Asesorías y Tutorías para la Investigación Científica en la Educación Puig-Salabarría S.C.
José María Pino Suárez 400-2 esq a Lerdo de Tejada. Toluca, Estado de México. 7223898475
RFC: ATI120618V12

Revista Dilemas Contemporáneos: Educación, Política y Valores.
http://www.dilemascontemporaneoseducacionpoliticayvalores.com/
Año: VII Número: 2 Artículo no.:13 Período: 1ro de enero al 30 de abril del 2020.

TÍTULO: Pensar el aprendizaje individualizado basado en el estilo de los estudiantes con discapacidad auditiva.

AUTORES:

1. Ph.D. Olga Zhuykova.
2. Ph.D. Yu.V. Krasavina.
3. Senior Lect. E.P. Ponomarenko.
4. Ph.D. Yu.V. Serebryakova.

RESUMEN: El documento considera estudiar el aprendizaje individualizado de estudiantes con discapacidad auditiva según su estilo de pensamiento. El estudio incluyó la identificación de características individuales de los estudiantes con y sin discapacidad auditiva, el diseño del proceso de aprendizaje basado en las capacidades y estilos de pensamiento potenciales de los estudiantes, y el análisis de la eficiencia de los métodos propuestos. La implementación de caminos individuales basados en el aprendizaje basado en el estilo de pensamiento contribuyó a enfrentar los desafíos asociados con la enseñanza de estudiantes con discapacidad auditiva. La aplicación de psicodiagnóstico en el proceso educativo permite al maestro elegir tareas específicas con un nivel apropiado de dificultad para los estudiantes y prestar más atención a la presentación de información en el aula en medios electrónicos y en papel.

PALABRAS CLAVES: individualized learning, thinking style, hearing impairment.

TITLE: Thinking style-based individualized learning of students with hearing impairment.

AUTHORS:

1. Ph.D. Olga Zhuykova.
2. Ph.D. Yu.V. Krasavina.
3. Senior Lect. E.P. Ponomarenko.
4. Ph.D. Yu.V. Serebryakova.

ABSTRACT: The paper considers studying individualized learning of hearing-impaired students based on their thinking style. The study included identifying individual characteristics of students with and without hearing impairment, designing the learning process based on students' potential capabilities and thinking styles and analyzing the efficiency of the proposed methods. Implementing individual paths based on thinking style-based learning contributed to dealing with challenges associated with teaching hearing impaired students. Application of psychodiagnostics in the educational process enables the teacher to choose specific assignments with an appropriate level of difficulty for students and pay more attention to the presentation of information in the classroom on electronic and paper media.

KEY WORDS: individualized learning, thinking style, hearing impairment.

INTRODUCTION.

The competency-based approach in higher education implies greater individualized learning that fosters students' engagement in independent learning activities and research, self-motivation and personal responsibility for their results including individual planning, self-study, self-organization, self-assessment, self-development and academic achievements (Selezneva, N.,2009).

The literature review has revealed that there are a number of approaches to individualized student learning (Melton, R.F., 1981; Kirsanov, A.A.,1982; Unt, I.E.,1990; Smirnova N.G.,2002; Zhukova, N.M.,2006; Terov A.A., 2009; Zagvyazinsky, V.I., 2011, etc.). Individualized learning can be considered as a system of educational and didactic tools that meet the learning goals and maximize every student's potential (Kirsanov, A.A.,1982). Individualization includes taking into account individual characteristics of students when selecting teaching methods and forms (Unt, I.E.,1990).

Smirnova N.G. (2002) considers individualized learning as a key factor in the self-development of student's creative personality, his professional and personal qualities, behavioral characteristics, as well as learning and professional skills. The scholar reasonably claims that in order to implement the individualization it is necessary to take into account diagnostic data, use varied multilevel individualized assignments for students' independent work and implement active learning methods.

When considering students' personality characteristics, Zhukova N.M. (2006) holds the same position and associates individualization with the possibility of each student to reach his goals, travel his learning path, and further his personal and professional development.

Individualized learning is especially crucial in inclusive education. Although students' disability affects their choice of future profession, most of them chose their degree course because of their individual preferences (Morina, A. et al., 2017). According to Krikun, V.M. & Bobkova, O.V. (2012), Aismontas, B.B. (2018), and other scientists, individualized learning for people with disabilities involves the organization of learning activities and developing their individual working style in accordance with their specific features and needs, and development level.

Individualized learning of hearing-impaired students revolves around their individual characteristics manifested in their cognitive activity, their psychophysical (including hearing) abilities and their ability to mobilize emotional-volitional and intellectual efforts (Bobkova, O.V., 2017). At the same time, educational system should be built on the basis of an individualized approach, increasing the

level of visibility, using means and methods that allow the students to develop their communication skills and form a logical thinking style (Aismontas, B.B., 2018).

