



Formation Of Teachers' Readiness To Work With Technically Gifted Children

Tatyana I. Anisimova

Kazan Federal University, Elabuga, Russia

Liliya N. Latipova

Kazan Federal University, Elabuga, Russia

Albina B. Sergeeva

Kazan Federal University, Elabuga, Russia

Landysh R. Sharafeeva

Kazan Federal University, Elabuga, Russia

Olga V. Shatunova

Kazan Federal University, Elabuga, Russia

Abstract

Modern Russia needs to create an innovation economy integrated into the global economy through the development and implementation of upgrading programmes for industries that possess a breakthrough value. To modernize their equipment and technology domestic enterprises need professionals who are ready to join the current reforms; they also need specialists' training for the innovative economy of tomorrow. In these conditions it is becoming particularly urgent to detect technically gifted children of an early age, support and train them with the purpose of professional orientation to engineering areas. This determines the necessity to form the natural science teachers' readiness for working with technically gifted schoolchildren.

The purpose of the study is to provide effective forms and methods of formation of future teachers' professional competence to work with technically gifted students.

The main methods used to investigate the problem of teachers' readiness for work with technically gifted children are generalization of the advanced pedagogical experience, observation, questioning and interviewing teachers.

The study represents the experience of the teaching staff of Engineering and Technology Faculty and the Faculty of Mathematics and Natural Sciences at Elabuga Institute of Kazan Federal University in attracting students – undergraduates of teacher education to conducting subject contests and Olympiads among schoolchildren, to organizing and conducting events in the Children's University, Children's intellectual and health-care camp "Intel Summer", and summer physical and mathematical school. It is noted that there is an objective need for teachers' special training that would promote the formation and development of the undergraduates' professional competencies necessary for successful work with gifted schoolchildren.

For that purpose, the curriculum for training direction 44.03.05 "Teacher education (two profiles)" at the Faculties of Mathematics and Natural Sciences and Engineering and Technological Disciplines includes subjects the main objective of which is to form the ability to organize students' cooperation, support their activity, initiative and self-reliance, and to develop their creative skills.

In particular, it is planned to study the following subjects for the profile of "Mathematics and Informatics": Computer Science and Robotics, Robotics Basics, Computer Graphics and Animation, Programming on Delphi, Programming in C ++, which promote the development of skills in using robotic art technology in classroom and extracurricular activities for the development of students' creative abilities in the process of designing and programming robots.

The purposeful work allows students to achieve prominent results in different competitions. Students of the Faculty of Mathematics and Natural Science of Elabuga Institute won the first place at the All-Russian Olympiad on Robotics in the city

Innopolis (Kazan), which gave them the right to participate in the International Olympiad on Robotics in New Delhi where the team was in the top ten.

Thus, the work on the formation of the future teachers' readiness to train technically gifted children conducted in Elabuga Institute of Kazan Federal University allows achieving several objectives:

- Preparation of the unique pedagogical potential in accordance with current and future trends in the education system of the Russian Federation;
- Formation of the applicants' data base in the field of teacher training in physics, mathematics, computer science, technology, due to a large number of schoolchildren, participating in various projects and competitions;
- Positioning Elabuga Institute as a center for the identification, development and support of children who have shown outstanding ability in the field of technical creativity.

Nevertheless, the formation of teachers' readiness to work with technically gifted children makes it necessary to provide for an expansion of networking with educational institutions on the basis of which it is possible to improve the professional competence in this area.

