Proceedings IFTE-2019, 927-936
doi:10.3897/ap.1.e0881

V International Forum on Teacher Education

Factors Affecting the Quality of Learning Outcome in a Higher Educational Institution

Rashida G. Gabdrakhmanova*(a), Guzel I. Garnaeva (b), Leonid A. Nefediev (c), Anvar N. Khuziakhmetov (d)

(a), (b), (c), (d) Kazan Federal University, 420008, Kazan (Russia), 18 Kremlyovskaya street

Abstract

The quality of the students' educational outcomes is reported to be one of important problems attracting scholarly attention. Every employer seeks highly qualified employees. Academic performance is one of the indicators of professional learning outcomes. University achievement is influenced by various factors. The goal of our study is to explore the relationship between student university academic outcomes and the quality of school education they received before entering university. The Institute of Physics at Kazan Federal University introduces several foundational academic programs of higher education. For this particular study we selected the second and third year students from three different programs having assumed that the first year students have already gone through their period of adaptation and proceeded to the next stage of their studies. The first stage of our pedagogical analysis leads us to see that there is no relationship between the students' training results and the type of school (rural or urban) they graduated from. We've come to such a conclusion based on correlation mining and structural analysis of the data matrix.

Keywords: education; adaptation; freshman; evaluation; correlation matrix; rural school; urban school.

Published by Kazan federal university and peer-reviewed under responsibility of IFTE-2019 (V International Forum on Teacher Education)

* Corresponding author. E-mail: rashgabdra@mail.ru

Introduction

The period of being a student attracts the attention of philosophers, psychologists, physiologists, sociologists and teachers. The quality of the students' educational outcomes is reported to be one of important problems attracting scholarly attention. Each employer wishes to get a professional employee with the advanced and solid knowledge which he or she can successfully put into practice. Today, the students in a higher professional institution are making efforts to master the theoretical knowledge in their future craft and tomorrow they are already applying the acquired knowledge when working jobs related to their specialization (Gabdrakhmanova, Garnaeva, & Nefedyev, 2017). Academic performance is one of the indicators of the educational quality (Solovyov, 2004). The abovementioned scientists applied various approaches but we decided to use correlation mining and structural analysis of the data matrix (Garnaeva, Kuznetsov, & Nefedyev, 2008) what makes it possible to detect various underlying factors.

Purpose and objectives of the study

In order to implement our study we set the following objectives:

1) to study psychological and pedagogical literature devoted to the theory and practices in modern higher education as well as to the problems associated with the educational quality and factors affecting educational quality at higher education institutions including methods of scientific research;

2) to determine the indicators,

3) to select a method,

4) to identify a groups of students for analytical work;

5) to draw conclusions of analytical work results.

Special aspect of comparative data analysis

The method of comparative analysis is found in many studies (Graf, 2016; Mahoney, 2004; Skocpol & Somers, 1980). Employment of the correlation matrix and its structural processing, which has been repeatedly tested by scientists in their research, makes possible to identify hidden factors that affect the object of study.

Status of a problem

To solve the emphasized problem we addressed to the following scientific studies:

- theory and practice of modern higher education,
- research considering a student as the subject thereof,
- studies investigating the problems in the field of instruction quality at an educational institution,
- scientific examination specifying the methods used in research.

Analyzing these works and many other scientific studies according to the problem selected, we have found that the matters concerning the studies of interrelationship between University students' educational outcome and type of school (rural or urban) they have left before entering the higher educational institution, appeared to be under-investigated. We suggest using correlation and structural analysis to determine this interdependence increasing thereby the number of techniques.

Hypothesis of study

The University admits students who have successfully completed school and passed USE (a Unified State Exam). If to mark the places of permanent residence for Kazan Federal University enrollees we shall need a map of the world, since the geography of applicants is so wide. All prospective university

students can be divided into two categories: those who finished a village school and city school leavers. We have formulated the hypothesis of the study: whether the fact of teaching a student in a rural or urban school before entering the University has a strong impact on his / her academic progress.

