

The teacher as a factor of motivation in the teaching of informatics and computing

Jelisavka Bulatovic

Academy of Technical - Art Professional Studies, Belgrade, Serbia

Abstract. The paper examines the role of the teacher as a key motivational factor in the teaching of informatics and computer science. Teachers have a significant influence on students' motivation, which directly affects their success and interest in the subject. Through the analysis of different methods and approaches used by teachers, strategies that encourage active learning and student engagement will be identified.

Key words: Teacher, motivation, informatics, computing, student engagement, learning strategies.

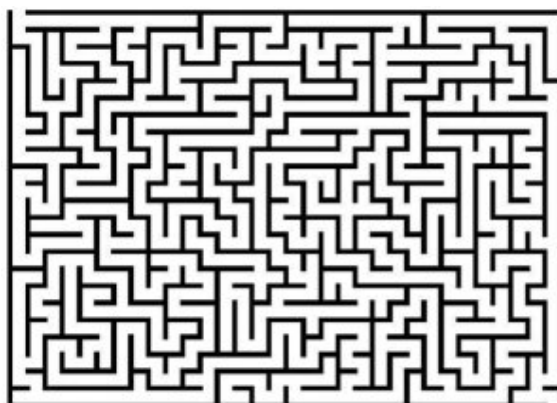
Introduction

Teaching informatics and computer science is a challenging task due to the rapid development of technology and changes in educational needs. The role of the teacher in this process is essential, because the students' motivation can significantly affect their attitude towards the subject and their overall academic success (see Bulatovic, 2024; Bulatovic, 2025). Motivation, as a key factor in learning, can be intrinsic or extrinsic, and understanding these aspects can help teachers adjust their approach. This paper will focus on different aspects of motivation and explore ways in

which a teacher can contribute to a positive learning environment, as well as how modern technologies can be used to increase student engagement.

Analysis and discussion

A person becomes a personality through learning. That learning begins at birth and continues throughout life. From the moment a child begins to walk independently, a huge number of paths and possibilities open up before him. "A picture speaks more than a thousand words" - Chinese proverb (Nikolić, 2018).



Each of these paths has its own challenges, minor or major obstacles. And since then, parents

should teach the child that obstacles are not insurmountable, that one should not give up, that

one must be persistent, and all with one thought - to achieve one's goal. Even then, motivation begins. The next stage (period) in a child's development is school age. When they come to school, as time goes by, children are offered more and more subjects and various activities. The first and most

important thing every teacher should know is that all children are different. One wants, the other doesn't, the third can, the fourth won't, the fifth is motivated, the sixth is unmotivated, the seventh has other interests.



Figure 1. It can be like this

That is why teachers of informatics and computer science must notice the good and bad qualities of students at the very beginning. Good qualities should be developed even more, and bad ones should be encouraged to change for the better. The teacher's role is to increase students'



Or like this...

motivation, to develop skills or strategies that will make students more capable, and to provide a positive environment for learning information and computing so that students can be responsible for their own learning. The key word for that is – motivation (Nikoliočić, 2018).

