A Case for AI to Increase Benefits and Solve Challenges of E-Learning Based on the Experiences of Pedagogical Experts

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Abstract

Driven by internet adoption around the globe and accelerated through the implications on teaching during the COVID-19 pandemic, e-Learning is booming. This trend continues to grow as such digital programs enable participants to learn new content or acquire additional skills without committing to a specific place or time. Meanwhile, Artificial Intelligence (AI) has become widespread, and e-Learning programs can significantly benefit from this innovative technology. This paper provides a comprehensive overview of AI, its benefits, and how it can be used within digital learning to create innovative and customized educational experiences. Further insights from semi-structured expert interviews are portrayed. Those pedagogical and AI professionals share their perspectives on the potential benefits and risks of e-Learning environments and further elaborate on potential AI usage. The final part of the research covers an AI use case to create customized learning plans for an exemplary e-Learning program. This EU-funded project is called the "Young Refugees AI Student Empowerment Program" (RAISE). It addresses the most significant challenges of the e-Learning program e-VELP, which was set up to provide an innovative platform for young migrants and refugees who want to share their knowledge and cultural diversity through workshops free of charge and entirely voluntarily in Europe.

Keywords: Artificial Intelligence, customized learning, e-Learning, migrants and refugees, pedagogy

1. Introduction

The number and quality of studies on the strengths and weaknesses of e-Learning as a "technology-mediated learning approach" grew significantly over the last few years. This was further accelerated by the COVID-19 pandemic, in which face-to-face learning vanished in favor of teaching and learning entirely on digital platforms (Valverde-Berrocoso et al., 2020).

Rohde et al. (2023) summarized the concept of e-Learning, potential definitions, and different types of digital learning offers in a comprehensive literature review. The research further investigates the motives for why e-Learning is still a very engaging learning method in a post-pandemic world for educators and students alike, and it also shows why and how many e-Learning programs can be further improved. This literature review focused on theoretical insights into e-Learning based on existing pedagogical concepts. To analyze the chances and risks further, it is essential to understand the practical application of e-Learning programs for different target groups. Therefore, for this research, expert interviews were conducted to present the experience of e-Learning specialists and get insights into the implementation of digital programs in real-world examples. By interviewing experts, this study aimed to gather further perspectives into their specialized knowledge and practical experiences in e-Learning to comprehensively understand why AI can revolutionize digital learning in different fields. In addition, the insights of the expert interviews aimed to validate past research findings on the impact of AI in e-Learning and highlight the diverse angles of a holistic view of both best practices and challenges in e-Learning implementation, ultimately fostering potential advancements in the field. Another reason for conducting expert interviews was to validate the findings of a previous study focused on students' feedback on an existing e-Learning program (Rohde et al., 2023). The aim of conducting expert interviews was to understand better both the chances and challenges of e-Learning and how AI can overcome the latter, outlining essential elements for state-of-the-art digital learning in adult education.

After introducing existing literature on e-Learning and presenting the results of expert interviews, an exemplary e-Learning program and its respective follow-up program are introduced. The latter adds a personalized learning approach based on AI to optimize the program's effectiveness and user experience. This initial EU-funded program is called the "Youth Volunteer Educators e-Learning Program" (e-VELP) and was developed during the recent pandemic to provide young migrants and refugees aged 18-30 the opportunity to share their knowledge and skills. It aims to accelerate the students' professional integration into the EU work environment based on their expertise and close collaboration with host organizations (Flindt et al., 2021). e-VELP still exists today but has been optimized through the follow-up project "Young Refugees AI Student Empowerment Program" (RAISE) to enhance the participants' learning experience by implementing AI into the initial program. Among other findings, the e-Learning program lacked personalization and did not adequately address participants' needs. Furthermore, survey feedback showed that participants perceived the program's scope as too broad, resulting in excessive time demands. Moreover, e-VELP was initially only feasible for those with strong English proficiency, which did not allow students with limited English skills to participate.

These three key insights and responses from empirical investigations represent significant and promising highlights for optimizing the introduced e-Learning program. However, research demonstrates that e-Learning constitutes a complex educational environment, necessitating consideration of numerous additional aspects to offer adult learners a profound, intrinsically motivating, and insightful digital learning experience.

