

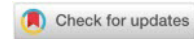
APPLICATION OF ARTIFICIAL INTELLIGENCE IN EDUCATION IN THE FUNCTION OF RAISING ENTREPRENEURIAL COMPETENCE

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Abstract: In the time we live in, the digital competencies of employees represent an important factor in achieving positive business results. In this sense, the integration and application of modern technologies and artificial intelligence in the learning and teaching process is of crucial importance in the information society of the 21st century. It is precisely the emergence of artificial intelligence and the rapid development of ICT that constantly affects the challenges of life and work, and therefore the success of students through the education system as members of a society in which ICT is an indispensable part. It is known that the development of information technologies has initiated improvement in various areas such as: finance, business, health, education, and the entire labour market. In this research work, it will be evolved to a new review of the relevant literature and research in practice, how artificial intelligence can influence the outcome of the educational process and increase the entrepreneurial competencies of employees. In this direction, this research will present a research study of questionnaires applied for analysis and obtaining data on training and testing for statistical evaluation. Statistical analysis will be based on the application of artificial intelligence, i.e., Adaptive Neuro-Fuzzy Inference Systems (ANFIS).

In this research, we use the ANFIS methodology to determine the most important factors of student success in teaching. Based on the review of the relevant literature, it is evident that there is not enough research that would deal with the analysis of the relationship between students' success in mathematics and the factors that influence it. This is confirmed by the research results, which indicate that the quality of students' work in practice is influenced by several different factors: educational technology, teacher competence, teacher motivation, etc. This type of research fills the gap in the lack of research to determine which key factors have the strongest impact on student success.

The research results of this paper confirm that the application of artificial intelligence in teaching through educational software, among other things, can be a key success factor for improving teaching. In this sense, the effects of the application of artificial intelligence and specific educational software and the effects they have on student motivation, that is, the interest and self-confidence of all factors of the educational process, have been identified. The obtained results indicate the benefits and advantages that educational institutions can have from the introduction of educational technologies in teaching. In this way, technology has become not only useful, but also a necessary instrument for purposeful action in society.

The results of the research show that artificial intelligence through Neuro-fuzzy architecture was created with the aim of overcoming complex and complex problems, it has its application in situations that are mostly impossible to describe analytically. Once learned ways to overcome complex problems, they can be applied after schooling in order to contribute to raising the entrepreneurial competencies of pupils and students, which will lead to the improvement and modernization of business and help you stay relevant in the labour market.

Keywords: Education, artificial intelligence, business intelligence.

Field: Education

1. INTRODUCTION

Quality education requires students to be digitally literate, for the ultimate goal of entrepreneurial competence (Denić et al. 2017). The data showing the growth and application of e-learning, as surprising as it is, reflect the real needs of modern man and the age in which he lives ("the age of knowledge"). E-learning, the most common form of distance learning, has proven to be the only way of learning that allows individuals and groups to successfully master different educational content, at any place and at any time, which will later be used for professional development (Milicevic et al., 2021).

Therefore, in this paper we will consider the main goal of educational software, the improvement of teaching performance, which makes teaching attractive both for the teaching process and for learning itself, all with the ultimate goal of raising entrepreneurial competencies (Miljković, J., Ljujić, B., 2012).

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Educational software is a combination of information and communication technology (ICT) and electronic learning (e-learning) (Denic & Zlatkovic, 2017).

2. PARADIGMS OF APPLICATION OF ICT IN TEACHING

ICT as a teaching tool and ICT as a learning tool (Shelly, G., et al., 2012):

- removes time and space barriers, because students can get in touch with the teacher and communicate with each other and exchange information anytime and anywhere,
- provides access to global knowledge,
- facilitates the exchange of knowledge, as students can make presentations and notes individually or in groups and monitor their progress,
- enables immediate exchange of experiences and better practice, and such learning becomes more interactive and fun through various multimedia tools and encourages experiential learning, opens windows for new thinking, innovation, brings joy and motivation to the new with the ultimate goal of developing practical skills.