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Introduction

Education in the field of engineering and technology has become one of the most highly demanded and prestigious in the job market. The stereotype of the "attractiveness" of the professions of a lawyer and economist has had a negative impact on the number of engineers and highly qualified workers in Russia. Even nowadays young people are not willing to choose technical faculties and departments at colleges and universities. However, according to government documents universities focusing on engineering and technology are to provide for the growth of intellectual potential in Russia. It is reflected in "The strategy of scientific and technological development of Russian Federation" which was adopted in 2016. It says that "the goal of scientific and technological development of Russia consists in proving for independence and competitiveness of the country with the help of creating the system of the development and effective use of intellectual potential of the nation [9]. Reaching this aim presupposes finding talented youth and building up a successful career in the field of science and innovations, which will ensure the development of intellectual potential of the country. That is why one of the main challenges which Russia faces nowadays is regular work on attracting talented technically gifted children and young people to design and engineering and creative activity so that this activity would become the meaning of life for them.

In this connection, it is important to train teachers who would be able to deal professionally with the issues of identifying, developing and supporting the technical giftedness of children.

In the document which is called "Working concept of giftedness" [11], the following definition is given: "Giftedness is a systemic, life-long quality of the psyche that determines the ability of a person to achieve higher, uncommon results in one or more activities compared to other people." From this definition one may conclude that in order to achieve success, a person needs to develop his giftedness throughout his life. However, if you do not develop giftedness from nature, then after a while you can find that the predisposition to a particular activity will become less pronounced, and further development of abilities will require considerable investment or even may become impossible.

In Psychology and Pedagogy, there are various approaches to understanding the types of giftedness. The developers of the "Working concept of giftedness", along with other experts, single out intellectual giftedness, and it is subdivided into different types depending on the subject content of the activity.

According to this point of view, technical talent belongs to this type. As a rule, talking about technical talent, they mean the ability to understand, analyze and simulate technical processes, design and analysis of mechanisms. A

child is considered as having technical abilities, if he is interested in machinery and machines, can fix something, uses old parts to create new crafts or toys, constructs, thinks about the essence of this or that invention. Typically, these children are characterized by technical thinking and technical awareness.

Unfortunately, there are not so many studies on the problem of identifying, developing, and psycho-pedagogical support for technically gifted children and young people. At various times, scientists such as P. N. Andriyanov, A. N. Bogatyrev, V. A. Gorsky, T. V. Kudryavtsev, V. A. Molyako, Y. L. Ponomarev, V. G. Razumovsky, I.S. Yakimanskaya and others investigated this problem. In the work with gifted children, the teacher plays a special role. For the best organization of the educational process aimed at the development of gifted children, the teacher must have specialized psychological and pedagogical knowledge, skills and abilities, among which, according to T. P. Abakirova [1], the following are distinguished: knowledge of giftedness, its types, psychological bases, criteria and principles of detection; knowledge of the psychological characteristics of gifted children, their age and individual development; knowledge of the peculiarities of professional qualification of specialists for working with gifted children; knowledge of the types and forms of work with gifted children, the principles and strategies for developing programs and technologies for teaching gifted children; skills in the development and implementation of methods for identifying gifted children on the basis of signs of giftedness; skills in the field of didactics and methods of teaching gifted children, taking into account the types and characteristics of the giftedness of pupils, their contingent and the specific conditions of instruction; skills of psychological and pedagogical counseling of gifted children, their parents and other family members

Moreover, a teacher working with gifted children must possess a number of professional qualities [5]:

- be able to develop flexible, individualized programs;
- create a warm, emotionally safe atmosphere in the classroom;
- provide students with feedback;
- use different learning strategies;
- respect the personality of the child, contribute to the formation of positive self-esteem of the pupil;
- encourage creativity and imagination;
- stimulate the development of higher-level mental processes;
- respect the individuality of the pupil.

A teacher who works with gifted children must also have a sense of humor and be tactful, he must have a good understanding of the psychology of children and adolescents, especially of the psychology of gifted children, and have a wide range of interests. Such a teacher should be ready to communicate with students on topics not related to the theme of training, he should be able not only to provide students with the opportunity to choose the trajectory of learning independently, but also encourage them in this endeavor [3].