Literature review

Researchers are exploring the problem of the students' educational outcome from various standpoints. For instance, scientists study the influence of stress severity (Clinciu, 2013); social class background (Hansen & Mastekaasa, 2006); upon the student's achievement at University; as well as the interdependence of family parenting style, current family and friendship relations, distancing from those cultural environment where the students were raised (Lehmann, 2014; Khuziakhmetov & Gabdrakhmanova, 2015); students' academic performance structural survey (Garnaeva et al., 2008); academic achievement of rural students at Universities of a higher rank (Postiglione, Ailei, Jung, & Yanbi, 2017); new teaching methods introduction (Gabdrakhmanova, 2015; Gabdrakhmanova, Khusainova, & Chirkina, 2016b); students' adapting to teaching and learning activities (Zhegulskaya, 2011); cultural incorporation of rural schoolchildren into urban culture and adaptation to a higher educational institution (Xiulan, 2015); teaching mathematics in rural and urban school (Young, 2010); developing academic curriculum on modular basis (Garnaeva, Aganov, Nefedyev, & Nizamova, 2015); creativeness in teacher and student's joint working within educational process (Khuziakhmetov & Gabdrakhmanova, 2016); employing network information resources in the educational process to facilitate adaptation of students (Garnaeva, Nizamova, & Temnikov, 2015; Gabdrakhmanova, Khusainova, & Chirkina, 2015); social activity and academic progress (Nuñez, 2009; Gabdrakhmanova, Khusainova, & Chirkina, 2016a). The problem of students' progress is also discussed at upgrade training courses for university professors (Gabdrakhmanova, Khusainova, & Chirkina, 2015; Gabdrakhmanova, Kalimullina, & Ignatovich, 2016; Lim & Morris, 2009; Brady & Bates, 2015; Gagné, & White, 1978; Purdie, & Hattie, 1999; Zimmerman, Bandura, Martinez-Pons, 1992). All the above mentioned constitute merely a part of studies devoted to the problem of teaching students effectively (Temnikov et al., 2015; Gabdrakhmanova et al., 2015).

Methodology

Theoretical and empirical methods

The Institute of Physics of Kazan (Volga Region) Federal University served as the base for the given study. To confirm the hypothesis we used a set of different methods that complement each other:

Theoretic methods: theoretical analysis and synthesis of philosophical, methodological, pedagogical, psychological, sociological, scientific-methodical literature, generalization, comparison.

Empiric methods: documentation study, qualitative and quantitative analysis of experimental results, statistical and mathematical research methods.

Description of the experiment and operating procedure of applying correlation and structural analysis

Correlation mining and structural analysis (Garnaeva et al., 2008) were selected to function as diagnostic methods. Such analyses make possible to reveal hidden factors influencing the object under study. The group of second and third year students being educated at the Institute of Physics according to the following programs: radiophysics, pedagogical education, geodesics and remote sensing, has become the object of the given study. The total number of students participating in the study amounted to 155. The total number of student groups made 8. For the analysis we have determined the following parameters: students' grade points in disciplines for the current semester in the second and third year, final points on the

subject (credit tests and exams), student's gender and place of residence before entering the University (as we wanted to find out: whether student's academic progress is affected by the fact of his / her studies in rural or urban school before entering the University). The findings of investigating the complicated system of the students' academic progress (at the Institute of Physics of KFU) are presented in the form of a data matrix wherein the rows made students of the groups under study and the columns represented their grade points in a discipline for the current semester, marks for the exams passed in the current semester, student's gender and place of residence before entering the University. In total, we selected 56 subjects most of which is relating to a natural-science cycle disciplines.

Results

Experimental procedure and results

The Institute of Physics of KFU implements several basic professional academic programs of higher education. At enrolling students for a freshmen year with training according to a specific program, their results of the secondary school final exams (EGE) are duly considered for a particular set of disciplines. With a view to the given study we selected the second and third year students of three different training programs. We assumed that the first year students have already passed their period of adaptation and proceeded to further training with measured steps. After performing calculations we received the data which were distributed according to the field of education and presented in the form of a graph showing how interdependent were the facts chosen by us.

Geodesics and Remote Sensing (3d year)

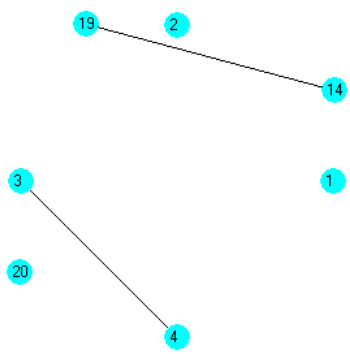

Fig. 1. Weighted graph of correlative relationship at control status P=0.999 (3 – mathematics, 4 – physics, 14 – radiophysics and radioelectronics, 19 – land cadastre geodetic base, 1 – student's gender, 2 – astronomy, 20 – student's place of residence before entering the University).