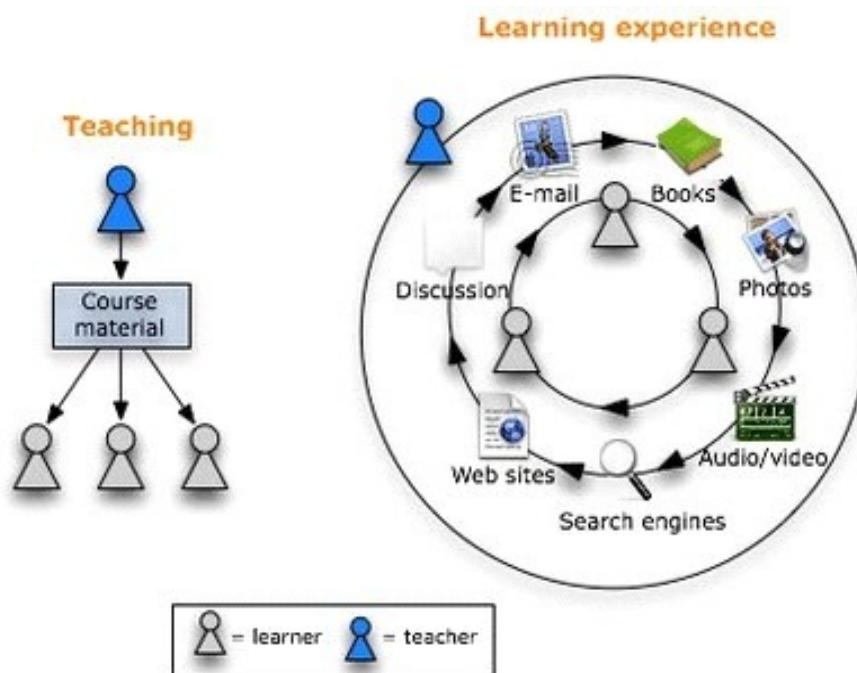


Figure 2. Comparison of teacher-centered and student-centered teaching of computer science and computing (Mirkovic, 2012).

Motivating students to learn includes everything that (externally or internally) stimulates learning, directs it, determines its intensity, duration and quality. Zlatar (2015) states that motivation exists in only 10% of the student population, and all the rest need to be further motivated. In order to increase student motivation, achievement motivation

should be increased. Achievement motivation is a general tendency to strive for success and a tendency to choose activities directed towards a goal and success. The need for achievement is a psychogenic need that manifests itself in the desire to overcome obstacles and achieve something that is valued, to compete with others and surpass them,

to increase self-esteem by successfully using one's own abilities in teaching computer science and computing, as well as by investing long-term effort in

achieving something that is difficult to achieve (Fulgosi, 1990; Rajovic, 2007).

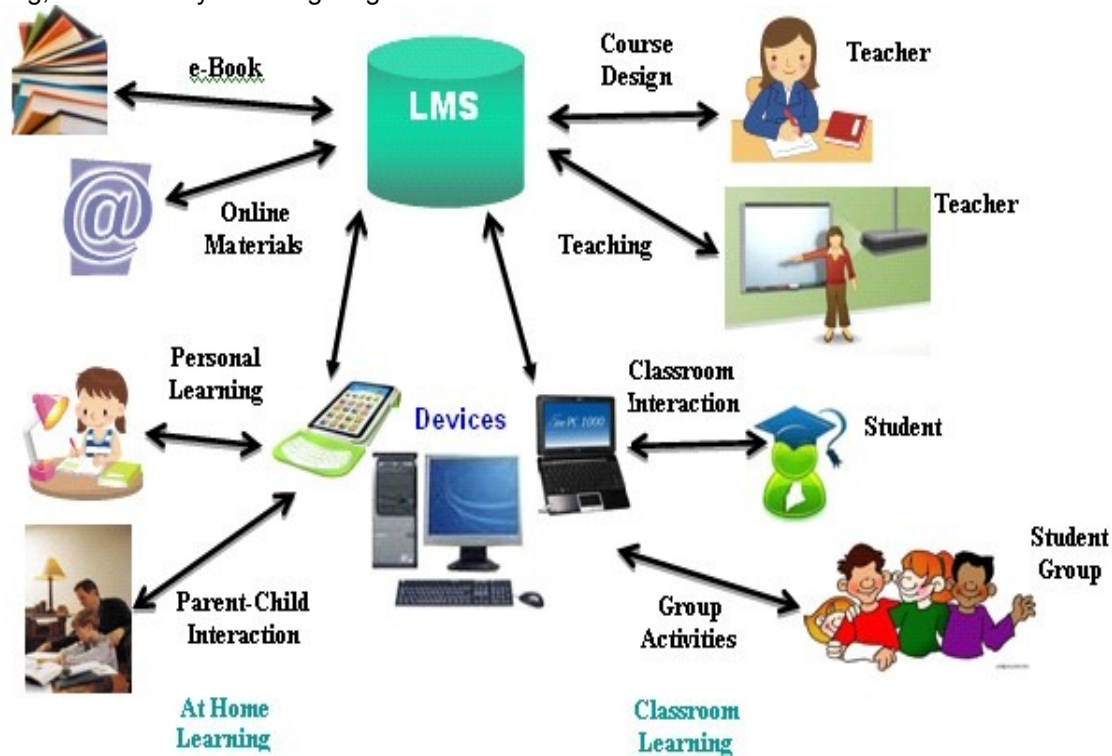


Figure 3. Information technology enables students to play an active role in learning at school and at home (Mirkovic, 2012).

