

Learning success factors for university students in context of digitalization in education

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Abstract — Due to rapidly changing modern world technologies, the employers, when hiring the university graduates, enquire not merely into the level of their professional knowledge, but also a predisposition toward learning, potential *successfulness*, capabilities and *actual abilities*.

Currently, due to digitization in education, the problem of learning success of university students is of particular relevance, since *successfulness* is a value category reflecting a person's idea of the purpose of life.

The article discusses the influence of some general personality abilities on the learning success of a university student pursuing a degree in Pedagogical Education with profile of Mathematics and Computer Science.

In the course of the research, the most demanded abilities for future teachers of mathematics and computer science were chosen. Such abilities include: analytical abilities, spatial perception, visual thinking, ability to count, verbal abilities. The authors in their research analyzed the dependence of the influence of all combinations of abilities on the student's academic success. Empirical evidence suggests that not all of the abilities chosen for research unambiguously determine the student's academic success.

As a result of the study, models of dependence of learning success on types of combinations of various abilities were developed and the correlation of combinations of levels of development of abilities and learning success of students of higher educational institutions majoring in Pedagogics was evaluated.

Keywords — *learning success, abilities, pedagogical education.*

I. INTRODUCTION

In pedagogy, the issue of learning success has a long history of research, from secondary school to postgraduate education. The causes of this issue were explained by the influence of the intellect on the learning activities of students, the teacher's skill; besides, the need for an individual approach was emphasized. In later research works, there was a tendency to study the effect of motivation on academic performance of students at school. And, finally, it was found out that student's personality traits represent an important factor that had a direct impact on learning activities and success.

Recently, researchers have come to the conclusion that the academic performance of students is influenced by such factors as intellectual and personal characteristics, motivation, value orientations, educational process organization, teacher's level of pedagogical skills, independent studies, self-regulation and self-management level, etc.

But this issue still remains the area of disagreement where two completely opposite points of view on the aspect of determining the main factors for ensuring academic achievement and preventing academic failure exist.

At the same time, the issue of determining the influence of various factors on the academic success of university students has not been studied sufficiently. At the same time, this is one of the urgent problems of higher education. According to the psychological and pedagogical community, the student learning success is not only a professional problem, but also one of the components of psychological health.

The term "Learning Success" was introduced in education in 1935 by B.G. Ananyev. The essence of this definition is determined by the optimal combination of pace, intensity, style of study, degree of diligence and effort that the student makes to achieve certain results [1].

From the point of view of the psychological direction, the learning success is defined as a student's certain emotional state, which expresses personal attitude to the activity and its results [5, 10, 11, 16,17].

Smirnov S.D. recognizes that the question of the influence of abilities on the student learning success seems trivial, but the nature of this influence is not as straightforward as it appears at the first glance. Much depends on the place which the abilities occupy in the personality structure of a particular student, in the system of life values and how they impact the development of other personal qualities [11]. The scientist allocates such relatively independent components in the structure of abilities as general intelligence, social intelligence, special abilities and creativity. He also noted the presence of positive relationship only of relatively special abilities with learning success. Such abilities include sensory abilities (phonemic sensitivity for a linguist, pitch modulation sensitivity for a musician, color sensitivity for an artist, etc.);

motor abilities (schematonics and fine motor coordination for athletes, dancers, circus performers, etc.); professional abilities (technical thinking, spatial thinking, mathematical thinking, etc.). In many cases, the low level of development of professionally important special abilities simply makes successful training in a higher educational institution of the appropriate profile inaccessible. And vice versa, successful training in a higher educational institution will in fact coincide with development of special professional abilities.

Pedagogical approach considers the learning success in terms of the quality of education, in the context of efficiency problem and learning performance [2, 4, 6, 7, 15].

The criteria for academic success is academic (learning) performance, reflecting in the score (mark) level of academic achievement, as well as interest, motivation, quality and methods of mental activity (effort, intensity, pace, duration, consistency, ratio of rational and irrational methods, etc.) [12].

In the process of learning, the students constantly correlate their abilities and capacities with the requirements of standards and peculiarities of studying at a higher educational institution in a chosen educational program. And, if their expectations were not met, or the students' abilities did not meet the requirements of university education (they are at an insufficient level of development for mastering the program), then the students leave the educational institution. As a rule, by the third year of study, there remain those students who established themselves in the correctness of the choice of their professional activity [13, 14]. Thus, the students from the third to the fifth year of study were chosen for the research.

As known, the quality of professional personnel is a determining factor in the level of competitiveness of the digital economy. The growing role of human capital assets as the main factor of economic development leads to the fact that it is the teacher who becomes the main figure in the practical implementation of economic and information technology innovations. At the same time, the productivity of the teacher's activities depends not only on the level of professional competence and professionalism, but also on the level of success. Consequently, the professional success of students of pedagogical educational institutions largely determines the progressive development of education and society as a whole. Thus, the students pursuing a degree in Pedagogical Education with profile of Mathematics and Computer Science were chosen for the present research.

Considering the issues of professional self-determination, the researchers discuss the dependence of abilities and the chosen type of activity and the training profile. Thus, the English psychologists Jim Barrett and Jeff Williams [3] identified some basic abilities and their combinations, which, in their opinion, are of great importance for a teacher, a mathematician, a scientist.

