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Využívanie systémov na správu učenia založených na AI a štandardných systémov v modeloch kombinovaného a dištančného vzdelávania

Exploiting Artificial Intelligence-Based and Standard Learning Management Systems in Blended and Distance-Learning Models

Natalia Shumeiko, Kateryna Osadcha

Abstract

In this article, the authors analyze the matters related to AI-based and standard learning management systems (LMSs), investigate their role in education, and note their relevance in the organization of students' training at universities. The authors consider LMSs as resources in the teaching-learning process during the coronavirus pandemic when universities have entirely moved to online education, highlighting LMSs' essential and fundamental relevance. Moodle and Claroline were instruments and online platforms that provided additional support to learners in a distance-learning mode at that period. Delivering knowledge to learners, tailoring the content of the study, and making educational materials available to learners are much more effective with the LMS, in our view, not only in the online mode but also in a blended learning format. The research contributes to an in-depth understanding of how AI-based and standard LMSs such as Moodle, Claroline, and EdApp help teachers monitor the learning process remotely and help students feel supported in learning.

Keywords: Learning management system. Artificial Intelligence. Blended mode of learning. Moodle. Claroline. EdApp. Higher education. Information and communication technologies.

Introduction

In the current age of application of new technology in the educational sphere and the ubiquity of the Internet, the higher education landscape has significantly transformed. Everyone seems to know: The Internet – an information source! The phrase: *“I'm Googling”* is often possible to hear today almost everywhere, either in the cafe, in the street, or within the walls of the educational institution, often in a whisper. As teachers, we have often heard

this in our offline lessons. We heard from students when we taught online classes, but not so frequently: *“I cannot log in to the system.”* Perhaps there was a time when students and teachers, one might even say worldwide, have become aware of this “SYSTEM,” meaning a learning management system. One can ask: Why? What kind of time was it? Let us recall. The tremendous global impact of the coronavirus pandemic resulted in the wide use of LMSs and, in general, the extensive use of information and communication technologies (ICTs) in a distance-learning environment. Given all the circumstances that influenced the educational sphere, transferring the tasks and materials for lessons to the online plane resulted in a shift that is evident today – there is a tendency towards a blended learning model in many universities. Moreover, many academic programs, particularly for part-time students, require online adaptation to ensure accessibility and flexibility for students in pursuing knowledge. Within this educational transformation, an LMS, which *“is a software application that automates the administration, tracking, and reporting of training events”* (Ellis, 2009), e.g., Moodle or Claroline, allows the teacher to manage the training process in a blended format. The teacher is the key figure in this process and plays a vital role in it.

A Brief Overview of Literature

Different aspects of using LMSs in education are in the field of view of scientists (Varga, 2020; Cheng et al., 2022; Sulaiman et al., 2022; Al-Mamary, 2022/1; Al-Mamary, 2022/2; Toring et al., 2023; Strakos et al., 2023; Shumeiko, 2024). Researchers focus on identifying learning styles and cognitive peculiarities in LMSs (Lwande et al., 2021). Factors influencing the students’ use of mobile LMSs (m-LMSs) were in the spotlight of recent scientific research (Alfalalah, 2023). The use of LMSs during the COVID-19 pandemic and in the current post-coronavirus situation became a central focus of the recent studies (Osadcha et al., 2022; Chaudhry et al., 2023). Scholars investigate the benefits and difficulties of using LMSs (Multazam et al., 2022). Predicting student performance in a blended learning format using LMS interaction data has captured the attention of scientists (Fahd et al., 2021). Based on the Abstract of the recent publication (Sougleridi et al., 2024), a structure and methodology for integrating AI into an LMS platform was explored by scientists. Explaining the study’s relevance, they wrote: *“To meet the learners’ hyper-personalized needs, LMS platforms must be reimagined. Massive amounts of data are being generated and gathered by learning platforms, and when these data are processed using cutting-edge data science tools like AI, machine learning, etc., they can produce insightful data intelligence that will help to further enable efficient, adaptive, and personalized learning and training programs. AI and machine learning can assist us in processing these data to enhance the functionality of an eLearning or LMS platform and modernize it in accordance with new training methodologies and learner expectations”* (Sougleridi et al.,