In this regard there are higher demands to the teacher who deals with gifted children and adolescents. He should not only know the peculiarities of working with such learners, but also have the skills to diagnose and develop giftedness [10]. It is known that gifted pupils cause difficulties for their teachers because of their psychological identity, increased cognitive needs and opportunities. N.V. Dudyreva [4] notes that the low level of knowledge of educational technologies of the development of giftedness by teachers often leads to a decline and fading of the creative activity of such schoolchildren.

The survey we conducted among 85 school technology teachers in 2016 showed that many of them are not ready now for psychological and pedagogical support of gifted children. The absolute majority of the teachers who took part in the questioning (95%) recognize that they have very little desire to work with gifted schoolchildren, the modern teacher needs to have certain professional competencies in this field. To the question "Do you have sufficient competencies for the development of the technical giftedness of schoolchildren?" 33% of the respondents answered in the negative. This means that there is an objective need for special teacher training that would help the teachers to form and develop the necessary professional competencies for successful work with gifted schoolchildren.

At present, researchers distinguish the following prerequisites for solving the problem of preparing a teacher for work with a gifted person:

- social: the need of society, the education system needs a teacher with a complex of professionally significant qualities;
- theoretical: the problem of the development of a creative teacher has been actualized in psychology and pedagogy;
- practical: the need to diagnose the professional qualities of teachers working with gifted children [2].

One of the stages in organizing work with gifted children is the stage of identifying gifted children. As a rule, a gifted child is noticeable. He has certain qualities that help to distinguish him from his peers: high intellectual abilities, outstanding creative abilities, ability to quickly master things and outstanding memory, intellectual curiosity and the pursuit of knowledge, high personal responsibility [14]. But the teacher should keep in mind that in the class there may be children with potential giftedness. The bulk of approaches to the development of the content of education for gifted, methods of identifying and developing giftedness are aimed specifically at children with actual talent. The case of children with signs of potential giftedness requires a fundamentally different approach. Here, we have difficulties in determining the criteria for the identification of such children, the choice of forms and methods of disclosure and the development of their talent [7].

Support for gifted children can be carried out on 4 levels [13]:

1. Individual - individual psychological and pedagogical work directly with a talented or gifted student (individual counseling, additional classes).
2. Group - psychological and pedagogical work with groups of talented and gifted schoolchildren (group consultations, trainings).
3. The level of the class - the activities of teachers to create a psychologically comfortable environment, positive relationships with classmates.
4. The level of a specialized institution (psychological and pedagogical, counseling centers).

The following main areas of support for talented and gifted children are singled out:

1. Identification of talented and gifted children. This method is based upon creating a bank of psycho-diagnostic techniques for the study of individual and personal characteristics of gifted children [13]. Also activity at this stage involves monitoring the development of a gifted child, his/ her success and achievements in various fields of knowledge. At this stage the teacher should actively cooperate with other subject teachers, with teachers of supplementary education, as well as with the parents of a gifted child. In general, working with parents should be aimed not only at identifying the child's abilities, but also at providing psychological help in communicating with the "unusual" child.
2. Integration of institutions of basic, supplementary and professional education, networking to identify points of cooperation in working with gifted children. To develop, a gifted child needs to go beyond the established boundaries of basic education, choose the educational services provided by other types of educational institutions in his district or region [12]. In this case, the teacher should help the student to orient oneself in the variety of services offered by additional, professional education. If necessary, he must be able to organize interaction with universities and research institutions. This part of work presupposes the organization and holding of various competitions, creative exhibitions, scientific conferences both at the municipal and regional level.
3. Ensuring the continuity of the development of a gifted child. "Continuity" means continuity in the development of a gifted child between all the levels of education: "pre-school education - primary school - secondary school - university" at the level of ideas, goals, content and methods of work [6]. A special attention is attached to continuity of the main secondary, supplementary and professional education

2. Methods

The Elabuga Institute of the Kazan Federal University has been carried out an active work to develop and support the technical talent of children and youth. Innovative projects are the key direction of the work of the university with technical gifted children. It includes such projects as the Children's University, IntelLeto ("Intellectual Summer"),

Intellectual Children's Camp for Gifted Children, Khyyal (the Tatar word for “dream”), the Summer Physics and Mathematics School, the Center for Educational Robotics. Let us consider the content of their activities.