2. Research Objectives and Question

This study aims to explore the required success factors for proficient e-Learning programs while recognizing the complexity of the field. It compares those success factors with the initial structure of the e-Learning program e-VELP and its further improvement through RAISE. In this context, the overarching research question is: "What are the essential

components of an effective e-Learning program, and how does RAISE incorporate these elements?"

2.1 Expectations

The experts are expected to possess solid knowledge in e-Learning and AI, particularly in designing and implementing personalized learning approaches and integrating AI technologies. Additionally, the experts should be capable of identifying and explaining essential elements of an effective e-Learning program, such as personalization in e-Learning, multilingualism, and efficiencies in time management. Based on this, they should be able to assess and interpret RAISE's performance in implementing and integrating these critical components. Based on their experience and expertise, the experts are expected to identify potential areas for further optimization of the e-Learning program to better align with the target audience's needs. Given the multilingual background of the heterogeneous audience and the required implementation of multilingual learning content, the experts are also expected to discuss and evaluate the significance of linguistic diversity in e-Learning programs. The outcomes of the expert interviews aim to gain comprehensive insights into the effectiveness of e-Learning programs like RAISE and generate valuable insights for the latter's continued development and optimization.

3. Methods

3.1 Instrument Selection

The foundation of this paper involves a critical examination of the concept of e-Learning through a review-based approach conducted via a comprehensive literature review focused on crucial topics such as e-Learning, online learning, asynchronous learning, VR in education, gamification, AI, self-paced courses, assessments, and quizzes. This review utilized thematic databases, including Web of Science, Google Scholar, Scopus, and ERIC. The systematic analysis of existing research studies forms the basis for gaining an overview of e-Learning, its central elements, opportunities, and risks, and for contextualizing the findings concerning each other. On top of this, semi-structured expert interviews were developed based on the highlighted areas derived from the initial analysis of existing research. The in-depth interviews with AI and e-Learning experts are intended to provide further insights into the concept of e-Learning and potential AI usage, and they are based on their expertise and viewpoints. These insights will then be applied to the exemplary e-Learning program e-VELP and its follow-up project RAISE.

The data collection process for the interviews is based on digitally designed interviews with open questions. All questions invite the experts to express their experiences without restrictions or particular directions. For valuable insights from experts toward the conclusive answer to the research question, the interviews were structured into five parts that could be derived from different theoretical frameworks of the literature review. The aim was to focus on different perspectives and get a holistic understanding of e-Learning in adult education: 1) e-Learning in the context of adult education, 2) Elements of attractive e-Learning programs, 3) Personalized Learning in e-Learning programs, 4) Challenges of e-Learning, 5) e-Learning trends in the future.

These structured interview guide sections serve as a framework for the analysis, enabling the extraction of expert insights essential for comprehensively addressing the research question. Based on the participants' L1, the online interview was conducted in German.

3.2 Sample Composition and Setting

Six experts (n = 6) from Germany voluntarily participated in this study and were willing to share their expertise in a 30-minute interview via the online platform Zoom (February 2024). Four experts were male (66.7%), and two were female (33.3%). All participants brought unique insights into education, e-Learning, educational computing, and AI in e-Learning. Together, they represented a diverse spectrum of expertise aimed at advancing educational technologies and methodologies. Due to the small number of participants, the survey can be seen as an initial pilot study to assess the research question and gain valuable insights for future work ideas.

3.3. Procedure

The analysis presented in this study is based on the responses obtained from all participants. It employs Kuckartz's content-structuring analysis (2018) to categorize the interviews based on all open-ended questions. Due to the limited number of participants, the categorization process followed Kuckartz's systematic approach involving four main steps: 1st Reviewing and transcribing the responses to identify recurring themes; 2nd Coding the entire material into broader categories based on similarities and differences. Each category is assigned one code representing its essence, 3rd Developing subcodes if needed and 4th Visualizing and analyzing the data. This analysis used Excel (Microsoft Office) and MAXQDA, a computer-assisted qualitative data analysis software that aids in coding and organizing data into categories.