Children's experience is based on immediate and tangible goals, and with the help of an IT and computing teacher, intrinsic motivation should be introduced. The younger the student, the more susceptible he or she is to extrinsic motivation. Therefore, an IT and computing teacher will often start from extrinsic motives and work on their "internalization" (Zlatar, 2015). Computer science teachers can use a variety of strategies to motivate students (see, Brusilovsky and Millán, 2007; Deci and Ryan, 2000; Hattie, 2009; Schunk, 2012; Wiggins and McTighe, 2005) including: Interactive learning methods: The use of projects, teamwork, and hands-on exercises can increase student interest in computer science instruction. The use of projects in computer science and computing as a learning method involves students working on concrete tasks that are often connected to the real world. This method allows students to apply theoretical knowledge in practice. Projects can be individual or group, and can focus on a variety of topics, from research papers to practical problem solutions. One of the advantages of this method is that it encourages students' creativity in computer science and computing, because it allows them to explore and think outside the box of traditional learning. Students have the opportunity to learn through experience, which often leads to a deeper understanding of the material. In addition, working on projects can improve organizational and time management skills, as students must plan and

complete tasks within specific time frames. Teamwork in the teaching of informatics and computer science is another key aspect of interactive learning. Students work together in groups, which encourages cooperation, communication and mutual understanding. This method allows students to exchange ideas and perspectives, which can enrich the learning process. While working in a team, students learn how to share responsibilities, how to listen to each other, and how to make joint decisions. This not only develops their social skills, but also helps create a positive learning environment. Teams in computer science classes can work on different activities, such as research projects, debates or presentations, which further increases student engagement and motivation. Practical exercises are an extremely important part of interactive learning methods in the teaching of informatics and computer science, as they allow students to directly apply what they have learned. Exercises can include laboratory experiments, simulations, fieldwork, or even visits to relevant institutions. This method is particularly useful not only in computer science and computing but also in science and other technical subjects, where students can see theoretical concepts in action. Practical exercises not only help students better understand the material in computer science and computing classes, but also develop their practical skills that will be useful in their future education or career. Students often find these

activities more interesting and engaging than traditional lectures in computer science, which further increases their motivation to learn. All three methods, the use of projects, teamwork, and practical exercises, contribute to creating a dynamic learning environment that can significantly increase student interest and engagement in computer science. Personalized learning in computer science is an approach that focuses on adapting the educational process to the needs, interests, and abilities of each student (see Dweck, 2006; Miller and Kagan, 2016; Bransford et al, 2000; Csikszentmihalyi, 1990). The goal is to create an individualized experience that allows students to learn at their own pace and in the way that suits them best. Here are some key elements of personalizing learning in computer science classes: Assessment of abilities - understanding the current level of knowledge and skills of students in order to adapt content and activities. Tailored content - providing material that matches the interests and needs of students, which may include different types of media, such as texts, video content or interactive games. Flexible learning - allowing students to choose when and where they learn, which can increase motivation and engagement. Progress monitoring - regularly assessing student progress to identify areas that require additional support or challenges. Technological support - use of educational technologies and platforms that enable personalized learning and facilitate communication between students and teachers. Professionalization of learning in computer science can be applied in different ways to adapt the education to the needs and interests of the students. Here are some examples: Adaptive curricula - students can learn at different paces, where the content is adapted to their abilities and progress. For example, if a student masters a certain topic faster than others, they can move on to more advanced lessons. Interest-based learning - students can choose projects or topics that interest them, which increases their motivation in computer science classes. Technological tools - the use of applications and platforms that offer personalized learning recommendations in the teaching of informatics and computer science, such as quizzes, video content or interactive games, which adapt to the level of knowledge of students. Mentor system - students can have mentors who help them set personal goals and work towards them, providing support and resources tailored to their needs. Self-directed learning - students can choose when and how they learn, for example through online courses or independent research projects. These approaches to computer science teaching allow students to focus on their strengths and weaknesses, thereby increasing the effectiveness of learning. Providing feedback is a key part of personalizing learning (see Dweck, 2006; Hattie and Timperley, 2007; Abou El-Seoud et al, 2014; Harandi, 2015). Here are some examples of how this can be implemented: Automated grading