2024). In our view, the relevance of this study is obvious. As in today's fast-paced society, AI – a part of our reality. Embedding AI into an LMS helps obtain in-depth information on how learners interact with an LMS. This data can contribute to developing, improving, and delivering more personalized programs for learners. Scholars also pay attention to general issues related to the use of advanced online education technology in the modern educational space (Balogh, Turčáni, 2011; Tariq et al., 2021; Shumeiko, Mandáková, 2023). The basic requirements for LMSs, from the point of view of the teacher's needs, are to present the content of training, communicate with students, motivate them to study, observe their progress, and assess their knowledge (Balogh, Turčáni, 2011). The scientific works mentioned above contributed to a deeper understanding of the different aspects of LMSs' use in education. They are definitely valuable for our theoretical analysis. How? In this way: (1) the peculiarities of the LMSs' use are explored and are valuable for further LMS-related study; (2) the benefits and difficulties of LMSs' use are clearly explained (note that such clarity pertains to standard LMSs; and it is based on the information obtained from the recently published works mentioned in the paragraph above), and these research outcomes are helpful in a more detailed study of LMSs both the standard and AI-based in this paper.

We focused on and aimed at analyzing the AI-based (EdApp) and standard LMSs (Moodle and Claroline). To disclose the aim stated in the paper, the following research questions (RQ) are relevant:

RQ1: What are the characteristics (some of which are the most important in our view) of AI-based and standard LMSs? Are there any differences between them? What do they have in common?

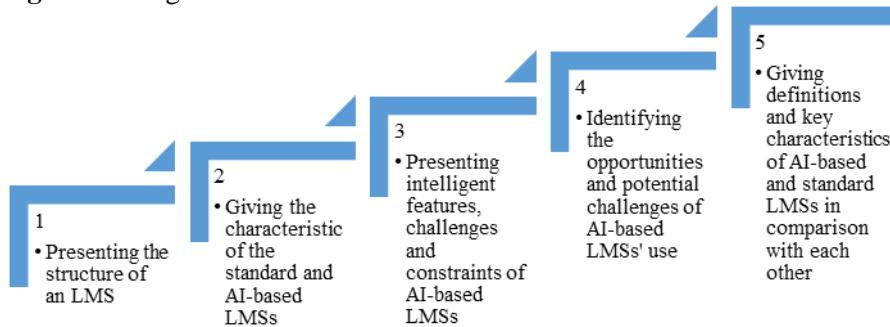
RQ2: How can AI-based LMSs be exploited in blended and distance-learning formats? Are there any potential challenges?

Research Methodology

The paper is an argumentative research with the following objectives: to present the structure of an LMS; to give the characteristics of the standard LMSs on the example of the functioning of Moodle and Claroline; and then, accordingly, present the characteristic, intelligent features, challenges and constraints of AI-based LMSs on the example of the EdApp. The fulfillment of these scheduled objectives will allow us to identify the opportunities and some challenges in AI-based LMSs' use, not all but primary ones. Then, we will give definitions and characterize AI-based LMSs and standard LMSs, attempting to show them in comparison to each other. The article provides a theoretical analysis of information resources, and recent publications related to the topic under study. The graphical method (a visual way of presenting data in Figures 1-6) is applied to present the theoretical data in graphical form.

The research structure and its five steps are presented in Figure 1 below.

Figure 1: Diagram of the research structure

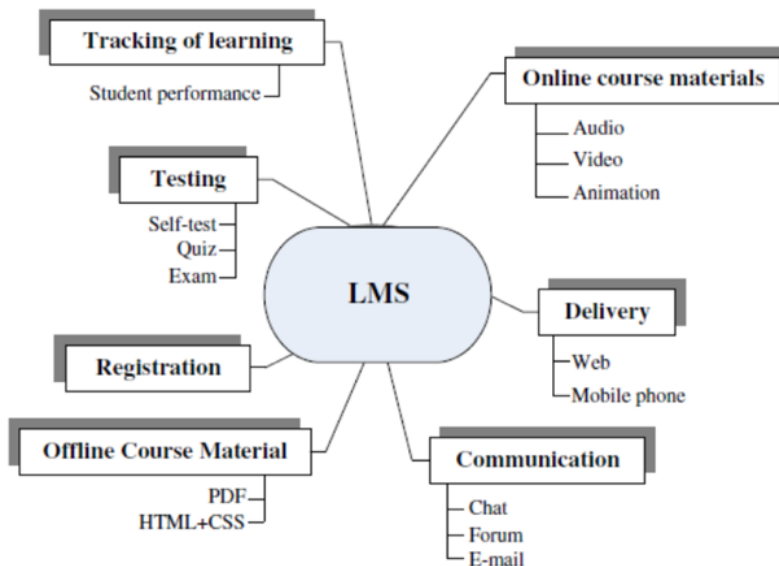


Source: own work

LMSs: The Structure and Features

The LMS is a web-based technology for planning lessons and assessing learning progress. It also offers solutions for sharing content and information and is suitable for blended and distance-learning models for universities. It is worth pointing out that „an LMS provides the virtual platform for the e-learning by enabling the management, monitoring student, delivery, tracking of learning, testing, communication, registration process, and scheduling“ (Cavus, 2015).