4. Results

4.1 Descriptive Analysis of e-Learning Literature

The concept of e-Learning has reshaped traditional learning methods and empowered students and educators, even after the recent COVID-19 pandemic. Its transformative influence is due to its great benefits, including developing independent learning skills, resource selection for self-development, fostering personal mobility, and increasing motivation for self-education and development (Alenezi, 2023). Moreover, many researchers found that it enables flexible learning and provides access to resources tailored to students' needs. Using e-Learning programs instead of traditional learning methods further promotes inclusion, allowing equal access to information regardless of users' location, ethnic origin, race, or age (Al Rawashdeh et al., 2021; Tang et al., 2021). The success of e-Learning programs for students and educators depends on three main dimensions (Rizana et al., 2020): *User satisfaction* defines the user's happiness during the learning experience in digital learning programs. A*ctual usage* expresses the frequency with which students use the e-Learning program (Lwoga & Komba, 2015). *Continuance usage intention* assesses whether and to what extent students continue using the e-Learning program and whether they recommend it to others (Mouakket & Bettayeb, 2015). These components of e-Learning success are based on factors such as the learners' and instructors' characteristics, motivation, learning environment, and organizational support (Rizana et al., 2020; Alenezi, 2023). The rise of AI can significantly enhance the success of e-Learning by better addressing the wide range of student needs and improving general requirements (Chen et al., 2020; Kashive et al., 2020). Using AI as an innovative technology improves decision-making processes in higher education and reduces reliance on human resources (Tang et al., 2021; Xie et al., 2019).

Through AI, extended reading passages can be summarized, small exercises can be performed more efficiently, and it can further facilitate data collection (Tang et al., 2021). Furthermore, it can simplify the e-Learning process by understanding the learner profiles and

provides an appropriate learning environment that connects them to the right learner network (Cope & Kalantzis, 2019; Lu et al., 2018; Montebello, 2018). Examples from practice where AI personalizes e-Learning through adaptive learning platforms and adjusts content based on student performance are Smart Sparrow or Duolingo. These programs can create personalized plans tailored to individual learning styles and progress and track the learners' journey. AI can also support automatic assessments (Aluthman, 2016) and anticipations of student performance (Almeda et al., 2018). The AI-powered math coach MATHia provides assessments and real-time feedback for middle and high school students to give them a successful math experience with individual support and ensure more engaging and effective learning results. Programs like Khan Academy can suggest courses, articles, and resources based on filled assessments and student performance. Hence, AI can be especially beneficial for students with different levels of knowledge, learning styles, or personalities, and it has enormous potential to become an impactful support in education (Kavitha & Lohani, 2019; Gligorea et al., 2023). Not only do personalization, feedback, and assessment opportunities enhance the learner journey, but tools like virtual classrooms such as Zoom and Microsoft Teams are well known in practice as well, in which AI can enhance participation and analytics in real-time to help educators offer personalized support. However, today, there is limited research on implementing AI techniques in the context of e-Learning with a focus on its potential risks and challenges (Ouyang & Jiao, 2021). Therefore, for this research, expert interviews were conducted to gain further critical insights into the concept of e-Learning, AI, and its use in education.

4.2 Descriptive Analysis of Interviews

Based on the open-ended questions of the interviews, five main codes were created based on the thematic analysis: Chances of e-Learning, Elements of attractive e-Learning programs, Challenges of e-Learning, Optimization of e-Learning, and e-Learning trends in the future. The following table shows the five main codes, each containing various subcodes. The provided mentions indicate the number of votes during the interviews attributed to each subcode in absolute and relative frequency. The category marked in bold represents the most frequently assigned subcode for each main code.