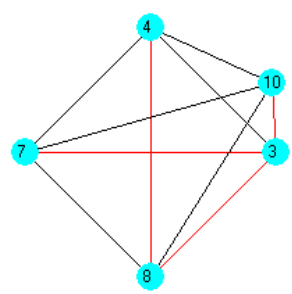

Fig. 2. Weighted graph of correlative relationship at control status P=0.95 (3 –mathematics, 4 – physics (1st semester), 7 – probability theory and mathematical statistics, 8 – physics (2nd semester), 10 – theoretic manipulation of geodetic measurements).

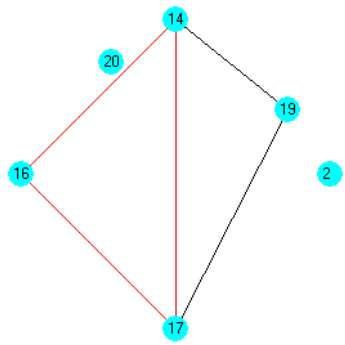

Fig. 3. Weighted graph of correlative relationship at control status P=0.95 (2 – astronomy, 14 – radiophysics and radioelectronics, 16 – higher geodesy, 17 – remote probing, 19 – land cadastre geodetic base, 20 – student's place of residence before entering the University).

Geodesics and Remote Sensing (2nd year)

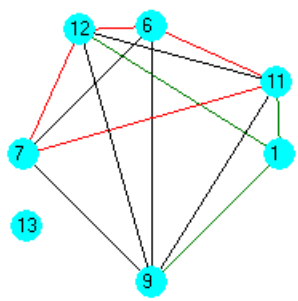

Fig. 4. Weighted graph of correlative relationship at control status P=0.95 (1 – student's gender, 6 – mathematics, 7 – probability theory and mathematical statistics, 9 – geodetic astronomy, 11 – theory of geodetic measurements processing, 12 – physics, 13 – student's place of residence before entering the University).

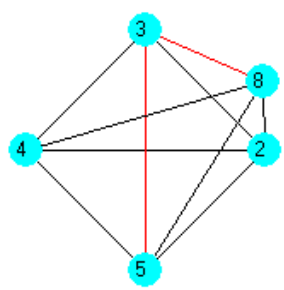

Fig. 5. Weighted graph of correlative relationship at control status P=0.95 (2 – mathematics, 3 – physics, 4 – geodesics, 5 – mathematics, 8 – geodetic astronomy).

Pedagogical education (2nd year)

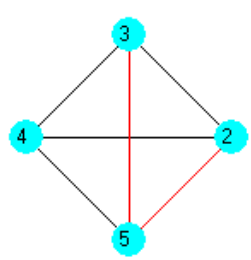

Fig. 6. Weighted graph of correlative relationship at control

status P=0.95 (2 – analytical geometry and linear algebra (1st semester), 3 – introduction to physics (1st semester), 4 – analytical geometry and linear algebra (2nd semester), 5 – introduction to physics (2nd semester).

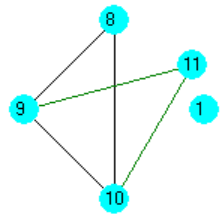

Fig. 7. Weighted graph of correlative relationship at control status P=0.95 (1 – student's gender, 8 – mathematical analysis, 9 – mechanics, 10 – chemistry, 11 – student's place of residence before entering the University).

Pedagogical education (3rd year)

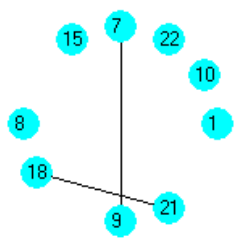

Fig. 8. Weighted graph of correlative relationship at control status P=0.999 (1 – student's gender, 7 – linear algebra and analytical geometry, 8 – Theory and methodology of education and upbringing, 9 – philosophy, 10 – foreign language, 15 – methods of pedagogical and psychological interaction between the educational process participants, 18 – history of physics development, 21 –electricity and magnetism, 22 – place of the students' arrival).

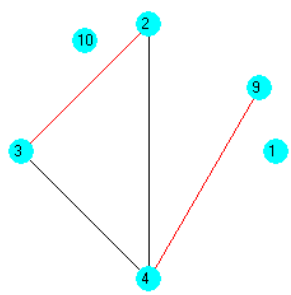

Fig. 9. Weighted graph of correlative relationship at control status P=0.99 (1 – student's gender, 2 – linear algebra and analytical geometry, 3 – general framework of Pedagogics, 4 – Russia in the context of worldl history, 9 – philosophy, 10 – foreign language).

Radiophysics (2nd year)

Fig. 10. Weighted graph of correlative relationship at control status P=0.99 (1 – student's gender, 13 – student's place of residence before entering the University).