and comments - when students complete tests or assignments in computer science classes, the system can automatically generate feedback that explains their mistakes and offers suggestions for improvement. Individual learning plans in the teaching of informatics and computing - based on student results, the teacher can create personalized learning plans that include specific goals and strategies, as well as regular feedback on progress. Interactive platforms - learning through applications can allow students to receive instant feedback on their answers, which helps them immediately identify areas for improvement in teaching. Video feedback - IT teachers can record short video messages explaining how students can improve their work, creating a more personal approach. Peer review - students can exchange work and provide each other with feedback, which encourages collaboration and develops critical thinking skills. These examples illustrate how feedback can be tailored to the needs of individual students, thereby improving their learning and motivation in class. Providing feedback is key to personalizing learning as it allows students to understand their strengths and areas for improvement (Harandi, 2015; Hutchison and Woodward, 2018; Na et al, 2020; Pratolo and Solikhati, 2021). Here are some examples: Automatic feedback - in online courses, when a student completes a quiz, they receive immediate feedback on correct and incorrect answers. For example, if a student gets an answer wrong on a theory of computer systems question, the system can provide an explanation explaining why the answer is incorrect and direct them to additional learning resources. Personalized suggestions - a student who is facing difficulties in computer science classes can be given feedback that includes recommendations for additional exercises. For example, if a student does not understand the concept of artificial intelligence, the system can suggest video lessons or articles that explain the topic in detail. Peer feedback - in group projects, students can share feedback on each other. For example, a student can receive feedback from a colleague about his presentation, where the colleague will point out what was good and where he can improve. Systematic progress analysis - students can be provided with regular reports on their progress. For example, a student can receive a report at the end of the month that shows his grade, compares it to previous months, and makes recommendations for improvement, such as additional exercises or consultation with an IT teacher. Interactive platforms - on platforms like Kahoot! or Quizizz, students can get instant feedback on their answers during games and quizzes, which motivates them to learn through fun and competition. These methods allow students to actively participate in their learning process and to adjust their learning strategies in the teaching of informatics and computing based on feedback. Creating a positive environment - refers to working

with students to create a supportive and inspiring environment that encourages learning and personal development (Stupurienė and Gülbahar, 2022; Hwang et al, 2023; Qu and Wu, 2024; Mohamed et al, 2025). For example: Encouraging mutual support - a computer science teacher can organize group activities where students work together on projects, which develops team spirit and mutual support in class. Giving positive feedback - instead of focusing only on mistakes, the teacher can praise students for their efforts and successes, thereby increasing their confidence. Decorating the classroom - creating a pleasant physical space with inspirational quotes, artwork or greenery can contribute to the positive mood and motivation of students. Involvement of students in decision-making - when students have the opportunity to participate in decisions related to learning or classroom rules in computer science classes, it can increase their responsibility and sense of belonging. Such examples can help create a positive environment that encourages learning and personal development of students. Encouraging open communication and support can significantly increase student motivation. Modern information technology enables the creation and use of rich and diverse teaching materials. The book, although still important, is no longer the only educational tool, because there are a number of other very effective resources that impose a new way of learning and allow existing teaching practices to be reshaped and made more effective. Web portals can be a very rich treasure of theoretical statements on various issues of the teaching process and processed teaching units arranged so that teachers can easily apply them in practice with possible changes, additions and enrichments. Interactive teaching and learning that is based on the use of the Internet enables a more flexible organization of teaching informatics and computing that goes far beyond the classroom, but its possible effects will be absent if they are not applied properly. Learning through the world information network implies teachers trained for this kind of teaching, so it is the duty of the teaching faculties to give an appropriate place in the curricula to the preparation of teachers for information technologies (Jesic, 2010). The role of the teacher as a motivational factor in the teaching of informatics and computer science is very important, because the quality of the teacher can significantly affect the interest and engagement of students. Here are some aspects to consider in the discussion: Teacher expertise and enthusiasm - when a teacher shows deep subject knowledge and passion for computer science, it can inspire students. A teacher's enthusiasm is often contagious and can create a positive atmosphere in the classroom. Access to students - teachers who make an effort to understand the needs and interests of their students can better adapt their teaching. This may include using relevant real-world examples or providing opportunities for hands-on