Table 1. Indicators of successful application of ICT in an educational institution

Indicators of successful application of ICT in an educational institution	Description of indicators
Technological means	Optimization of equipment types and characteristics in accordance with the needs and requirements of the educational institution.
Installed technologies	Planning, coordination and verification of requests, communication media, furniture, lighting, security and insurance, educational institutions.
Technologies available to students and teachers	Providing staff who can support adequate work and learning for ICT users.
Technology service	Maintenance and upgrade of hardware and software.
Professional development	Development of human capacities of employees in an educational institution – INSET for teachers, librarians, professional associates and other employees.
Planned technologies	Documentation of ICT implementation plans and its placement in the educational public.
Used technology	monitoring the time spent at the computer with the aim of performing various educational tasks of the participants in the educational process.
Achieved educational outcomes	Level of ICT competence of users of ICT resources.
Effectiveness in mastering certain teaching subjects	Achievement of educational goals, including independence in learning.
Funding	Total money spent on ICT implementation.

Source: (Shelly, G., et al., 2012):

3. ANFIS (ang. Adaptive Neuro-Fuzzy Inference Systems)

We use the ANFIS methodology to determine the most important factors for student success in mathematics (Stojanović et al., 2021). In this sense, some authors emphasize that the process of acquiring knowledge is far more effective when it is combined with educational technologies in mathematics classes in elementary school (Radovanović, B. 2020). We have a similar situation in secondary education, where the effect of acquiring knowledge is significantly more effective in situations when it is connected with the motivation to learn mathematics (Rajović, J. et al. (2020).

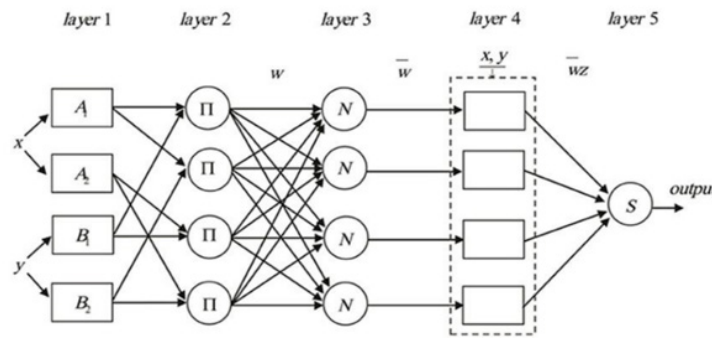
Based on the review of the literature, it is evident that in the world today there are close to 150 million of students and students who attend so-called online classes, of which approximately 25% are students. This fascinating data is changing every day, because the number of e-students and e-students is increasing drastically students and students are digitally literate in order to be able to actively and effectively follow the lessons. In this sense, some authors emphasize the importance of the introduction of educational technologies into the teaching process, because it is obvious that the phenomenon of the Internet has radically changed the educational process, that the business market is more demanding and that we must be digitally literate in order to be more competitive on the market (Nikolić, V. and all 2019).

It is known that there are more than 140 million online students in the world, and the growth rate

of the number of students is estimated to be around 20%. This fascinating data is changing daily, as the number of e-learners is continuously increasing. That is why today it is necessary for pupils and students to be digitally literate. The priority of educational institutions must be the introduction of ICT into the educational system, because we are all aware that the Internet has changed the educational process, that the business market is more demanding and that we must be digitally literate in order to be more competitive on the market (Nikolic, V. et all 2019).

Neuro-fuzzy architecture was created with the aim of overcoming complex and complex problems and situations that are mostly impossible to describe analytically. It is precisely these systems that represent the synergy of neural networks and fuzzy inference systems. In the following Figure 1, a schematic representation of the ANFIS model is given.

Fig. 1. Schematic diagram of the ANFIS model



Source: (Hesami, 2019)

For the purposes of the work, the research was conducted in the experimental group, three classes of the first grade of secondary education, namely secondary schools and high schools, from territorially different environments participated. In addition to the above, other students belonged to another group. The students of the “Mihajlo Petrović Alas” Technical School from Kosovska Mitrovica, the Electrical Technical School of Priština-Gračanica and the students of the Gymnasium from Priština, temporarily relocated to Laplje Selo, took part in the research. Respondents from the Technical School “Mihajlo Petrović Alas” are in the concept of learning “from station to station”, they covered the teaching unit in two school hours. 88 subjects of the experimental group and 86 subjects of the so-called control group participated in the research. The classes were conducted by three teachers.