Radiophysics (3d year)

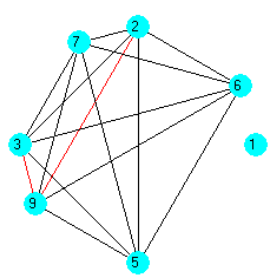

Fig. 11. Weighted graph of correlative relationship at control status P=0.99 (1 – student's gender, 2 – analytical geometry, 3 – mathematical analysis (1st semester), 5 – linear algebra, 6 –mathematical analysis (2nd semester), 7 – probability theory and mathematical statistics, 9 –differential equations).

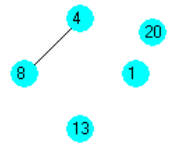

Fig. 12. Weighted graph of correlative relationship at control status P=0.999 (1 – student's gender, 4 – mechanics, 8 –molecular physics, 13 – electricity and magnetism, 20 – semiconductor electronics).

Training programs for various groups of students are different but we have obtained quite similar results for all three fields of education. The comparative analysis did not reveal any dependence between learning outcomes and the student's finishing either village or city school before entering the University. All our graphs show that the student's place of residence before entering the University is not at all connected with training results. Whether a student finished either rural or urban school appears to be of no importance. Each school has given its leavers all basic knowledge, skills and abilities which are prescribed in the educational standard for the secondary school and which helped them to enter the University and subsequently study thereat.

Discussions

School leavers in the Russian Federation enter University based on EGE (Unified State Exam). And this situation is permanently debated. It is widely thought that studying at a city school enhances the likelihood of entering University and guarantees successful study there. We made an attempt to check this assumption. Reliability and validity of the given study is caused by employing up-to-date research methodology based on psychological and pedagogical sources as well as teaching techniques. Harmonious exploitation of theoretical and experimental research methods has also preconditioned the adequacy of data.

Conclusion

The main conclusions of the study are as follows:

1. The interrelationship between students' training results within the second and third year of education and type of school (rural or urban) a student finished before entering University has not been revealed. The data inserted into correlation matrix indicate that the relationship is proven to exist only between the other data that we have selected.

2. We have found out to what extent other factors identified are interlinked. Black lines indicate strong connections, for instance, learning outcomes in mathematics are strongly connected with training outcomes in geodetic astronomy. Red lines indicate weak connections, for example, linear algebra training result and differential equation learning outcomes.

3. We are also interested in interdependence between the results of training in linear algebra, analytical geometry and a discipline called 'Russia in the context of world history'. We could manage to discover this interconnectedness as a result of our research and one more thing that got us interested was astronomy because it was not at all related to other subjects under study. It is possible that

relatively soon these facts will be investigated by us.

Acknowledgments

This study has been performed according to the Russian Government Program of Competitive Growth of Kazan Federal University.

References

Nuñez, A. M. (2009). Organizational effects on first-year students' academic outcomes at a new public research university. *Journal of College Student Retention: Research, Theory & Practice, 10*(4), 525-541.

Clinciu, A. I. (2013). Adaptation and stress for the first year university students. *Procedia-Social and Behavioral Sciences*, *78*, 718-722.

Young, D. J. (2000). Rural differences in student achievement: The effect of student perceptions. *Educational Research and Evaluation, 6*(3), 207-228.

Gabdrakhmanova, R. G. (2015). Sovremennye formy organizatsii uchebnoi deyatel'nosti studentov [Modern forms of organization of learning activities students]. *Kazanskiy pedagogicheskiy zhurnal,* 3(110), 79-82.

Gabdrakhmanova, R. G., Garnaeva, G. I., & Nefediev, L. A. (2017). Influence of Prior Academic Performance On The Adaptation Of Students To University. *The European Proceedings of Social & Behavioural Sciences,* XXIX, 174-188. doi: http://dx.doi.org/10.15405/epsbs.2017.08.02.22

Gabdrakhmanova, R. G., Kalimullina, G. I., & Ignatovich, V. G. (2016). Professional pedagogical education quality management. *Mathematics Education, 11*(1), 103-112.

Gabdrakhmanova, R. G., Khusainova, R. M., & Chirkina, S. E. (2015). Otchet prepodavatelya o realizacii uchebnoy discipliny v sisteme upravleniya kachestvom professionalnogo obrazovaniya [The report on the implementation of the discipline in the quality management system of vocational education]. *Pedagogicheskoe obrazovanie v Rossii,* 6, 20-25.

Gabdrakhmanova, R. G., Khusainova, R.M., Chirkina, S. E. (2016a). Ob akademicheskoy mobilnosti studentov v usloviyah setevogo vzaimodeystviya [On the Academic Mobility of Students in Networking environments]. *Education and Self Development, 1*(47), 58-64.