The educational project "Children's University" is aimed at popularization of scientific knowledge among junior schoolchildren, as well as their intellectual development and expansion of their worldview. The subjects of the classes cover a wide range of disciplines: mathematics, chemistry, physics, astronomy and a number of others. The Children's University is open to all children who want to touch the world of science. Lectures and practical classes, which take place on Sundays once a month, are conducted by professors and associate professors using the latest educational technologies.

Intel Summer is a project for schoolchildren aged 7 to 15 years who want to have a rest during the holidays, but also to perform various types of educational and intellectual activity under the guidance of the group leaders who are chosen among talented students who have been specially trained to work with children. Classes with schoolchildren are conducted by experienced teachers of the university. To develop the giftedness of students of Tatar schools and gymnasiums, a similar project "Khyyal" ("Dream") was launched.

One more educational project is "Summer School of Physics and Mathematics ". It operates on the basis of the sports camp of the Institute, is organized for high school students who graduated from the 8th, 9th and 10th grades. The educational process in the summer physics and mathematics school is aimed at in-depth preparation of schoolchildren for participation in the Olympiads and competitions in physics, mathematics, computer science and includes: practical classes to solve problems of increased complexity, popular science lectures of leading scientists of KFU, seminars, laboratory work-shops, creative competitions, research design under the guidance of teachers and research workers of KFU. Every year foreign lectures come to visit and teach, among them, Murat Choshanov, Professor of the Department of Mathematics at the University of Texas at El Paso, Doctor of Physical and Mathematical Sciences, Vice President of the International College at the University of Suan Sunanda Rajabat Janzhai Yingprayun. On most simple examples they introduce children to various fields of physics: thermodynamics, optics, reactive forces, the Doppler effect. Together with Rajabat Janzhai Yingprayun, the Doctor of Science in Physics and Mathematics, pupils attending the school conduct entertaining experiments that are very similar to tricks, but, in spite of this, they have an exact scientific explanation. The school program also provides for active rest, health-saving activities, a variety of cultural and creative activities.

In 2015 the Center for Educational Robotics began its work in the Institute. Its opening was preceded by traditional competitions in robotics. More than 150 people from different cities and districts of the Republic of Tatarstan come to these competitions, held twice a year. Competitions are held in two age groups ("younger" - 7-13 years and "senior" - 14-17 years) in the following nominations: "Racing on the line", "Sumo. Walking Robots ", "Kegelring ", "Ladder "and" Pearl Catcher ".

The main objectives of the competition in robotics are:

- attracting students to innovative, scientific and technical creativity in the field of robotics;
- promoting robotics and LEGO-design as a educational subject;
- formation of new knowledge, skills and competencies for students in the field of innovative technologies, mechanics and programming.

The main assistants of the head of the Center are students Islam Khamitov and Vladislav Starostin, prize-winners of the All-Russian Olympiad in Robotics and participants of the International Olympiad in Robotics (World Robot Olympiad, WRO). It should be noted that students of the Faculty of Mathematics and Natural Sciences of the Elabuga Institute in 2016 won first place at the All-Russian Olympiad in Robotics in the city of Innopolis (Kazan), which gave them the right to participate in the International Olympiad in Robotics in New Delhi and they managed to get to the top ten.

The next most important direction of the work of the Elabuga Institute of KFU in the field of identification, development and support of technical giftedness of schoolchildren is organizing and holding technology competitions on the premises of the faculty of Engineering and Technology. Such contests as "Creative work of

schoolchildren", "Young masteress", "Competition of projects on technical labor" are held annually, in which more than 300 students of grades 5-11 of general educational institutions take part.