Table 1: Main codes based on interviews with experts

Code	Subcode	Mentions		Code	Subcode	Mentions	
		absolute frequency	relative frequency			absolute frequency	relative frequency
1 Chances of e-Learning	**Customized learning**	22	42 %	**3 Challenges of e-Learning**	**Self-independence as a condition**	11	33 %
	Add on to classic learning environments	14	27 %		Implementation into reality	8	25 %
	Flexibility	13	25 %		Subject incompatibility	5	15 %
	Motivation	3	6 %		Insufficient usability	5	15 %
2 Elements of attractive e-Learning programs	**Multimedia**	15	37 %		Scope	4	12 %
	Usability	9	23 %	**4 Optimization of e-Learning**	**Quality of program**	20	77 %
	Goal transparency	6	15 %		Further variation	6	23 %
	Interaction	6	15 %	**5 E-Learning trends in the future**	**Use of Artificial Intelligence**	11	50 %
	Content modularization	2	5 %		Increasing importance of e-Learning in education	11	50 %
	Feedback	2	5 %				

Source: *Own table*

The table shows that *customized learning* as a chance of e-Learning was mentioned most often (22 mentions). Hence, e-Learning provides the potential to be more personalized and needs-oriented than other teaching-learning formats. It allows learners to progress at their

own pace and receive tailored content, improving their comprehension and engagement. As another chance for e-Learning, experts mention it as a valuable *add-on to classic learning environments*. The experts emphasize its role in enhancing content visualization through digital materials, its actuality, and its promotion of digital competencies and method variety. All six experts unanimously mentioned another chance for e-Learning: its *flexibility*. The relatively high number of mentions (13 mentions) also confirms the significant opportunity, particularly regarding time management, location independence, and integration into daily routines, reflecting its broad appeal across various contexts. Less often mentioned (three mentions) are potential enhancements in *motivation* by facilitating deep engagement with the topics that can be chosen to suit age and gender.

The code *elements of attractive e-Learning* programs also provides valuable insights into how e-Learning should be structured from the experts' perspective: The critical role of *multimedia* in e-Learning is widely acknowledged (15 mentions) for its ability to activate multiple senses and enhance the overall learning experience by including components such as videos, audio, virtual reality (VR) experiences, and digital laboratory tools. These potentially crucial tools can enrich content and cater to different learning styles, thus making e-Learning more inclusive. Introducing multimedia approaches has become increasingly important in capturing today's leading e-Learning generation and the specific characteristics of this target audience. *Usability* is another essential theme for e-Learning, with nine mentions. The experts mention the importance of intuitive navigation, attractive layout, personalized course design, and relevance to everyday life. *Goal transparency* is also considered essential, underlining the importance of clearly defined learning objectives and interaction opportunities, as the experts argue that increased interaction levels correlate with higher brain activation. With two mentions per subcode, *modularized content* to facilitate personalized learning paths and the significance of providing and receiving *feedback* in e-Learning are further crucial elements that should be addressed in effective e-Learning programs.

To further address the research question on the relevant components of a successful e-Learning program, it is also essential to analyze the potential challenges of e-Learning programs and methods to avoid them. This considers technical, social, and instructional aspects. The most frequently mentioned risk (with 11 mentions) is fostering *self-independence* in e-Learning. This includes the risk of social isolation and potential loss of motivation in the learning journey, highlighting concerns about maintaining engagement and connectivity in digital learning environments. The experts also discuss broader challenges of *implementing e-Learning into reality*, including technical hurdles, overlooking social aspects or potential discrimination, deficiencies in content delivery and structure, and limited resources. Not all subjects are deemed suitable for online delivery due to *subject incompatibility* (5 mentions). Additionally, *insufficient usability* can be challenging, such as misaligned layouts, ambiguity in goal setting, and unclear task instructions. The experts also raise concerns regarding the *scope* of e-Learning units (4 mentions), meaning that attention may decline as program length increases.

To address the risks and to *optimize e-Learning* in general, the experts mention critical ideas for improvement. This includes the *quality of the program,* such as targeted content and content delivery strategies that perfectly align with the needs and characteristics of the students. The user interface of the e-Learning program is another significant aspect, underlining the importance of intuitive and user-friendly design to enhance the overall learning experience. Furthermore, adjusting complexity is essential for catering to diverse learner abilities, ensuring that content difficulty matches individual skill levels. One expert highlights the importance of promoting active engagement to improve the program's overall quality, encouraging interactive elements and participatory learning approaches. Achieving

further variation requires accessibility and usability for all learners, including those with disabilities or limited access to technology. Also, translation into multiple languages is highlighted as fundamental for reaching multilingual audiences, ensuring language barriers do not hinder comprehension and engagement.