Figure 2: The structure of the LMS



Source: In Balogh & Turčáni, 2011

Considering the elements of the structure of the LMS (Figure 2), we can characterize the interaction between the participants of the educational process conducted online or in a blended learning format. Consequently, the LMS simplifies:

- (A) The registration of students and courses (Mikuš et al., 2007).
- (B) To conduct online learning / offline learning (Mikuš et al., 2007).
- (C) Data / knowledge is delivered to students in various forms (Cavus, 2015). LMSs provide an online space to store the training content. Pedagogues upload videos, lecture notes, and quizzes, and students, having access to these materials, read the information and complete the tasks.
- (D) Access to learning materials. Students access materials related to the studying process anytime and anywhere (asynchronous online learning lets learners view instructional materials each week at any time they choose).
- (E) The 'student-student' and 'student-teacher' communication (Cavus, 2015). A pedagogue and the learners interact via discussion forums, e-mailing, online meetings, live chats, or collaborative projects.
- (F) Students are assessed via home assignments and exams (Cavus, 2015), and grade levels are maintained (Morgan, 2003; Malikowski et al., 2006).
- (G) Student tracking (Harrington et al., 2006; Mikuš et al., 2007). Using the LMS makes it possible to track student progress.

A comprehensive LMS should be able to (Ellis, 2009):

- automate and centralize administration;
- use self-guided services;
- deliver learning content rapidly;
- consolidate training initiatives;
- support standards;
- personalize educational content and enable knowledge reuse.

Using LMSs is helpful for blended and distance-learning models. It is also worth mentioning that „*modern technology has cast a shadow over all fields, especially education, and has emerged as the dominant feature in communicating information via platforms, necessitating the availability of an LMS in universities to make communication easier between all parts involved in the educational process*“ (Al-Mamary, 2022/1). Many LMSs have been developed for distance learning courses. Let's look at Moodle and Claroline, considering these online platforms in terms of their applicability in online or blended learning.

Moodle and Claroline – OS LMSs

Moodle (<https://moodle.org/>) is the most commonly used open-source (OS) LMS. Here are some powerful properties of Moodle (Cavus, 2015):

- pedagogues create online lessons and teaching materials;
- teachers easily upload notes, instructions, the materials in different formats (e.g., MP3, PDF, Word) needed to implement training, documents with images, tables, drawings, links;
- the LMS installation is easy both locally and on the network;
- Moodle is good for synchronous online learning (learners log in using their passwords and are in a class that is held virtually at a specific time);
- pedagogues and students use multimedia products, such as videos, PowerPoint, or Excel, on Moodle.

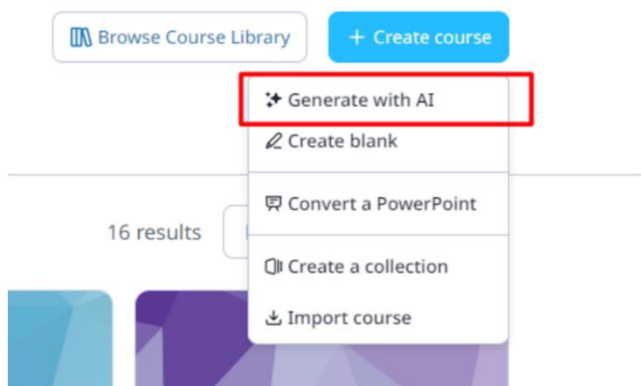
Claroline (<https://www.claroline.com>) is the LMS released under an OS license. Claroline is a good platform for higher education institutions. This platform makes it possible to create the content for the course or courses and then deliver them online. It is worth noting that „*this system provides teachers with quite a simple method of learning project creation, organization, administration, and management. At the same time, it is available for schools as “open source” software*“ (Karolčík, Čipková, 2013). This LMS platform is used in over 80 countries. Claroline has been translated into more than 30 languages (Awang, 2012).

