areas of professional and pedagogical activity, formation of teacher's readiness for the development of systems thinking, research of potential of disciplines of natural science cycle directed on development of systems thinking. The indicators of reflexive criterion (*reflective- estimative component*) are the ability to analyze (the allocation of strengths and weaknesses of their activities for the formation of readiness to the development of systems thinking), and evaluation (the ability through reflection to assess their activities for the formation of teacher's readiness for the development of systems thinking); ability to adjust their activity with respect to the goals of formation of teacher's readiness for the development of systems thinking. We have identified the following levels of assessment of the formation of teacher's readiness for the development of systems thinking: reproductive, productive and creative.

The reproductive level is characterized by:

– absence of system of valued orientations in the field of development of systems thinking and necessity in its development, inability to define the purposes and tasks of activity on forming teacher's readiness for development of systems thinking (*motivational criterion*);

– possession of minimal information in the areas of professional and pedagogical activity, the formation of teacher's readiness for the development of systems thinking in the field of disciplines of the natural science cycle, the lack of need to expand this knowledge (*cognitive criterion*);

– weak ability to carry out professional and pedagogical activities; the realization of activities for the forming teacher's readiness for the development of systems thinking according to the proposed plan or model, using minimal knowledge in the field; situational desire to explore the potential of disciplines of natural science cycle aimed at the development of systems thinking (*praxeological criterion*);

– performing analysis and evaluation of their activities on the formation of readiness for the development of systems thinking only according to the algorithm proposed in advance or with outside help, the lack of skills of self-adjustment of their activities with respect to the purpose of formation of readiness for the development of systems thinking (*reflective-estimative criterion*).

The productive level is characterized by:

– weak formation of the systems of interests and valued orientations in the field of formation of teacher's readiness for the development of systems thinking, the periodic need to work in the development of systems thinking. There are some difficulties in defining the goals and objectives of the formation of readiness to the development of systems thinking; (*motivation-valued criterion*);

– possession of sufficient information in the areas of professional and pedagogical activity, the formation of teacher's readiness for the development of systems thinking; the ability to obtain additional knowledge in these disciplines of the natural science cycle in the specified areas of research (*cognitive criterion*);

– uncertainty in the realization of professional and pedagogical activities; the presence of difficulties in the process of formation of teacher's readiness for the development of systems thinking, using a sufficient amount of information in this area; the manifestation of the desire to explore the potential of the disciplines of natural science cycle aimed at the development of systems thinking (*praxeological criterion*);

– developed skills of analysis, evaluation and adjustment of their activities to form readiness for the development of systems thinking, but the emergence of some difficulties in this case (*reflexive-evaluative criterion*).

The creative level is characterized by:

- positive attitude to the activity of formation of teacher's readiness for the development of systems thinking; formed need for this activity, the ability to goal-setting activities of the formation of teacher's readiness for the development of systems thinking (*motivation-valued criterion*);
- possession of a high level of knowledge in the areas of professional and pedagogical activity, formation of teacher's readiness for the development of systems thinking, , skills of independent search for additional knowledge in disciplines of the natural science cycle (*cognitive criterion*);
- independence and confidence in the implementation of professional-pedagogical activity (*from goal setting to predict expected outcomes*), strong expressed formed readiness to the development of systems thinking using a significant amount of information in this field, a manifestation of active interest in the study of potential of natural sciences aimed at the development of systems thinking (*praxeological criterion*);
- full possession of the skills of analysis, evaluation and adjustment of their activities to form readiness for the development of systems thinking. (*reflective-estimative criterion*) (Figure 1).

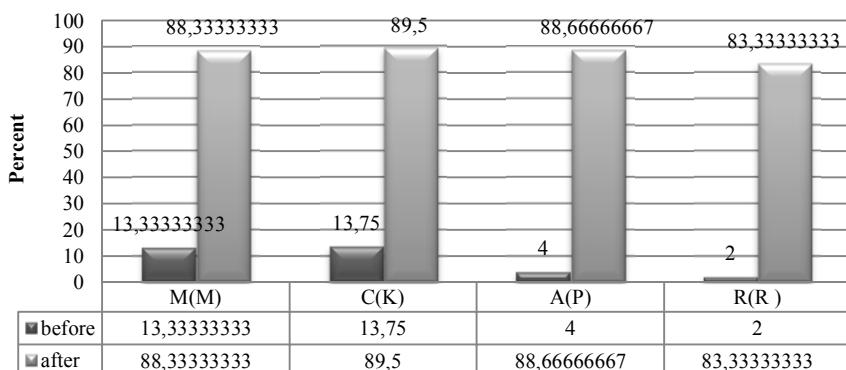


Fig. 1. Dynamics of forming teacher's readiness for the development of systems thinking (before and after the formative phase of the experiment): M(M) – motivation criterion (*motivation-valued component*); C(K) – knowledge criterion (*the cognitive component*); A(P) – praxeological criteria (*praxeological component*); R(R) – reflective criterion (*reflective-estimative component*)

The results of the ascertaining experiment show the following results of formation of readiness of a teacher's readiness for the development of systems thinking: motivation-valued criterion – 13,3%, the cognitive criterion – 13,8%, active criterion – 4%, reflective-estimative criterion – 2%. The results of the ascertaining experiment indicate an insufficient level of formation of teacher's readiness for the development of systems thinking. They showed the need to conduct the stages of experimental work in order to form the teacher's readiness for the development of systems thinking.