Grigorenko, E. & Sternberg R.J. (1995) define thinking style as a way in which people choose to use or exploit their intelligence as well as their knowledge. Being explored for approximately three decades, the concept was applied in different areas including education, proving there is connection between students' thinking style and their academic achievements. However, for hearing-impaired students, the use of effective educational practices based on special features of their thinking styles is understudied and requires further research.

DEVELOPMENT.

The study included identifying individual characteristics of students with and without hearing impairment, designing the learning process based on students' potential capabilities and thinking styles and assessing the efficiency of the proposed methods.

The study involved 152 participants (108 students without hearing impairment and 44 hearing impaired students). The students participating in the study were Mechanical Engineering students at M.T. Kalashnikov Izhevsk State Technical University.

In order to determine students' thinking style, Rezapkina method (Rezapkina, G.V., 2011) was used (the thinking styles were determined as subject-active, visual-figurative, verbal-logical, abstract-symbolic and creative).

A *subject-active* thinking style that characterized by information processing through actions and the sequential execution of operations predominates among practically minded students. People with a practical thinking style appear to be best suited for engineering work and build an objective world. Artistically minded students tend to have a *visual-figurative* thinking style. They are likely to carry out activities related to the transformation of visual images and representations (architecture, design, etc.).

Individuals with a distinct verbal intelligence are characterized by a *verbal-logical* thinking style, thanks to which they can clearly formulate their thoughts, reason logically, draw valid conclusions and convince. For students with a mathematical mindset, *abstract-symbolic* thinking style is natural, in which information processing occurs using formulas and operations. Finally, students who are able to think creatively find a non-standard solution to the problem; possess *creativity* that is much in demand, especially in modern engineering and graphic work.

In order to determine their thinking styles, students were asked to fill in the questionnaire including 40 questions during 45 minutes. The respondents were answering the questions while staying in the classroom.

Prevailing thinking styles of the students without hearing impairment studying in one academic group are shown in Figure 1. There is no significant difference in the results for other academic groups for students without hearing impairment. From the bar chart, it is clear that there are students with different thinking styles. Interestingly, the development of thinking styles is different as well (0-2 points indicate low level; 3-5 points – average level; 6-8 points – high level).

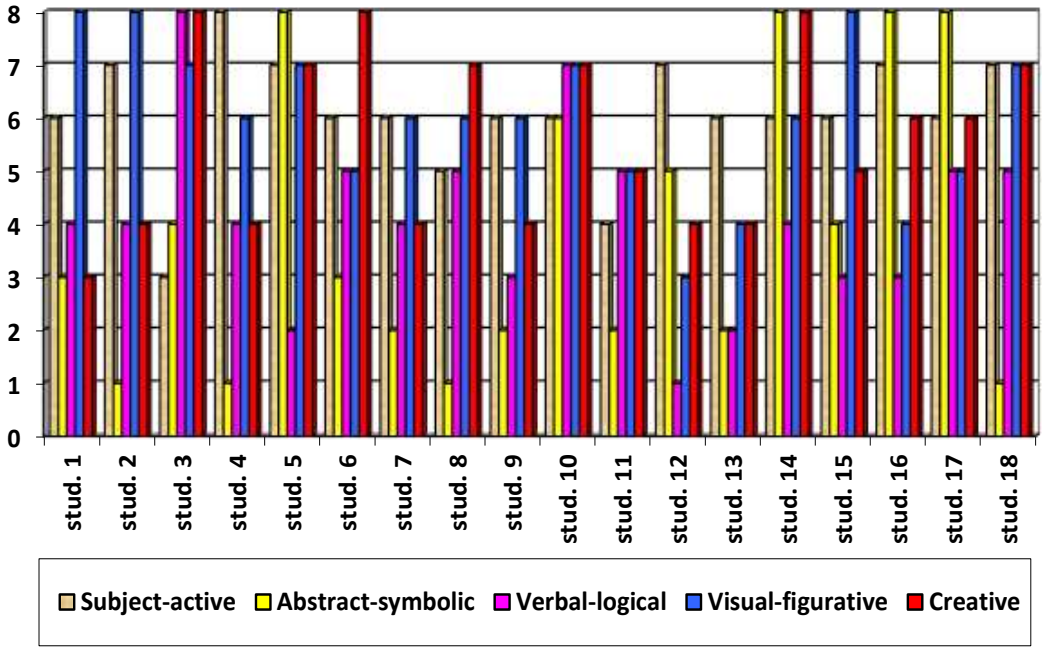

Fig. 1. The study results of thinking styles for students without hearing impairment

The study results of prevailing thinking styles for all the respondents are presented in table 1.

Table 1. Students' thinking styles distribution.