Having studied the competences of the Federal State Educational Standards of Higher Education for Educational Program 44.03.05 "Pedagogical Education" (with two profiles), we came to the conclusion that in order to succeed in future professional activities, graduates must have general competencies, in particular, ability to search for information,

to perform critical analysis and synthesis. Development of such competencies is promoted by the introduction of distance learning, the use of information technologies in the educational process, which requires the student to have such abilities as well-developed spatial perception, analytical abilities, abilities to count, and visual thinking.

In order to perform an organizational function (involving students in the scheduled activities, cooperating with them in achieving the intended goal), the future teacher must have well-developed verbal abilities.

II. PROBLEM STATEMENT

The problem of learning success is complex and depends on many factors, including the structure of abilities. In psychological and pedagogical literature, we did not find a description of the key abilities that are characteristic of the future teacher of mathematics. Considering the criteria for learning success, the influence of various abilities and their combinations on learning success, the relationship between learning success and abilities is established. In this article, we consider the relationship between certain types of abilities, as well as their combinations and the success of students pursuing a degree in Pedagogical Education.

III. RESEARCH QUESTIONS

The subject of the research is the correlation between the learning success and the structural model of abilities for students pursuing a degree in Pedagogical Education (Educational Program 44.03.05 with two profiles), profile of Mathematics and Computer Science.

IV. PURPOSE OF THE STUDY

The purpose of the research is to identify the relationship of the structural model of personality abilities with the learning success of students training in Pedagogics.

V. RESEARCH METHODS

Empirical research was conducted on the basis of the Kurgan State University.

To study the individual abilities of the students' personality, the following test methods suggested by Jim Barrett and Jeoff Williams [3] were used:

- verbal aptitude test;
- counting ability test;
- spatial perception level test;
- visual thinking level test;
- analytical abilities level test.
- The following indicators were considered as criteria for the student learning success:
- academic performance;
- motivational (striving for self-development, openness for vocational training, which involves participation in the activities of student scientific communities,

attendance of additional classes, elective courses, participation in academic competitions, etc.);

- operational (ability to study the material independently: writing notes, essays, associated with independent search of information (including the use of information technologies), conducting student research; the ability to apply this knowledge in practice).

To analyze the relationship between the structure of abilities and academic (learning) success of the students pursuing a degree in Pedagogical Education (Educational Program 44.03.05 with two profiles) with profile of Mathematics and Computer Science, we used the functionality of MS *Excel* to develop the appropriate models.

VI. FINDINGS

As a result of the experiment, it was established that learning success for future teachers of mathematics and computer science correlates with analytical (correlation coefficient is 0.77) and verbal abilities (correlation coefficient is 0.79). In addition, the correlation of academic success and the development level of analytical abilities, as well as verbal abilities, is polynomial.

At the same time, in our research, we examined the complex impact of abilities on the academic success of the students. Having developed the matrix of the structure of the chosen abilities and applied weighted coefficients, allowing to avoid ranking the abilities of different types, we came to the conclusion that the greatest positive influence on the level of academic success of future teachers of mathematics and computer science is a combination of analytical abilities and spatial perception (correlation coefficient is 0.89), analytical abilities and counting abilities (correlation coefficient is 0.84), visual thinking and counting abilities (correlation coefficient is 0.81), spatial perception and visual thinking (correlation coefficient is 0.80), counting ability and verbal abilities (correlation coefficient is 0.79).

The results are in good agreement with the conclusions of Jim Barrett and Jeff Williams, who believe that the combination of advanced analytical abilities and spatial perception is characteristic of professions that require the ability to combine visual perception with a scientific approach; the combination of analytical abilities and counting abilities is important to the activities associated with numerical regularities; visual thinking and counting ability are especially valuable for professions requiring a high level of abstraction; spatial perception and visual thinking are essential for activities which combine scientific thinking with the ability to visualize three-dimensional mental images; and, finally, the counting ability and verbal abilities are the prerequisites for professional success in education management activities.

Continuing to combine various types of abilities, we found out that a triple of such abilities as analytical abilities, spatial perception and visual thinking polynomially influences the student's academic success (correlation coefficient is 0.84). A relatively steady relationship with learning success is demonstrated by combination of analytical abilities, visual thinking and counting ability (correlation coefficient is 0.79)

and combination of analytical abilities, counting ability and verbal ability (correlation coefficient is 0.78). The influence of such triples on the academic success of the future teachers suggests some correlation between these types of abilities that requires further research. However, the combination of a larger number of abilities indicates the absence of correlation, which allows to make a conclusion about the significance of specific abilities for the learning success.

VII. CONCLUSION

The results of the study suggest that the academic success of the students of pedagogical profile is largely related to the level of development of analytical and verbal abilities.

Thus, the most effective way to improve the academic performance of students of pedagogical profile is based on the development of such abilities.

Constructed models of the dependence of learning success on the types of combination of various abilities suggest that if analytical abilities, counting abilities, spatial perception and visual thinking can be developed in context of digitalization in education, then the development of verbal abilities requires interaction between participants of the educational process.

Perhaps it makes sense to develop a model of multiple regression, where various types of abilities will be used as variables with an assessment of their significance for the successful learning of students of pedagogical profile. But this is the subject of the further research.

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