GBL and AI in the context of Bosnian-Herzegovinian education system

1. Introduction

Bosnia and Herzegovina has a complex formal education system that is divided between the two main entities, the Federation of Bosnia and Herzegovina (FBiH) and Republic of Srpska (RS), as well as the Brčko District. Each entity has its own Ministry of Education and is responsible for education policy and curriculum development (cf. Duraković, 2023, Kasumagić-Kafedžić & Clarke-Habibi, 2023, Sritharan, 2019). In Bosnia and Herzegovina, primary education lasts for 9 years, followed by 4 years of secondary education, which is divided into general secondary schools (gymnasiums) and vocational secondary schools. Higher education is provided by universities and colleges (both state-maintained and private-maintained higher education institutions).

Previous research on different aspects of education system in Bosnia and Herzegovina (Duraković, 2023, Jahić & Osmanković, 2020, Kasumagić-Kafedžić & Clarke-Habibi, 2023, Rahimić & Kožo, 2009) pointed out common challenges, such as lack of a unified curriculum and educational standards across the country, insufficient funding, outdated teaching methods and curricula, lack of teacher training and professional development opportunities. It is recognized, however, that addressing these challenges through policy reforms, increased funding, and collaborative efforts between local and international stakeholders is crucial for improving the quality of education in Bosnia and Herzegovina. Efforts have been made to improve the education system on different grounds, e.g. to align its education system with European standards and implement the Bologna Process in higher education (Avdić et al., 2014, Kovačević, 2023), to address challenges regarding lack of a unified curriculum, insufficient funding, and outdated teaching methods (Avdić et al., 2014, Lazić & Perišić, 2023), or introduce peace education, gender equality, occupational safety and health education into the formal education system (Duraković, 2023, Kasumagić-Kafedžić & Clarke-Habibi, 2023, Vajkić et al., 2019). Nevertheless, more work is needed in order to fully integrate certain topics – e.g. peace education and gender equality – which would prepare students for the challenges of the contemporary world. Making efforts to integrate elements of game-based learning (henceforth GBL) into the formal education system would enable utilization of the full potential of education as a means of reconciliation in post-war Bosnia and Herzegovina, or as a means of raising awareness on gender equality.

Any reform and improvement of Bosnian-Herzegovinian education system demands a specific approach tailored to specific circumstances in the country regarding its unique political structure, demographic challenges (rural vs urban areas, migration, etc.), and post-war contexts. For instance, post-conflict Bosnia and Herzegovina has placed a greater emphasis on Peace Pedagogy, i.e. integrating peace education into the curriculum with international support, which is less of a focus in some other regional education systems. This helps promote reconciliation, tolerance and social cohesion in the post-conflict country by teaching students about diversity, conflict resolution and human rights (Kasumagić-Kafedžić & Clarke-Habibi, 2023). Bosnia and Herzegovina's education system reflects the country's multiculturalism, which can be seen as a strength in promoting diversity and preparing students for an interconnected world (Lazić & Perišić, 2023), if one takes into consideration that the curriculum incorporates content that celebrates the country's ethnic, religious, and cultural diversity. However, this also presents challenges in terms of developing a unified curriculum.

This chapter aims at elaborating on strengths and challenges of Bosnian-Herzegovinian education setting and investigate the potentials of incorporating elements of GBL in making an effort towards high-quality education.

2. GBL in the educational system of Bosnia and Herzegovina

There are a number of papers by Bosnian-Herzegovinian scholars deal with the concepts of such as gamification, knowledge management and e-learning (e.g. Ćosić, Salkić, & Zajmović, 2019) or gamification in higher education context (e.g. Ćosić, Krnjić, & Petrušić, 2022), but some of those do not refer specifically to the educational system of Bosnia and Herzegovina. This, however, does not exclude the possibility that efforts are being made to advocate for benefits of GBL approach in the country's formal and non-formal settings. Slijepčević & Košarac (2021) investigated students' knowledge and attitudes on the importance of game and impact of gamification on life quality of individuals and social groups, but their respondents were limited to two public universities in Republic of Srpska. They concluded that 55.6% of respondents agree that games contribute to the increase in their free thinking and action; 52.5% of the respondents believes that e-learning through games enables experimental development for the benefit of an individual and a society; respondents were hesitant regarding the claim that e-learning through games reduces social exclusion, which is perceived as a major issue in Bosnian-Herzegovinian society. These are important topics for which the authors themselves believe should be investigated on a wider number of respondents.

Huseinović (2023) conducted research on student attitudes and motivation for game-based English language learning in higher education, elaborating on the impact of English learning games on writing, reading, listening, and speaking skills. The research findings indicate that students exhibit high levels of motivation and interest when using games, with the majority reporting increased confidence in their skills when using games. Furthermore, correlation tests found that there is an influence of games on academic achievement, academic performance in English, and motivation, emphasizes the importance of incorporating GBL approach in the curricula. Yet, comprehensive research is deemed necessary to identify and analyze specific GBL programs that could be successfully implemented systematically in Bosnia and Herzegovina.