OS LMSs provide options that help in the teaching-learning process (e.g., Moodle offers various features, such as forums, quizzes, and interactive activities), fostering student engagement and interaction (Cavus, 2015). Claroline, another OS LMS, is easy to use. It allows lecturers to deliver education to students and manage the educational process (Awang, 2012; Karolčík & Čipková, 2013). Both platforms enable pedagogues to conduct lessons in a blended format or a distance-learning environment.

EdApp – the AI-Based LMS

AI embedded in the LMS adds such features as (1) AI provides real-time assistance; (2) AI enhances content accessibility and helps to generate unique content; (3) AI is helpful in personalizing learning; (4) AI can also check tasks automatically. In the context of characterizing AI-based LMSs, EdApp (<https://support.edapp.com/creating-courses-with-ai-create-beta>) came into the field of view. The website analysis allows us to describe the AI-based online platform EdApp as a mobile AI-based LMS and a course builder. This online resource helps create questions and generate courses and lessons. To make a distance learning course, the teacher needs to select “Create a course” and then “Generate with AI” (Figure 3).

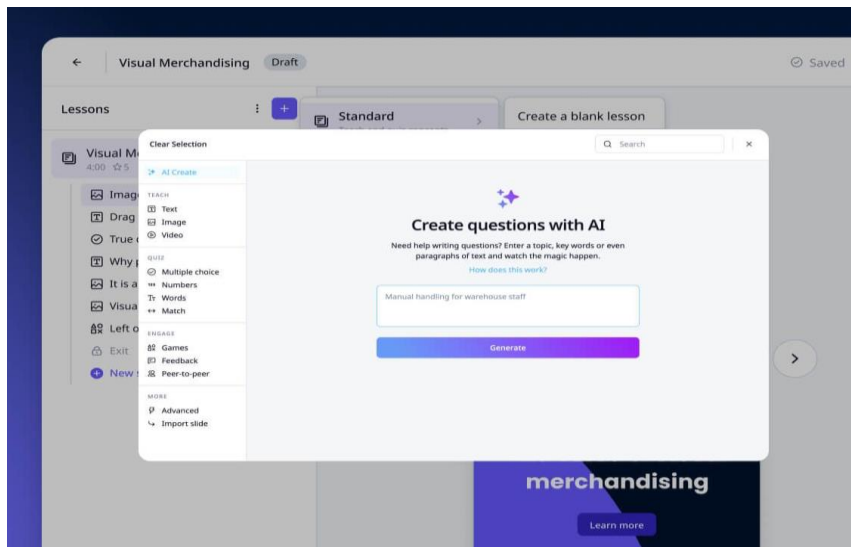
Figure 3: Creating the course with the help of “Generate with AI” in EdApp



Source: <https://support.edapp.com/creating-courses-with-ai-create-beta>

The teacher can fill in the course picture, title, and description. EdApp AI “power” can generate a course. Besides, EdApp's online AI-based platform makes it possible to make up questions (Figure 4).

Figure 4: Creating the questions for the distance course with the help of the option “Create with AI” in EdApp



Source: <https://support.edapp.com/creating-courses-with-ai-create-beta>

Key features to consider when using EdApp resources include: this platform can make it possible to have chat functionality, allowing educator and student feedback directly within the platform; pedagogues can see the analytics

part of the program to assess how learners are progressing (Edwards, 2021), not only individually but also in the group or class.

The recent scientific research findings emphasize the positive aspects of using AI-based LMSs in the educational process (Gowrabhathini et al., 2023). AI and the endless opportunities that it provides can be applied in education. Applying AI can make many activities easier, “*such as improving and mimicking the human decision-making procedure and creating automated and reliable algorithms*” (in Gowrabhathini et al., 2023; Misha et al., 2021). Scientists note that AI algorithms improve grading systems, tailor personalized learning experiences, and develop skills, fostering personalized and an adaptive learning environment with content adaptation, learning analytics, and intelligent tutoring systems (Baradziej, 2023). Moreover, the researchers consider that AI-based LMSs can affect student motivation, engagement, and performance by enabling self-regulated learning, gamification, and real-time at-risk student detection (Ferreira et al., 2023).