	Subject-active	**Abstract-symbolic**	**Verbal-logical**	**Visual-figurative**	**Creative**
Students without hearing disabilities	83%	47%	30%	62%	50%
Hearing impaired students	80%	40%	22%	59%	40%
Deaf students	75%	45%	20%	50%	43%

The study showed that subject-active and visual-figurative thinking styles prevail among the respondents. This is true for both students with and without hearing impairment.

Taking these results into account, specific assignments for students with particular thinking styles were designed when teaching Descriptive Geometry and Engineering Graphics courses. The students having subject-active and visual-figurative thinking styles were provided with the assignments aimed at searching for material demonstrating the main stages of the design engineer's work, as well as a visual representation of independently mastered specific operations and actions for creating sketches, working drawings, assembly drawings, and design documentation.

Before performing a sketch of any unit, students learned its name, elements, surfaces, material, applications, and what parts it was made of. Then, students developed a detailed drawing of the unit based on the created sketches. Also, using multimedia animation in the KOMPAS - 3D graphics editor, students demonstrated the unit from different sides in order to outline the internal shapes and forms. As a result of this assignment, students gained deeper knowledge necessary for the competent execution and design of sketches and detailed drawings of units.

The students also solved practical problems, illustrating, for example, the relationship of a subject with the professional activities of a design engineer. In addition, there were assignments involving searching for details of complex configuration (cylindrical, spherical, torus, conical surfaces), as well as examples of cut lines and intersection lines of surfaces so that students could compare objects, with which they worked on practical classes, with their real samples used in everyday life. Assignments and integrated modeling were aimed at designing, calculating and drawing original details.

Students were also introduced to advanced and promising technologies of modern design in the field of engineering, proceedings of annual scientific and practical conferences. It, eventually, promoted students' interest in their future engineering career.

The students with a prevailing verbal-logical thinking style performed various individual assignments and presented them in the form of a report with a presentation. While gathering material on the research topic, students got acquainted with papers of scientific conferences, read specialized literature, and used electronic libraries and virtual laboratories together with scientific and educational Internet resources. The main form of reporting was students' self-presentation.

The students learned about engineering specificities at the local industrial enterprises, they were introduced to their products, existing design developments, and technologies ensuring competitive product outputs. The information obtained was reflected in students' essays and reports. Specifically, students were familiarized with products used in space industry, complex security systems, modern communications, oil production equipment. Moreover, students explored the latest patents of local inventors and rationalizers. From 2017 to 2019 students worked on such topics as Engineering Designer Job, Regional advances in Mechanical Engineering, Patents in Mechanical Engineering, Leading Engineering Designers, etc. The students were also invited to visit annual industrial exhibitions to see the main technology and technique developments. After visiting the exhibition, students presented a report and photos, which were evaluated on the basis of a rating system developed by the group expert assessment method (Zhuykova, O.V., 2016)

Practice has shown that most hearing-impaired students experience difficulties at all stages of report preparation and presentation, and need help and guidance throughout the process. Academic staff provided them with assistance in the framework of the related courses. While working or speaking to the class, students had to comment on each single action, while reading, they had to follow their finger through the text (Leongard, E.I. & Stanevsky, A.G., 2009). In each class, particular attention was paid to memorizing terms and definitions; it contributed not only to memorization of the text, but also to mastering and deeper understanding the subject.

The students with an abstract-symbolic and creative thinking styles were involved in the research work in the following areas: Theory and Practice of Innovative Integrative Graphic Design Course, Improving a Graphic Design Training Course through the Use of 3D Models of Standard and Typical Details, Computer Simulation of Electronic Devices, Development of Promising Electrical Circuits according to the Technical Specifications of Enterprises.

An independent choice of the topic of research work was welcomed; for example, in 2018, students prepared reports on such topics as History of Engineering Graphics, Outstanding Graphic Designers, Information Technology in Engineering and Teaching Engineering Graphics to Design Engineers and others. Student works included problem solving, setting goals and statistical data analysis.

Preparing scientific reports and presenting them in front of the audience, students learned to hypothesize, choose research methods, express their thoughts in a logical and science-based manner, generalize and draw conclusions. It was a great challenge for deaf and hearing-impaired students, and in each case the progress was evaluated individually in accordance to the goals set before the beginning of the work.

According to the analysis of academic achievements of students being involved in individualized learning paths based on the their thinking style, the majority of them (96%) showed satisfactory results in final test in Descriptive Geometry and Engineering Graphics courses. Besides, hearing-impaired students successfully participated in creative competitions held at the Department. In 2018, an intra-university Olympiad in Engineering and Computer Graphics was held among freshmen, where a team of hearing-impaired students consisting of five people took part. Three students had a sufficient level of speech perception and good speech skills, two students were profoundly deaf. Their learning individual path concentrated on virtual realistic computer 3D-

modelling and technical drawing. The team showed 4th result, while one of the totally deaf students showed 3rd result among 135 participants of the Olympiad.