The forming stage of the experiment was performed on the basis of the Voronezh state pedagogical University, and was aimed at improving the educational process of the University in order to increase the level of forming teacher's readiness for the development of systems thinking. According to the hypothesis the process of forming of teacher's readiness for the development of systems thinking can be more effective when applying the model of forming teacher's readiness for the development of systems thinking on the basis of the realization of the program. Initial, intermediate and final stages have been developed. At the initial stage, students receive primary information about systems thinking, ways of its development and the potential of possibilities of natural science cycle aimed at the formation of teacher's readiness for the development of systems thinking. At the intermediate stage, reproductive "knowledge-skills" are formed, determining the ability to reproductive activity characterized by the ability to independent activity on the basis of orientation of activity. At the final stage, productive "knowledge-skills" (skills) are formed, determining the ability to productive and creative activity on the basis of generalized mode of activity, i.e. the ability to perform activity in changed conditions by independent transformation of the known orientation basis of activity. Students at this stage are offered to develop independent ways to solve problems on the basis of previously acquired knowledge and skills, as well as to assess their activities.

The result of control stage of the experimental work show as follows of formation of readiness of teachers to the development: motivation-valued criterion – 88,3%, the cognitive criterion – 89,5%, active criterion – 88,7%, reflective-estimative criterion – 83,3%.

Conclusion

Thus, the readiness of the teacher has a close relationship with the knowledge of a personality as a whole. The features of forming teacher's readiness for the development of systems thinking are reflected in 3 stages, such as: reproductive, productive and creative. The creative level showed that possession of a teacher of knowledge in the areas of professional and pedagogical activity for the development of systems thinking.

The results of experimental work confirmed the effectiveness of the developed model of forming teacher's readiness for the development of systems using.

References

1. Uznadze D.N. Eksperimental'nye osnovy psihologii ustanovki // Psichologicheskie issledovaniya. M., 1966. P. 135–327.
2. Anan'ev B.G. Chelovek kak predmet poznaniya. SPb.: Piter, 2001. 288 p.

3. Vygotskij L.S. Izbrannye psihologicheskie issledovaniya. M.: Izd-vo APN RSFSR, 1956. 519 p.
4. Leont'ev A.N. Deyatel'nost'. Soznanie. Lichnost'. M.: Politizdat, 1975. 304 p.
5. Platonov K.K. Struktura i razvitiye lichnosti. M.: Nauka, 1986. 254 p.
6. Derkach A.A. Akmeologicheskie osnovy razvitiya professionala. M. : MPSI ; Voronezh : MODEK, 2004. 752 p.
7. D'yachenko M.D., Kandybovich L.A. Psihologicheskie problemy gotovnosti k deyatel'nosti. Minsk: Izd-vo BGU, 1976. 176 p.
8. Duraj-Novakova K.M. Formirovanie professional'noj gotovnosti studentov k pedagogicheskoye deyatel'nosti: dis. ... d-ra ped. nauk. M., 1983. 356 p.
9. Kuz'mina N.V. Akmeologicheskaya teoriya povysheniya kachestva podgotovki specialistov obrazovaniya. M.: ICPKPS, 2001. 114 p.
10. Slastenin V.A. Pedagogika: innovacionnaya deyatel'nost' / V.A. Slastenin, L.C. Podymova. M.: Magistr, 1997. 308 p.
11. Verbisky A.A. Contextual Learning Technologies the System of Continuous Professional Education // International Journal of Continuing Engineering Education and Life-Long Learning. 2011. № 3. P. 176–178.
12. Vyunoval N.I. Integrated and Differentiated TendenCIENS IN University Lecturer training in Russia // Perspektivy nauki. 2019 № 5 (20). P. 164–166.
13. Formirovanie sistemnogo myshleniya v obuchenii: ucheb. posobie / Pod red. Z.A. Reshetovo. M.: YUNITI-DANA, 2002. 344 p.
14. Richmond B. Systems thinking: critical thinking skills for the 1990s and beyond // System Dynamics Review. 1993. Vol. 9, № 2. P. 113–133.
15. Senge P. The fifth discipline : The art and practice of the learning organization. New York: Random House Business Books, 1993. 432 p.
16. Sapozhkova N.A. Formirovanie sistemnogo myshleniya pedagoga kak pedagogicheskaya problema // Vestnik Voronezhskogo Gosudarstvennogo Universiteta № 4. «Problemy vysshego obrazovaniya». 2018. P. 93–96.
17. Gural' S.K. Diskurs-analiz v svete sinergeticheskogo videniya. Tomsk: izd-vo Tom. un-ta, 2009. 174 s.
18. Aver'yanov A.N. Sistemnoe poznanie mira: Metodologicheskie problem. M.: Politizdat, 1985. 253 p.
19. Sadovskij V.N. Osnovaniya obshchej teorii sistem. Logiko-metodologicheskij analiz. M.: Nauka, 1974. 237 p.
20. Andreev V.I. Pedagogika: uchebnyj kurs dlya tvorcheskogo samorazvitiya. 2-e izd. Kazan': Centr innovacionnyh tekhnologij, 2000. 608 p.
21. Knyazeva E.N. Innovacionnaya slozhnost' / otv. red. E.N. Knyazeva. SPb.: Altejeva, 2016. 608 p.
22. Komarova E.P. Development of Foreign Language Professional Communicative Competence on the Basis of Problem-Modular Technology // Perspektivy nauki. 2019. № 5 (20). P. 176–178.
23. Zimnyaya I.A. Social'no-professional'naya kompetentnost' kak celostnyj rezul'tat profesional'nogo obrazovaniya (idealizirovannaya model') // Problemy kachestva obrazovaniya. Moskva; Ufa: Issledovatel'skij centr problem kachestva podgotovki specialistov, 2005. Kn. 2.
24. Barabanshchikov V.A. Sistemnyj podhod v strukture psihologicheskogo poznaniya // Metodologiya i istoriya psihologii. 2007. T. 2. Vyp. 1. P. 86–99.
25. SHCHedrovickij G. P. Sistema pedagogicheskikh issledovanij. Metodologicheskij analiz. V sbornike: «Pedagogika i logika». M., 1993 // Elektronnaya publikaciya: Centr gumanitarnyh tekhnologij. URL: <https://gtmarket.ru/laboratory/basis/6738>
26. Asmolov A.G. Strategy f Social and Cultural Development of Education: on the way to Overcoming the Identity Crisis and Forming Civil Society // Educayion Studies. 2008. T. 1. P. 65.