But at the same time, researchers distinguish the challenges and constraints of using AI-based LMSs: issues related to privacy and security, algorithmic bias, uneven access to infrastructure, and loss of human control and autonomy (Gavorník et al., 2024). The lack of standardized evaluation methods is a significant gap in the current literature, along with a shortage of comparative and longitudinal studies, under-researched areas of specific learning contexts, and AI’s ethical and privacy implications (Baradziej, 2023).

AI-Based and Standard LMSs: insights

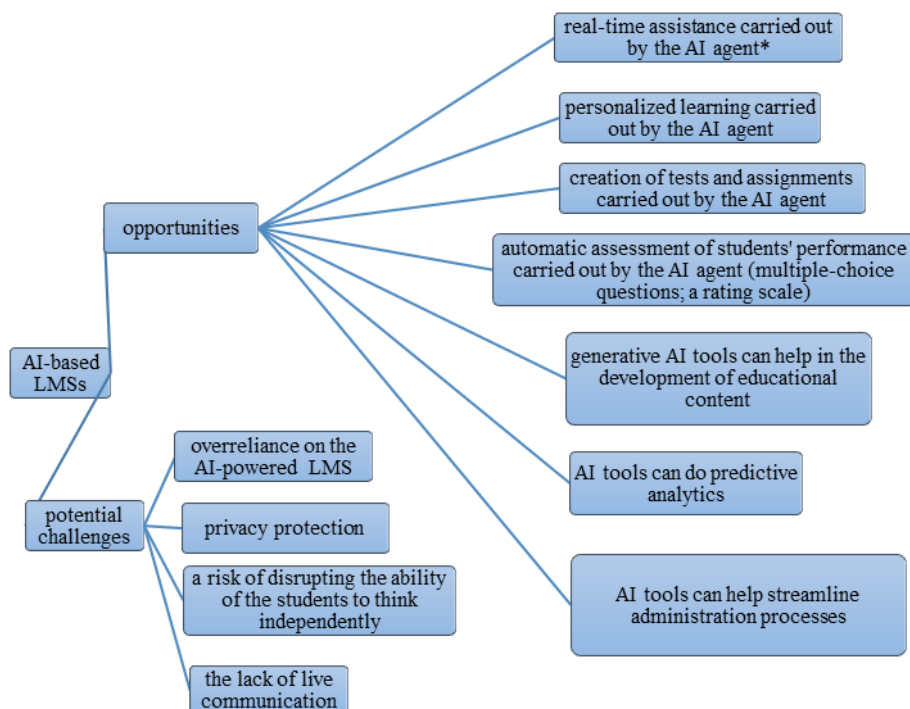
The analysis of the existing scientific publications on the topic of the current paper, particularly on the use of AI-based and standard LMSs for blended and distance-learning models, allowed us to uncover highly relevant and valuable insights for the educational process under modern conditions. Notably, the previously published articles explored the factors that influence students’ adaptation to the use of mobile LMSs (abbreviated as m-LMSs); among these factors are accessibility, the user interface, and device compatibility (Alfalah, 2023; Al-Mamary, 2022/1); investigated the role of AI algorithms in intelligent learning systems (Baradziej, 2023); explored students’ LMS acceptance patterns (Cheng et al., 2022). The issue of how LMS can affect student’s motivation and engagement is also taken a closer look at (Ferreira et al., 2023). The practical use of LMSs in the educational process was under analysis (Osadcha et al., 2022; Sulaiman et al., 2022; Multazam, 2022; Strakos et al., 2023).

But, as can be seen from a brief overview of the literature and works related to the topic of investigation and mentioned in this study, recently published papers should pay more attention to comparing AI-based LMSs with standard ones, especially regarding their use in blended and online educational courses. To address this gap in research, the following insights are shared while

considering the results of the above-mentioned scientific works and the authors' teaching experience with standard LMSs during the COVID-19 and post-pandemic periods. These insights attempt to provide critical characteristics of AI-based LMSs and standard LMSs while highlighting the potential opportunities and risks associated with using AI-based LMSs.

The integration of AI features in LMSs offers a wealth of educational opportunities. But there are also potential challenges. Figure 5 graphically presents some of the most obvious ones.