CONCLUSIONS.

Teaching hearing-impaired students presents a definite challenge for a number of reasons. Most students have poor initial level of competence in subjects that require the use of integrative skills, such as Descriptive Geometry and Engineering Graphics. Besides, due to specific physiological and psychological characteristics they require slower pace of learning and specific style of information presentation.

In our view, implementing thinking style-based learning can contribute to dealing with these challenges. Application of psychodiagnostics in the educational process enables the teacher to choose more specific assignments with an appropriate level of difficulty for students and pay more attention to the presentation of information in the classroom on electronic and paper media. However further research is needed for better understanding of how planning thinking style-based individual learning path affects students' academic achievements.

The study was supported by RFBR grant № 19-013-00701 «The analysis of visual information processing triggered by digital and non-digital platforms and its effect on mental models' development when teaching hearing impaired students».

BIBLIOGRAPHIC REFERENCES.

1. Aismontas, B.B., Odintsova, M.A. (2018) Educational Environment in University as a Resource for Resilience and Self-Activation in Students with Disabilities. Psikhologicheskaya nauka i obrazovanie [Psychological Science and Education], Vol. 23, (2), 29–41. (In Russ., abstr. in Engl.)

2. Bobkova, O.V. (2017) Education for students with disabilities and students with disabilities. Saransk. (in Russ.)
3. Grigorenko, E.L., Sternberg, R.J. (1995) Thinking Styles. In: Saklofske D.H., Zeidner M. (eds) International Handbook of Personality and Intelligence. Perspectives on Individual Differences. Springer, Boston, MA
4. Kirsanov, A.A. (1982) Individualization of educational activity as a pedagogical problem. Kazan: Kazan University Press. (in Russ.)
5. Krikun, V. M., & Bobkova, O. L. (2012). Principles of ICT application in continuous integrated education programs for people with disabilities. Vysshee obrazovanie v Rossii, (2), 93-97. (in Russ.)
6. Leongard, E.I. & Stanevsky, A.G. (2009) Hearing rehabilitation of deaf and hearing impaired students. Reality and perspectives. Raduga zvukov. (2), 22-23. (in Russ.)
7. Melton, R.F. High Educ (1981) Individualized learning methods in perspective. Vol.10 (4), 403-423.
8. Moriña, A., Molina, V. M. & Cortés-Vega, M.D. (2018) Voices from Spanish students with disabilities: willpower and effort to survive university, European Journal of Special Needs Education, 33:4, 481-494.
9. Rezapkina, G.V. (2011). Psychology and career choice: Preprofile training program. Moscow: Genezis (in Russ.)
10. Selezneva, N.A. (2009) The problem of implementing a competency-based approach to education outcomes. Vysshee obrazovanie v Rossii. (8), 3-9. (in Russ.)
11. Smirnova, N.G. (2002) Individualization of professional training of students in teacher training college based on the use of positional and contextual education. Yaroslavl. (in Russ.)

12. Terov, A.A. (2009) Pedagogical conditions for the individualization of the educational process in high school rural schools. Moscow. (in Russ.)
13. Unt, I.E. (1990) Individualization and differentiation of education. Moscow: Pedagogika. (in Russ.)
14. Zagvyazinsky, V.I. (2011) The current educational situation and prospects for the development of Russian education. Tomsk State University Journal, (9), 14 – 20. (in Russ.)
15. Zhuykova, O.V. (2016). Features of teaching descriptive geometry of students with hearing impairment. Innovatsii v obrazovanii conference. pp. 250-253 Innova: M.T.Kalashnikov Izhevsk State Technical University. (in Russ.)
16. Zhukova, N.M. (2006) Individualization and differentiation of university students. Moscow. (in Russ.)

DATA OF THE AUTHORS.

1. Olga V. Zhuykova. Ph.D. in Education, Associate Professor at Graphic Design and Advertising Technology Department, M.T. Kalashnikov Izhevsk State Technical University, Russia.

2. Yuliya V. Krasavina. Ph.D. in Education, Associate Professor at Professional Pedagogy Department, M.T. Kalashnikov Izhevsk State Technical University, Russia, e-mail: juliadamask@yandex.ru

3. Ekaterina P. Ponomarenko. Ph.D. student, Senior Lecturer at English Language Department, M.T. Kalashnikov Izhevsk State Technical University, Russia.

4. Yuliya V. Serebryakova. Ph.D. in Culturology, Associate Professor, Head of the Department of Humanities, Socio-Economic and Natural Sciences, Izhevsk Law Institute – the branch of The All-Russian State University of Justice (RLA of the Ministry of Justice of Russia).

RECIBIDO: 11 de diciembre del 2019. **APROBADO:** 24 de diciembre del 2019.