Based on the interviews, the experts agree that the essential elements and opportunities, as well as the challenges and enhancement strategies, can be addressed *using AI in the future*. They believe AI enhances individualized learning experiences through personal AI coaches and further support during the learning process. By offering immersive and experiential learning environments that deepen the learners' understanding and engagement, e-Learning can significantly enhance learning in various fields. Furthermore, AI can make the feedback process more efficient and accurate by automized assessments. This saves time and enables educators to focus on learning plan adjustments based on AI-generated insights. Additionally, AI's role in customizing educational content allows content to be dynamically adopted, and the specific learner needs to be addressed with more tailored approaches. Furthermore, experts highlight potential AI opportunities to run automized diagnoses that can identify learning gaps and recommend learning plans to address them specifically. In summary, the experts agree on the *increasing importance of e-Learning in education* and see enormous benefits in using AI technology as an essential component for successful e-Learning programs. This trend reflects a growing recognition of e-Learning's value as a primary educational platform, driven by advancements in technology and pedagogy. It underlines a shift towards integrating digital platforms as a fundamental component of higher education.

5 Discussion

In line with previous studies and the expert pilot study, it becomes evident that e-Learning is highly diverse and can significantly improve students' learning processes. The results demonstrate two main findings. First, the benefits and risks of e-Learning and the factors that contribute to the success of e-Learning programs are very similar to the findings of the initial literature review in section 4.1. Second, the experts' statements and literature review emphasize the potential of using AI in digital learning, showing a shared opinion on the opportunities this technology presents for e-Learning programs in higher education. Based on this, the practical implications of effective e-Learning programs, especially the ones supported through AI, can be summarized in the following main categories:

Tailored learning plans to address different learning types: The main chance of e-Learning is increased personalization of learning plans. Adaptive learning systems can offer a platform where students' progress is continuously monitored and assessed, addressing their individual needs along the learning journey. In order to do that, learning groups must be analyzed to determine everyone's strengths, weaknesses, and learning preferences. Without such a differentiated consideration, there is a risk that general differentiation measures will be applied that do not meet the learners' actual needs. This would ultimately impair the effectiveness of the learning process and fail to achieve the desired learning goals.

To accelerate this development, AI can be utilized to analyze learning behaviors and create tailored learning experiences by efficiently capturing individual needs through assessments based on algorithms. For e-Learning programs in particular, this can be relatively easily deployed through a questionnaire at the beginning that determines participants' skills, needs, and knowledge gaps. However, for developing such formats, it is crucial to have both IT experts who focus on technical implementations as well as pedagogical experts who plan the content and focus on didactical principles, which in turn makes a practical adoption relatively costly.

Easier integration into work and private life: Another practical implication is the concept of improved interaction, which also impacts students' motivation. e-Learning is more flexible and accessible than traditional learning, which, especially in adult education, represents a significant advantage over other learning methods. e-Learning offers self-paced learning, allowing better integration into busy life schedules.

E-Learning allows for easier and more flexible access to education and research; therefore, it mentions increased motivation to get started as a great benefit. However, these statements might only be correlated, not caused by e-Learning programs themselves but rather by the flexibility and accessibility they offer. Adults might only be more motivated to participate in e-Learning programs than attend regular face-to-face events, as the latter usually can not provide flexibility regarding time and place or tailored learning content. Thus, motivation to participate in an e-Learning program or not is a benefit from the learners' perspective only when attractive advantages are not present in traditional learning scenarios. Based on this thesis, further research could investigate how students would assess their motivation if e-Learning and face-to-face learning offer the same conditions. By evaluating two groups, it could be determined whether the high motivation for e-Learning is only due to its advantages compared to traditional learning contexts and to what extent group learning in such context would impact the students' motivation compared to individual learning digitally.

To bridge the benefits of traditional and digital learning, AI-powered tools could be integrated into e-Learning programs to answer students' immediate questions and support in reducing further isolation. Such AI-based assistants can further translate learning content into different languages or make it accessible for students with disabilities.