projects. Interactive teaching methods - learning through interaction, group projects and practical exercises can increase student motivation. Teachers who use modern technologies and tools in the teaching of informatics and computing for learning can make lessons more interesting. Goal setting - when a teacher helps students set personal learning goals, it can increase their motivation. Clearly defined goals give students a sense of purpose and direction. Providing feedback - regular and constructive feedback can help students feel valued and motivated to improve their skills. Supportive environment - IT and computing teachers who create an inclusive and supportive environment can help students feel more confident in expressing their ideas and asking questions. Career link - explaining how information and computing knowledge and skills can be applied in the real world and to different careers can further motivate students to engage (Igwe and Ligaya, 2025; Li et al, 2025; Liu et al, 2025). Laketa (1998) found that students like teachers who have human qualities, who maintain work discipline, who have physical and teaching qualities. Examining the characteristics of teachers, he found that a good teacher is one who can understand students, who is a good collaborator, who behaves democratically, who is patient, who has a wide range of interests, who is pleasant in appearance, who has a sense of humor, who is calm and consistent, who is interested in children's problems, who gives praise evenly and who has the ability to adapt. Students like teachers who are ready to help them in their work, who present the material clearly and in detail, who have a sense of humor and who love students (see Robinson, 2022; Hasanzadeh et al, 2024). Laketa (1998) also identified two rankings of teacher characteristics. One consists of the characteristics that students value most in their teachers, and the other - the characteristics of teachers that students dislike. The ranking of the characteristics that students value most in their teachers, and therefore in teachers of computer science and information technology: general human characteristics (calm, sense of humor, fair, honest, attentive, good-natured, serious); fairness in evaluating student work (fairness in grading, does not look for trifles when grading, is not strict in grading, encourages students while they are answering, rewards students, does not punish with a low grade, grades publicly); attitude towards students (understands students, helps students, cooperates with students, does not shout at students, treats all students equally, does not apply physical punishment, values and respects students); working qualities of the teacher (a good lecturer, loves and appreciates work, clearly presents and interprets the material, maintains order and discipline, encourages and motivates students, presents the material in an interesting way, is a good pedagogue) (see Laketa, 1987; Laketa, 2010). Ranking of traits that students do not

appreciate in their teachers: general human traits (nervous, arrogant, strict, uncultured behavior, impatient, too serious, too permissive); fairness in evaluating student work (unfairly evaluates, strictly evaluates, looks for trifles, easily gives a low grade, lenient in evaluation, asks for a lot for a grade, gives a grade too quickly); attitude towards students (yells at students, physically punishes them, humiliates them, gets easily irritated, is not equal towards all students, does not understand students, does not trust students; working qualities of teachers (bad teacher, does not like his job, thinks that his subject is the most important, does not cooperate with students, reads from a book, is a weak lecturer, does not know the material) (see Laketa, 1996, Laketa, 2010). It has therefore been established that the characteristics of teachers influence the mutual relationships between students and teachers in class and that the social climate in the classroom and the achievement of teaching tasks depend on them in many ways. The personal characteristics of teachers influence the behavior of students and their success in school and they determine how ready the teacher will be to understand and accept the student and to understand their needs and behavior (see Bardach and Klassen, 2021; Byusa et al, 2022).

Conclusion

Based on the previous presentation, we can conclude that the motivation of students in teaching informatics and computer science depends on various factors and strategies applied by teachers. Key points include: Interactive learning methods - the use of projects, team work and practical exercises significantly increases student engagement and enables them to apply theoretical knowledge in practice. These methods encourage creativity and develop social skills. Professionalization of learning - adapting the educational process to the individual needs and interests of students creates a motivating environment. Through ability assessment, tailored content and flexible learning, students become more active participants in their education. Feedback - regular and constructive feedback helps students to recognize their strengths and areas for improvement in computer science teaching. Interactive platforms and automated systems enable immediate feedback, which further motivates students. Positive environment - creating a supportive atmosphere through mutual support, positive feedback and involving students in decision-making can significantly increase motivation and engagement. The role of teachers - the quality of teachers, their expertise, approach to students and ability to inspire and motivate play a key role in creating a positive educational environment. All these strategies together contribute to the creation of a dynamic and inspiring environment that not only increases students' interest in IT and computing, but also empowers them to become active participants in their education. To illustrate, Djerić et al (2025) using