Furthermore, information on how students in Bosnia and Herzegovina respond to GBL are limited, and student engagement in GBL-related activities is often project-motivated. For instance, a group of students from Bosnia and Herzegovina took part in EU funded project *"YES! GAM-EU: Youth Engagement Strategies and Gamification in the EU"* from 2018[1] that gave them insight into certain aspects of GBL. As part of the Erasmus+ Project about gamification in non-formal education and youth work, those students participated in developing different games and activities to tackle topics such as climate change, queer refugees, youth and volunteering during the Pandemic, fake news & AI. Another project, supported by the EU and the British Council BiH, aimed at making "the EU and EU-related affairs part of the learning process among high school and university students in BiH through interactive and educational tools (board games) created by youth participating in the project."[2] Overall, there is a need to conduct surveys that directly address the response of students in Bosnia and Herzegovina to GBL to provide thorough insights into this aspect.

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[1] cf. GamifyEU publication *Gamification in non-formal education and youth work*, p. 39 available at: https://ec.europa.eu/programmes/erasmus-plus/project-result-content/bf7becf3-e203-4b43-8d35-3d678f6f495a/GamifyEU_publication_-_gamification_in_non-formal_education_and_youth_work.pdf;
[2] https://humanityinaction.org/gamifying-eu-realities-in-bih/?lang=da

3. Serious games and AI in educational setting of Bosnia and Herzegovina

Serious games, which are videogames designed for purposes beyond mere entertainment, have been recognized as a valuable tool in education (Ahmed et al., 2023, Marco, 2023) as these can engage, motivate, and support students in learning, particularly in subjects that are traditionally difficult to grasp. Furthermore, the use of AI in serious games can further amplify their educational impact. AI can facilitate the creation of personalized learning experiences, adapt to individual students' needs, and provide real-time feedback (Pérez-Colado et al., 2023).

Given its potential to enhance educational process in many aspects[3], the incorporation of serious games and AI in the educational system of Bosnia and Herzegovina is a topic of growing interest. This is evident from the efforts done by the Federal Ministry of Education to organize the conference[4] "Artificial Intelligence in Bosnia and Herzegovina – Research, Application, and Development Perspectives", which emphasized the significance of AI in modern society, citing its indispensable segment in our daily lives with a wide range of applications, including education, medicine, agriculture, tourism, economy, gaming industry, speech recognition, GPS systems, and security sectors. The Minister highlighted that the Ministry's programs are aligned with the *Strategy for the Development of the Federation of Bosnia and Herzegovina 2021-2027* and the EU's *Digital Decade Strategy for Europe*.

Bosnia and Herzegovina, which still relies on traditional educational approaches, would benefit from the integration of serious games and AI in education as these help foster practical application of theoretical knowledge. In addition, AI-supported serious games would provide a more appealing and practical learning environment, empowering students' proactivity, collaboration, and engagement. Pérez-Colado et al. (2023) point out that AI technologies can improve productivity and creativity by supporting the creation of game narratives and graphics resources, respectively, making the development of serious games more effective and creative.

Incorporating AI-supported serious games into the educational system of Bosnia and Herzegovina would require careful consideration of different challenges ranging from the lack of funds, technical expertise and technical infrastructure, teacher training and support, equitable access to digital resources,[5] or even resistance to change in schools across the country. Nevertheless, a vital issue to consider is curriculum integration, not only in terms of "significant effort and coordination between game developers, educators, and policymakers" as presented in studies such as Marco (2023) and Ali et al. (2022) – but also the fact that, within the country, each Entity has its own Ministry of Education responsible for education policy and curriculum development.

In addition, the country needs strategic planning and comprehensive strategy for integrating technology-enhanced learning, as well as development of appropriate regulations and guidelines to address the issues of data privacy, algorithmic bias, and the ethical use of AI in

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[3] The benefits range e.g. from improving learning experience and educational outcomes to simplifying the development of serious games, making them more accessible and cost-effective for educational institutions (cf. Pérez-Colado et al., 2023).

[4] the link containing the information about the opening of the second conference about AI in B&H: http://www.fmon.gov.ba/Obavjest/Pregled/1176

[5] There has been an initiative of internet networking of schools in BiH to provide equal information and education opportunities for every child, cf. https://giga.global/by-connecting-schools-in-bosnia-and-herzegovina-to-the-internet-enable-education-of-the-21st-century/

education (cf. Tolks & Kuhn, 2024). Developing targeted strategies, such as investing in research, providing training for teachers, improving infrastructure, and addressing ethical concerns, would demand collaboration between different stakeholders (policymakers and ministry representatives, educators, parents, game developers, etc.), optimization of resources and phased approach prioritizing subjects or skills that have the greatest impact on student outcomes, as well as seeking external funding from international organizations, NGOs, or private sector. It is crucial to approach the integration of serious games and AI in the educational system in a strategic and cost-conscious manner, taking into account the country's specific educational needs and challenges, in order to fully embrace these technologies.