Higher engagement and multi-media training: To offer not only more tailored content and flexibility but also a great experience, the usability of the e-Learning program should be continuously analyzed. It makes learning more accessible, practical, communicative, and engaging, especially compared to a face-to-face large-scale lecture in higher education. Great usability of e-Learning programs can, for example, foster student engagement, reduce frustration, and increase satisfaction through positive experiences with the platform. Multimedia-rich content and modules positively impact the engagement and interest of students.

To support attractive content creation, AI tools can be leveraged to build automated video tutorials or test and adapt UI/UX features that make the platform more appealing for participants. However, AI technology is still in the early development phases and thus brings a few challenges. Even if AI allows for relatively low costs per item produced, an overall higher variety of content for more tailored experiences in digital learning can still result in higher costs. Additionally, pedagogical experts must be trained to operate those AI tools efficiently.

Easier creation and continuous content improvement: e-Learning can also bring practical changes when considering the curriculum of the e-Learning programs. By evaluating the quality of the content regularly and ensuring that the learning objectives are aligned with the implemented content, the effectiveness of e-Learning programs can be more impactful.

AI can be used optimally, for example, for data analysis to identify problematic modules within the e-Learning program or measure the effectiveness of methods and optimize them accordingly. One critical aspect is the risk of inaccuracy and unpurposeful results that have to be critically reviewed by the pedagogical experts. This risk is specifically dangerous for small data sets.

The main limitation of this study for more generalizable statements on e-Learning success factors is the limited available literature addressing the research question of this paper and the small sample size of the expert interviews. Furthermore, the study focused more on the students' needs than the educators'. For further research, the perspective of educators needs to be considered in more depth. For example, when critically analyzing the findings of the literature review and the expert interviews, aspects such as social isolation, loss of motivation, and technical hurdles were only mentioned in the expert interviews and not in the literature. However, this is not because these challenges are not generally applicable, but rather due to the limited available literature as e-Learning is still a young field.

The second part of the research question relates to how the exemplary program RAISE incorporates these elements.

Figure 1. Chances, elements, and challenges of e-Learning found in e-VELP
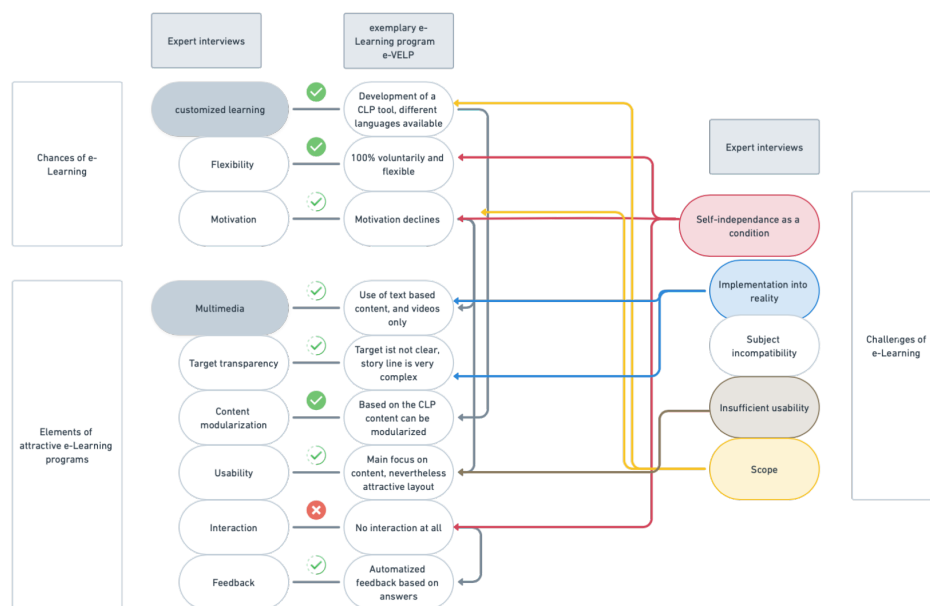
Source: Own figure

Starting on the left side of this chart, the chances are illustrated, followed by the elements of attractive e-Learning programs with all subcodes outlined in Section 4.2. The subcode highlighted in grey is the one that was mentioned most often within the respective codes. All subcodes already successfully implemented in e-VELP are tick-marked with a green symbol. Therefore, e-VELP has already successfully included the elements of *customized learning*, *flexibility*, and *content modularization*. Subcodes that are only partly fulfilled are indicated with a tick mark with a white background. Those include *motivation*, *target transparency*, *usability*, and *feedback* culture. Not to be found in e-VELP right now is the element of *interaction* (marked with a red-colored cross symbol).