the research of Seligman et al (2005) highlight two techniques that have been developed, tried and were effective, according to the results of a series of research on the development of a positive school. In one case, students are asked to write down the three best things that happened to them during their studies at the end of the working day and think about it, with the assumption that it will give them an advantage in further studies. In the second case, students should identify their strongest points and consciously and deliberately apply them in learning in as many different ways as possible. The findings of the study indicate that the application of the mentioned techniques in the learning of various teaching materials helped the students to gain better insights into their own potentials and to use them for more effective learning and their further development. Djerić et al (2025) propose strategies whose effectiveness should be examined through action research: I can master the task (self-confidence based on previously achieved success); I know how (and I'm constantly learning) and why I do it (I have goals that I develop and change). We are convinced that in the application of certain techniques, it is necessary to go for their professionalization, depending on how important the given situation is to the person and relevant to his individual development. Concrete procedures can be designed through negotiation with the participants of the learning process.

References

- BULATOVIC, J. Information technologies in teaching. *Scientific Electronic Archives*, v. 17, n. 2, pp. 76 - 80. 2024.
- BULATOVIC, J. The use of the Internet in the performance of schoolwork: A case study. *Scientific Electronic Archives*, v.17, n. 2, pp. 64 - 67. 2024.
- BULATOVIC, J. The role of educational social networks in teaching information technology during a pandemic: A case study. *Scientific Electronic Archives*, v.. 18, n. 2, pp. 1- 6. 2025.
- BULATOVIC, J. Forms of work in teaching -the field of information technology: a case study, *Scientific Electronic Archives*, v. 18, n.4, pp.1 - 6. 2025.
- NIKOLICIC,D. Motivation is the key to achieving good results in teaching and learning. Institute for Modern Education. 2018.
- MIRKOVIC, M. Student-centered teaching. Digital magazine "View through the window". 2012.
- GOLDSMIT, J. Selected chapters from piano teaching methodology. Zagreb: Academy of Music. 2015.
- FULGOSI, A. Personality psychology: theories and research. Zagreb: School book.1990.