4. Best practices of GBL in Bosnian-Herzegovinian education system

Detecting and implementing best practices for GBL can significantly enhance the quality of education in Bosnia and Herzegovina. Important step to consider is enhancing the quality of **preschool education**. Although preschool education in Bosnia and Herzegovina has a long tradition, it is facing a number of challenges, mostly arising from the arrangement of the state system and post-war transition processes which have significantly impoverished this level of education (Camović & Bećirović-Karabegović, 2022). Introducing GBL into curricula of future preschool education teachers would result in better quality of preschool education as a basis for further education. Games, including those targeted at adult learners hold great potential to improve the instructional and learning needs of adult learners, enhancing their academic performance (cf. Aziz, Hafawati, Jasmis, Elias & Mansor, 2021).

Another specific issue to consider is **bridging educational gaps** between urban and rural areas in Bosnia and Herzegovina, as research (Wang & Pong, 2014) has shown that GBL can stimulate interest, improve children's performance, and increase efficiency through games, problem solving and teamwork. Most importantly, in Bosnia and Herzegovina, GBL can be applied in contexts that demand fostering interaction, collaboration, dialogue and understanding across cultural backgrounds (as e.g. in the context[6] described by Pečenković and Delić, 2022).

In addition, GBL can play an important role in supporting **post-war recovery efforts** in Bosnia and Herzegovina. The Faculty of Health Studies at the University of Mostar was established in 2000 to help rebuild the devastated health services in post-war Herzegovina (Vasilj et al. 2020). The university introduced innovative teaching methods like block scheduling and visiting professors to quickly train nurses, physiotherapists, and other healthcare workers. This suggests that creative, flexible educational approaches can be effective for rapid, post-conflict capacity-building. Successful incorporation of GBL into programs in Bosnia and Herzegovina, educators and policymakers would foster critical thinking, communication, collaborative skills, and social cohesion.

Certainly, the effectiveness of GBL can be influenced by **cultural factors**, and this aspect is crucial to consider when implementing any educational strategies in Bosnia and Herzegovina. Cultural backgrounds (values, communication styles, learning preferences, and attitudes e.g.

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[6] In line with the project aims regarding inclusion and promotion of human rights, social cohesion etc., there is a fertile ground regarding successful implementation in diverse socio-cultural society of BiH. Bosnia and Herzegovina has been addressing the inclusion of migrant children in its education system, recognizing education as a fundamental human right. Activities initiated by the Una-Sana Canton focused on teaching Bosnian as a foreign language to migrant children, a crucial step for their inclusion in regular teaching processes.

towards technology) can impact individuals' preferences regarding different activities, as well as how both teachers and students engage with GBL activities.

One of the potentials to consider is exploration and adaptation of traditional Bosnian games for educational purposes (cf. Fernández-Gavira et al. 2021; Karatas et al. 2023; Kurt & Yavuz, 2018). Recently, drawing on certain cultural and/or social traits pertaining to Bosnia and Herzegovina led to the creation of a social game „Papirologija",[7] with which the creators emphasized challenges faced by the youth in exercising their socio-economic rights and freedom of movement within Bosnia and Herzegovina. Efforts like these can be institutionally supported and encourage other ideas to be implemented successfully.

5. Concluding remarks

There are numerous studies pointing out the importance of GBL in educational setting, highlighting its advantages such as risk-free learning, knowledge transfer, skill acquisition, etc. Obviously, the effectiveness of GBL is influenced by different factors, and this aspect is crucial to consider when implementing educational strategies in different contexts. By recognizing strengths and challenges specific for the educational context of Bosnia and Herzegovina, considering best practices and tailoring appropriate strategies, GBL can help achieve the effectiveness of teaching and learning processes, making education more engaging and impactful for students. Bosnia and Herzegovina can leverage GBL to enhance educational outcomes, promote student engagement, and improve the overall quality of education in the country.

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[7] This is a board game, but it can successfully be digitalized. It portrays (in a fun and satirical manner) the reality of administration (in)efficiency in the country; cf. https://www.mreza-mira.net/vijesti/razno/bih-drustvena-igra-papirologija-je-zvanicno-predstavljena-javnosti/; https://www.klix.ba/magazin/zanimljivosti/moze-li-ganjanje-papira-biti-zabavno-mladi-iz-bih-osmislili-zanimljivu-igru-papirologija/221126024;

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