Gabdrakhmanova, R. G., Khusainova, R. M., Chirkina, S. E. (2016b). Razrabotka mezhvuzovskogo EOR v usloviyah setevogo vzaimodeystviya [Development of inter-university EER under conditions of network interaction]. *Alma mater (Vestnik vysshey shkoly),* (11), 55-59.

Garnaeva, G. I., Aganov, A. V., Nefediev, L. A., & Nizamova, E. I. (2015). Pedagogicheskaja tehnologija i modul'noe obuchenie kak faktory razvitija vysshego pedagogicheskogo obrazovanija [Pedagogical technology and modular training in the development of

education]. *Kazanskiy pedagogicheskiy zhurnal*, 3(110), 10-23.

Garnaeva, G. I., Kyzneshov, E., & Nefediev, L. A. (2008). Strukturnye issledovanija uspevaemosti studentov fizicheskogo fakul'teta TGGPU [Structural studies of student performance, faculty of physical TGGPU]. *Vestnik TGGPU, 4*(15), 10-13.

Garnaeva, G. I., Nizamova, E. I. & Temnikov, D. A. (2015). Rol' setevyh informacionnyh resursov v upravlenii nauchno-issledovatel'skoj dejatel'nost'ju studentov [The role of network information resources in the management of research activities of students]. *Kazanskiy pedagogicheskiy zhurnal, 3*(110), 40-43.

Postiglione, G. A., Ailei, X., Jung, J., & Yanbi, H. (2017). Rural Students in a Chinese Top-Tier University: Family Background, School Effects, and Academic Performance. *Chinese Education & Society*, *50*(2), 63-74.

Hansen, M. N., & Mastekaasa, A. (2006). Social origins and academic performance at university. *European Sociological Review*, *22*(3), 277-291.

Khuziakhmetov, A. N., & Gabdrakhmanova, R. G. (2016). Creativity in Joint Activity of Teacher and Student in the Learning Process. *IEJME-Mathematics Education, 11*(4), 735-745.

Khuziakhmetov, A. N. & Gabdrakhmanova, R. G. (2015). Educational process: Co-authorship of the teacher and the student. *Social Sciences (Pakistan), 10*(7), 1736-1742.

Lim, D. H., & Morris, M. L. (2009). Learner and instructional factors influencing learning outcomes within a blended learning environment. *Journal of Educational Technology & Society*, *12*(4), 282-293.

Graf, L. (2016). The rise of work-based academic education in Austria, Germany and Switzerland. *Journal of Vocational Education & Training*, *68*(1), 1-16.

Mahoney, J. (2004). Comparative-Historical Methodology. *Annual Review of Sociology,* (30), 81-101.

Purdie, N., & Hattie, J. (1999). The relationship between study skills and learning outcomes: A meta-analysis. *Australian Journal of Education*, *43*(1), 72-86.

Brady, N., & Bates, A. (2016). The standards paradox: How quality assurance regimes can subvert teaching and learning in higher education. *European Educational Research Journal*, *15*(2), 155-174.

Gagné, R. M., & White, R. T. (1978). Memory structures and learning outcomes. *Review of Educational Research*, *48*(2), 187-222.

Solovyov, V. N. (2004). The influence of adaptation and motivation of learning activities on the progress of students. *Fundamental research*, (5), 81-83. Retrieved from http://www.fundamental-research.ru/ru/article/view?Id=5688

Skocpol, T., & Somers, M. (1980). The uses of comparative history in macrosocial inquiry. *Comparative studies in society and history*, *22*(2), 174-197.

Temnikov, D. A., Garnaeva, G. I. & Aganov, A. V. (2015). Model' povysheniya kvalifikatsii prepodavatelei v bol'shikh uchebnykh gruppakh [Model of teacher training in large training groups]. *Kazanskiy pedagogicheskiy zhurnal,* 3 (110), 83-86.

Lehmann, W. (2014). Habitus transformation and hidden injuries: Successful working-class university students. *Sociology of Education*, *87*(1), 1-15.

Xiulan, Y. (2015). From passive assimilation to active integration: The adaptation of rural college students to cities. *Chinese Education & Society, 48*(2), 92-104.

Zhegulskaya, Yu. V. (2011). Factors of first-year students' learning adaptation (on the example of the Kemerovo State University of Culture and Arts). *Bulletin of the Kemerovo State University of Culture and Arts*, (15), 130-138.

Zimmerman, B. J., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American educational research journal*, *29*(3), 663-676.