- RAJOVIC, G. Mini-projects in the teaching of geography, *Pedagoška stvarnost*, v. 53, n. 3 - 4, pp. 205 - 213. 2007.
- BRUSILOVSKY, P; MILLAN, E. User Modelling for Adaptive Hypermedia and Adaptive Educational Systems. "Adaptive Hypermedia and Adaptive Educational Systems". In: The Adaptive Web. Springer, Berlin, Heidelberg. 2007.
- DECI, E. L; RYAN, R. M. The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, v. 11, n. 4, pp. 227-268. 2000.
- HATTIE, J. Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement. Routledge. 2009.
- SCHUNK, D. H. Learning Theories: An Educational Perspective. Pearson. 2012.
- WIGGINS, G; MCTIGHE, J. Understanding by Design. ASCD. 2005.
- DWECK, C. S. Mindset: The New Psychology of Success. Random House. 2006.
- MILLER, D. I; KAGAN, J. The importance of feedback in the learning process. In *Educational Psychology Review*. 2016.
- BRANSFORD, J. D; BROWN, A. L; COCKING, R. R. How People Learn: Brain, Mind, Experience, and School. National Academy Press. 2000.
- CSIKSZENTMIHALYI, M. Flow: The Psychology of Optimal Experience. Harper & Row. 1990.
- DWECK, C. S. Mindset: The New Psychology of Success. Random House. 2006.
- HATTIE, J; TIMPERLEY, H. The power of feedback. *Review of Educational Research*, v. 77, n.1, pp. 81-112. 2007.
- ABOU EI-SEOD, M. S; TAJ-EDDIN, I. A; SEDDIEK, N; EI-KHOLY, M. M; NOSSIKER, A. E-learning and students' motivation: A research study on the effect of e-learning on higher education. *International Journal of Emerging Technologies in Learning (Online)*, v. 9, n. 4, pp. 20. 2014.
- HARANDI, S. R. Effects of e-learning on Students' Motivation. *Procedia-Social and Behavioral Sciences*, v. 181, pp. 423-430. 2015.
- HUTCHISON, A. C; WOODWARD, L. Examining the technology integration planning cycle model of professional development to support teachers' instructional practices. *Teachers College Record*, v. 120, n. 10, pp. 1-44. 2018.
- NA, K. S; PETSANGSRI, S; TASIR, Z. The relationship between academic performance and motivation level in e-learning among Thailand university students. *International Journal of Information and Education Technology*, v. 10, n. 3, pp. 184. 2020.
- PRATOLO, B. W; SOLIKHATI, H. A. Investigating teachers' attitude toward digital literacy in EFL classroom. *Journal of Education and Learning (EduLearn)*, v. 15, n. 1, pp. 97-103. 2021.
- STUPURIENE, G; GULBAHAR, Y. Informatics at primary education: Teachers' motivation and barriers in Lithuania and Turkey. In *International Conference on Informatics in Schools: Situation, Evolution, and Perspectives* (pp. 27-39). Cham: Springer International Publishing. 2022.
- HWANG, G. J; TU, Y. F; CHU, H. C. Conceptions of the metaverse in higher education: A draw-a-picture analysis and surveys to investigate the perceptions of students with different motivation levels. *Computers & Education*, pp. 203, 104868. 2023.
- QU, K; WU, X. ChatGPT as a CALL tool in language education: A study of hedonic motivation adoption models in English learning environments. *Education and Information Technologies*, v. 29, n. 15, pp. 19471-19503. 2024.
- MOHAMED, A. M; SHAABAN, T. S; BAKRY, S. H; GUILLEN-GAMEZ, F. D; STRZELECKI, A. Empowering the faculty of education students: Applying AI's potential for motivating and enhancing learning. *Innovative Higher Education*, v. 50, n. 2, pp. 587-609. 2025.
- JESIC, D. (2010). Acquiring competences for the new roles of teachers in the modern school and the future, *Journal of Social and Natural Sciences*, v. 1, pp. 195 - 200. 2010.
- IGWE, M. C. P; LIGAYA, M. A. D. Students' Performance in English: Effects of Teachers' Leadership Behavior and Students' Motivation. *Journal of Education and Learning (EduLearn)*, v. 19, n. 1, pp. 91-102. 2025.
- LI, W., COELEN, R; OTTEN, S. Enhancing interaction quality in interdisciplinary group work: The impact of student motivation and teacher-initiated diversity climate. *Social Psychology of Education*, v. 28, n. 1, pp. 41. 2025.
- LIU, J; GAO, J; ARSHAD, M. H. Teacher-student relationships as a pathway to sustainable learning: Psychological insights on motivation and self-efficacy. *Acta Psychologica*, v. 254, pp. 104788. 2025.

- LAKETA, N. Students' attitudes towards teacher behavior and students' distance from teachers. *Teaching and Education*, v. 1-2, pp. 61-69. 1987.
- ROBINSON, C. D. A framework for motivating teacher-student relationships. *Educational Psychology Review*, v. 34, n.4, pp. 2061-2094. 2022.
- HASANZADEH, S; SHAYESTEH, S; PISHGHADAM, R. Investigating the role of teacher concern in EFL students' motivation, anxiety, and language achievement through the lens of self-determination theory. *Learning and Motivation*, v. 86, pp. 101992. 2024.
- LAKETA, N. Teacher and student autonomy. *Teaching and Education*, v. 2, pp. 278-292. 1996.
- LAKETA, N. Teacher – teacher – student, Pedagogical paths 1, Užice: Faculty of Education.1998.
- LAKETA, N. Education and school. Užice: Faculty of Education. 2010.
- BARDACH, L; KLASSEN, R. M. (2021). Teacher motivation and student outcomes: Searching for the signal. *Educational Psychologist*, v. 56, n. 4, pp. 283-297. 2021.
- BYSA, E; KAMPIRE, E; MWESIGYE, A. R. Game-based learning approach on students' motivation and understanding of chemistry concepts: A systematic review of literature. *Heliyon*, v. 8, n. 5, 2022.
- DJERIC,I;MAKSIC,S; MALINIC,D. Nothing succeeds better than success. *Theme Collections* 30, pp. 69- 73. Vocational Education and Medical School in Vršac, Serbia Universitatea "Aurel Vlaicu", Arad, Romania. 2025.
- SELIGMAN, M. E. P; STEEN; T. A; PARK, N; PETERSON, C. Positive psychology progress: Empirical validation of intervention. *American Psychologist*, v. 60, pp. 410- 421. 2025.