The contest "Creative work of schoolchildren" is traditionally held in autumn, and the contests "Young Masteress" and "Competition of projects on technical labor" are held in spring, summing up the result of the creative work of schoolchildren for the first half of the year. Competitors compete among themselves in theoretical, practical and creative tours. They are given the opportunity to prove themselves in testing by various technologies, show their skills in processing various types of materials (metal, wood, plastic, cloth, etc.), and also demonstrate their creative abilities in design and presentation of products.

The main objectives of these competitions are:

- identification and encouragement of gifted students;
- support of young people in professional self-determination;
- popularization of technological education among students;
- studying the intellectual and creative potential of students in the educational field "Technology".

The experience of organizing and conducting technology competitions in the university proves that the participation of schoolchildren in such events contributes not only to the development of their giftedness, but also shapes their steady interest in engineering, engineering and design activities, which, consequently, helps them to become competitive in the labor market.

Discussion

Forming the future teachers' competence of mastering the technologies of working with gifted children and adolescents should start during their first year of their studies at the university. For example, for the profile of "Mathematics and Informatics" the study of the following disciplines is planned: "Informatics and Robotics", "Fundamentals of Robotics", "Computer Graphics and Animation", "Programming in Delphi", "Programming in C++". Studying these subjects contributes to the development of the skills of using the technologies of robotic creativity in the classroom and in extra-curricula activities for developing the creative abilities of pupils in the process of designing and programming robots [8]. The curriculum of all the profiles of the direction of preparation "Pedagogical Education" includes the subject "Psychological and pedagogical support of a gifted child in school". Students studying the "Technology and Additional Education" profile attend such courses as "Fundamentals of Creative and Design Activities", "Design and Research Activities", "Organization of Project Activities of Schoolchildren", in the process of mastering which they are forming the competencies necessary to work with technically and creatively gifted pupils [15].

In our opinion, in addition to the inclusion in the curricula of special disciplines aimed at equipping students with theoretical and practical knowledge and skills in the development of children's giftedness, it is necessary to give them the opportunity directly, as a result of cooperation through cooperation, to get a practical idea of this category of pupils. We believe that the most optimal form for this is the participation of students in organizing and conducting various events with schoolchildren: contests, Olympiads, quizzes, festivals. Helping organizers and jury members to conduct similar events, future teachers gain experience of working with gifted pupils both from the point of view of communication and the diagnosis of their abilities.

In 2017 the Elabuga Institute launched a research project "Development of a teacher training model for working with gifted children and young people", the aims of which are the following:

1. Designing and approbation of the model of development of giftedness of children and youth in the educational organization.
2. Identification of mechanisms and factors for the integrated assessment and support of gifted children and youth in the educational organization.
3. Development and implementation of educational programs for training of teachers who will be able and ready to implement psychological and pedagogical support of gifted children and young people (the main professional educational programs for bachelor's, master's programs, professional retraining and advanced training

programs).

4. Development of scientific and methodological recommendations and materials on the development and support of giftedness for teachers and students.

5. Offering research, consulting and educational services to specialists of educational organizations, parents on the development of giftedness, as well as to the students themselves.

Conclusion

Thus, the work carried out at the Elabuga Institute of the Kazan Federal University on formulating the readiness of future teachers to work with technologically gifted children helps to achieve several goals:

– preparation of a unique pedagogical potential in accordance with current and perspective trends in the RF education system;

– preparation of the base of future applicants for pedagogical directions of training in physics, mathematics, computer science, technology at the expense of a wide audience of schoolchildren participating in various projects and competitions;

– popularization of the institute as a center for the identification, development and support of children who have demonstrated outstanding abilities in the field of technical creativity.

Nevertheless, developing the readiness of teachers to work with technically gifted children, it is necessary to foresee and take into account the expansion of network interaction with educational organizations, on the basis of which further improvement of professional competencies in this field.

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