27. Yakimanskaya I.S. Razrabotka tekhnologii lichnostno-orientirovannogo obucheniya // Voprosy psihologii 1995. № 2. P. 31–42.
28. Rogers C.R. Freedom to learn for the 80's. Columbus-Toronto-LondonSydney: Charles E. Merrill Company, A Bell & Howell Company, 1983.
29. Mahmutov M.I. Organizaciya problemnogo obucheniya v shkole: kn. dlya uchitelej. M.: Prosveshchenie, 1977. 240 p.

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ФОРМИРОВАНИЕ ГОТОВНОСТИ ПЕДАГОГА К РАЗВИТИЮ СИСТЕМНОГО МЫШЛЕНИЯ НА ОСНОВЕ КОНЦЕПТУАЛЬНОЙ ПЕДАГОГИЧЕСКОЙ МОДЕЛИ

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Аннотация. Обоснована и разработана концептуальная педагогическая модель формирования готовности педагога к развитию системного мышления. Проанализирована отечественная и зарубежная психолого-педагогическая литература по проблеме готовности педагога к развитию системного мышления. Обобщены имеющиеся в отечественной и зарубежной литературе результаты, обоснованы методологические подходы и принципы в процессе подготовки концептуальной педагогической модели. Системное состояние современной науки имеет теоретический потенциал для серьезного обогащения и развития приоритетных направлений в области технологий, науки, экономики и образования в характеризуется рядом специфических особенностей, необходимостью осмыслиения сложных экономических процессов, инициированных научным прогрессом. Центром интегрированных подходов в связи с процессом глобализации образования является подготовка педагога нового формата. Это обусловлено, прежде всего, отсутствием взаимосвязи между требованиями Федерального государственного образовательного стандарта и проблемой готовности педагога работать с огромным объемом информации, умением выявлять практико-ориентированную профессиональную информацию в условиях ее неполноты и противоречивости, систематизировать ее с целью дальнейшей реализации в учебном процессе. Так как естественно-научные дисциплины обладают огромным потенциалом, направленным на развитие системного мышления как личностного качества педагога, то это приводит к необходимости исследовать проблему готовности педа-

гога по дисциплинам естественно-научного цикла к развитию системного мышления. В современных условиях невозможно представить профессионально, культурно и психологически адаптированного педагога к профессиональной работе и жизнедеятельности с минимальными затратами, четко выраженным знаниями в области естественно-научных дисциплин, осознанием восприятия профессионального знания, самостоятельности и глубины суждений, умением устанавливать психологически комфортные отношения субъектов образования, работать в команде.

Ключевые слова: готовность педагога к развитию системного мышления; формирование; педагогическая модель.

Received 14 June 2020