The test of knowledge, carried out in the next school hour through a fifteen-minute test, in the control and experimental groups, was shown in table 2.

Table 2: Results of knowledge test of groups of groups

	1	2	3	4	5
Control	18%	40%	23%	10%	9%
Experimental	3%	20%	40%	22%	15%

Source: author’s research.

4. CONCLUSIONS

The process of effective integration of software into the educational process is a complex and multifaceted process that includes not only educational technology, but also computer programs and pedagogy, institutional readiness, teacher competence, as well as planned long-term funding. The daily and effective use of ICT is still a problem for teachers, but it brings us long-term benefits for entrepreneurial competence. Experiences in practice show that educators encounter obstacles in the use of ICT, and therefore do not use it to the extent that results in positive learning effects. The literature emphasizes that one of the novelties of the 21st century is digital technology, which is closely related to a different, new approach to the curriculum, which necessarily implies reshaped learning goals and related activities in the educational process, the end result of which will be competent personnel on the labor market.

REFERENCES

- Denić, N., Petković, D., & Jovanović, N., (2017). Improving teaching process by applying information-communication technology, *Annals of the University of Oradea, Fascicle of Management and Technological Engineering*, Issue 3, December 2017, pp. 26-31. doi:10.15660/AUOFMTE.2017-3.3300,
- Denić, N., & Zlatković, D. (2017). A Study of the Potentials of the Distance Learning System. *The Eurasia Proceedings of Educational & Social Sciences, ICONSE 2017: International Conference on Science and Education* 8(1), pp 30-39. ISSN: 2587-1730.
- Hesami, M., Naderi, R., Tohidfar, M., & Yoosefzadeh-Najafabadi, M. (2019). Application of Adaptive Neuro-Fuzzy Inference System-Non-dominated Sorting Genetic Algorithm-II (ANFIS-NSGAI) for Modeling and Optimizing Somatic Embryogenesis of Chrysanthemum. *Frontiers in plant science*, 10, 869. Available at: <https://doi.org/10.3389/fpls.2019.00869>
- Milićević, V., Denić, N., Milićević, Z., Arsić, Lj., Spasić-Stojković, M., Petković, D., Stojanović, J., Krkić, M., Sokolov Milovančević, N. & Jovanović, A. (2021). E-learning perspectives in higher education institutions. *Technological Forecasting & Social Change*, 166(11), 1–5.
- Miljković, J., Ljujić, B., “Informaciono–komunikacione tehnologije (IKT) i menadžment u obrazovanju” *Pedagogija* LXVII, 1, 2012, pp 20-30, UDK: 005.336.5:004]:37
- Nikolić, V., Petković, D., Denić, N., Milovančević, M., & Gavrilović, S. (2019). Appraisal and review of e-learning and ICT systems in teaching process. *Physica A: Statistical Mechanics and Its Applications*, 513, 456–464. Available at: <https://doi.org/10.1016/j.physa.2018.09.003>
- Radovanović, B. (2020) *Prilozi metodologiji i filozofiji nauke*, Izdavački centar Filozofski fakultet Univerzitet u Nišu, pp. 1-173, Niš 2020. ISBN 978-86-7379-538-6
- Rajović, D, J., Denić, M.N., Stojanović, N.J.: Prilog proučavanju udžbenika engleskog jezika srednjih stručnih škola: kriterijumi analize; *UZDANICA*; 2020, XV/II/2; pp. 79–95, doi 10.18485/uzdanica.2020.17.2.6
- Shelly, G. B., Gunter, G. A., & Gunter, R. E. (2012). *Teachers discovering computers: integrating technology in a connected world*. Cengage Learning.
- Stojanović, J., Nešić, Z., & Bulut-Bogdanović, I. (2021). Digitalizacija obrazovanja u funkciji ekonomskog razvoja. *Društveni horizonti*, 1(1), pp. 29-40. Available at: <https://doi.org/10.5937/DruHor2101029S>