Figure 5: AI-based LMSs: opportunities and potential challenges



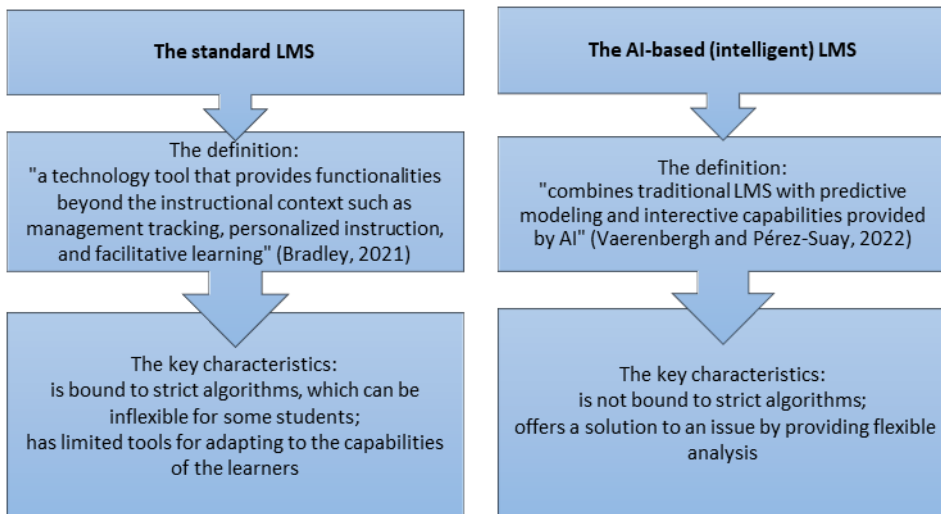
* this expression – “carried out by the AI agent” – implies as follows: “the interaction between the teacher and the student is carried out in the online environment of the AI agent correspondence. This operates according to the details the LMS services have provided. This AI agent is likely to demonstrate competences in a specific field in conjunction with the general communication and intelligence skills” (Aldahwan & Alsaed, 2020; Nenkov et al., 2016).

Source: compiled by the authors based on the conducted analysis of scientific literature and Internet sources we refer to in this paper

Figure 6 below presents the definitions and critical characteristics of AI-based LMSs and standard LMSs in the context of their use as part of the educational process. The limitations of standard LMSs (Figure 6) lie in their

rigid algorithms, which may not suit the needs of all students. Based on authors experience of teaching in the COVID 19 pandemic time, it should be stated that the standard LMSs, particularly Moodle, made it possible to share educational materials with students, conduct lessons online, test students' knowledge, assess them. The blended learning format involves using LMS as a resource for info-sharing.

Figure 6: The definitions and key characteristics of AI-based LMSs and standard LMSs



Source: compiled by the authors based on the conducted analysis of scientific literature and Internet sources we refer to in this paper

It is worth mentioning that delving into the topic so closely linked to Internet-related services, AI capabilities, and potential software applications, it is impossible to bypass information on the Internet. Resources helping answer the RQs of the current investigation have been read and critically assessed from the scientific perspective. There are the links, information, materials or articles' ideas from which have been considered helpful for the current research, among them: <https://www.techtarget.com> (Kirvan P. Learning management system); <https://keenethics.com/> (Savonin M. AI-powered LMS (Learning Management System): Benefits, Cons, and Best Practice); <https://www.docebo.com/> (Davey K. What to look for in an AI-powered LMS to improve learning). Some information from these web resources is used to complete Figure 5 and Figure 6 above for clarity and illustrative purposes.

Higher educational institutions adapt to provide blended or online support to students while teaching them. LMSs in this context are important, as their functionality to boost students' engagement. After the pandemic,

online educational technology, such as standard LMSs or AI-based ones, has become very relevant. Being a software application, these platforms, whether AI-based or standard, help deliver educational instructions and materials. In our opinion, flexibility is one of the main benefits of using education-focused LMSs, both AI-based and standard. Learners can join live classes virtually and watch the pre-recorded lectures. Blended learning mode is also highly supported, as LMSs allow document sharing and online submissions of completed tasks before the scheduled live lesson at the university. AI-based and standard LMSs are easy-to-use tools with intuitive interfaces that enable sharing options.

Conclusions

The potential of using AI-based and standard LMSs in the educational process was under analysis. The authors adhere to the research structure (moving from one step to another, fulfilling the objective of each of the five research steps) to achieve the aim of the study. The conclusions are drawn. The analysis of the structure of an LMS, as well as characterized AI-based and standard LMSs on the example of Moodle, Claroline, and AdApp, made it possible to present in graph format the opportunities and potential challenges of using AI-based LMSs in the educational sphere (Figure 5). Also, the key characteristics of the AI-based and standard LMSs were given (Figure 6). Some of the theoretical generalizations presented in this study - are a basis for further empirical research.

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