The challenges that can appear when working or learning with an e-learning Program are listed on the right-hand side. *Subject incompatibility* is not a very big challenge within e-VELP as the subject at hand is, in fact, quite suitable for e-Learning, but the aspects of *implementation into reality*, *self-independence*, *inadequate usability*, and *scope* need to be addressed in the future.

Even in this exemplary e-Learning program, the insight above can be applied here as well that AI is a helpful tool, especially in mitigating challenges and optimizing the overall experience. The chance of AI as an innovation that can be optimally integrated into e-

Learning programs to make the learning process more individualized and tailored to students' needs was also used in RAISE. Developing and implementing a personalized learning tool based on an AI questionnaire enables students of e-VELP today to personalize their learning process. Therefore, the questionnaire captures existing skills and relevant background information through precisely crafted questions from education experts. Thereby, the content of the e-Learning plan becomes more personalized, and at the same time, risks, as identified above, are also reduced. The scope is reduced as students only engage with content tailored to them, and the usability has been optimized through further investments in UI/UX, with IT experts focusing on aesthetically and meaningfully integrating it into the e-Learning program. Thus, the CLP Tool demonstrates AI's practical claim in adult education and highlights the benefits of a personalized learning experience enabled by AI as an innovative technology (Rohde et al., 2023).

To sum up and provide actionable takeaways for e-Learning program designers and educators based on the findings of the research, the following aspects should be considered:

1. Focus on tailored content creation in your e-Learning program and be open to using AI-based tools that help develop a dynamic course to engage the students' motivation.

2. Use AI-powered questionnaires to implement customized learning plans in your e-Learning program. Communicate the main chance of having a personalized learner journey as a student, not standardized content recommendations.

3. Offer an AI-based chat tool that enables students to ask questions if needed. It helps students to maintain their motivation in case they are stuck in their learning journey – regardless of their time and place.

6 Conclusion

In this paper, a literature review on the broad concept of e-Learning was conducted and further elaborated through interviewing AI and e-Learning experts. The study has delved into the critical dimensions of successful e-Learning programs and identified relevant components that positively influence the learning experience. Both literature insights and recent expert opinions clearly show that AI is already used in many ways today in teaching, particularly in e-Learning. Integrating AI technologies in modern e-Learning tools is greatly important, with experts highlighting the massive potential of AI for increasing customizability and offering personalized learning experiences. Even without AI technology, e-Learning programs already increase flexibility for students through on-demand learning opportunities. Flexibility can be further enhanced through AI as it facilitates multimedia usage, creates digital interaction possibilities, strengthens content adaptability, and provides the option to give and receive feedback.

The EU-funded RAISE project represents an excellent case for potential AI usage in an e-Learning program, as AI was used to create a CLP (Customized Learning Plan) tool. The personalized learning plan enables migrants and refugees to learn individually, reduces the scope, improves the learning experience, and showcases AI technology's benefits for e-Learning in general. The project emphasizes the relevance of optimizing already existing e-Learning programs through AI but also shows potential challenges requiring further future research around the optimal usage of AI in e-Learning. Possible issues include social isolation, motivational barriers, and technical errors when running complex operations such as translations of challenging content. Already today, AI can provide significant efficiency gains while imposing little risks for relatively generic tasks such as simple translations, contextualization, content modifications to make it more suitable for a slightly different target

group, and further improvements regarding multimedia use. In contrast, more complex projects can only be partly addressed through AI. This includes creating an end-to-end learning program for diverse audiences, as it might come with a greater risk of failing to address the specific needs of the students, hence requiring stringent review through pedagogical experts. To conclude, this study is an ongoing contribution to the intersection of e-Learning and AI technology by synthesizing recent theories with practical insights from experts.

Data Availability

The dataset generated for this study is available upon request from the corresponding author.

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