Final Preprint – accepted (17.10.2023)

Cite as: Winder, G., Kern, A., Zehetner, K. & Buchner, J. (2023). Unlocking Potential: Creating an Innovative Learning Platform to Foster Digital Skills of Educators. In S. Singh (Editor), The 9th e-Learning Excellence Awards. An Anthology of Case Histories 2023. 155-161. Online accessible: https://www.academic-bookshop.com/ourshop/prod_8077437-9th-eLearning-Excellence-Awards-2023.html

Unlocking Potential: Creating an innovative learning platform to foster digital skills of educators.

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Abstract: The development of digital competencies is vital for teachers and principals to harness the potential of digital technology in the classroom. In response, *aprendo*, a learning platform supporting the ongoing growth of digital competencies for more than 12,000 educators in the canton of St.Gallen, Switzerland has been created. The platform offers diverse learning opportunities in synchronous and asynchronous learning formats. Until 2027 it will offer about 100 modules in six competency dimensions.

aprendo provides flexible and accessible ways for users to develop digital competencies regardless of time and location. Despite initial technological implementation and user adoption challenges, the platform was well-received.

Moving forward, *aprendo* will expand and incorporate new modules, along with technological innovations like artificial intelligence to help users find suitable modules based on their interests. By equipping educators with knowledge and tools to navigate the digital landscape, *aprendo* aims to support the ongoing digital transformation of schools and prepare principals, teachers, and students in St.Gallen for the future.

Keywords: digital competencies, teacher development, Switzerland, aprendo.ch, e-Learning, education

1. Introduction

The 21st century is characterized by profound global societal transformation and rapid advancements in technology, which have a significant impact on various aspects of life. These changes bring forth new demands and challenges in the field of education, particularly for teacher education and the teaching profession itself (Falloon 2020; Schweizer 2019). Furthermore, global COVID-19 lockdowns and the increase of artificial intelligence (AI) applications such as ChatGPT, have led to a broad consensus that digital transformation in schools must be advanced (Gašević, Siemens, and Sadiq 2023). As a result, fundamental questions arise regarding the essential competencies required for active and responsible participation in future societies (Caena and Redecker 2019). To ensure that teachers remain effective in their roles and adequately support students' learning journeys, especially the realm of digital competencies requires additional effort for continuous professional development.

Recognizing the need for ongoing professional development in digital competencies among educators, the government of St.Gallen entrusted an innovative project team at the St.Gallen University of Teacher Education, with the task of developing a digital learning platform (KoDiBi 2020). As a result, *aprendo* has been created. The platform aims to strengthen the digital competencies of all teachers and school principals in the canton of St.Gallen.

The platform, designed to fully leverage the potential of digital technology in the classroom, offers a comprehensive range of learning opportunities. It caters to over 12,000 educators across primary, secondary, and vocational schools. This approach distinguishes *aprendo*, as the authors possess no knowledge of alternative continuous education platforms that comprehensively encompass the entire spectrum of digital skills acquisition among educators, spanning from early childhood education to professional development. *aprendo* offers flexible and accessible learning formats, including synchronous and asynchronous fully online and blended modules, empowering educators to enhance their digital competencies at their own pace and regardless of time and location. This user-centric approach acknowledges the heterogeneity of the users, allowing them to individually plan their continuing professional development.
In addition, our developed AI-powered "*aprendo* navigator" supports educators in choosing modules based on their interests and professional development goals. The feature acknowledges the importance of both the acquisition of skills and the promotion of affective-motivational learning of teachers to ensure lifelong learning engagement.
Built on cutting-edge software and featuring a user-friendly interface, *aprendo* overcomes initial challenges related to technological implementation and user adoption. It empowers its users to explore a diverse range of topics across six competency dimensions, which are *ICT Application*

Skills, Instructional Design and Educational Technology, Media Literacy, Computational Education, Digital Professionalism and *Digital Leadership*. These dimensions are based on *DigCompEdu* (Redecker 2017) and *dig.kompP* (Brandhofer and Miglbauer 2020), but combine them to more fully capture the competencies teachers need to shape education in the digital world (Brandhofer et al. 2022).

The platform has already yielded positive results, facilitating significant improvements in users' digital skills. The platform's versatility and adaptability allow for continuous evolution and expansion. Future plans include the incorporation of new modules, e.g., modules that focus on emerging topics in teacher education like AI literacy (Hornberger, Bewersdorff, and Nerdel 2023) or immersive learning with augmented/virtual reality (Buchner and Hofmann 2022), and the integration of further AI features that, for example, consider prior knowledge as another relevant factor for module recommendation.
These advancements will help users identify the most suitable modules based on their prerequisites and preferences and further enhance the learning experience.

2. The infrastructure – people and systems

aprendo consists of three different platform components, although they are not recognizable to users as separate applications. The three main components of the platform are the frontend, the backend, and the Learning Management System (LMS). Additional applications such as *Kaltura*, which is used as videoconferencing tool, are integrated via API (see Figure 1).

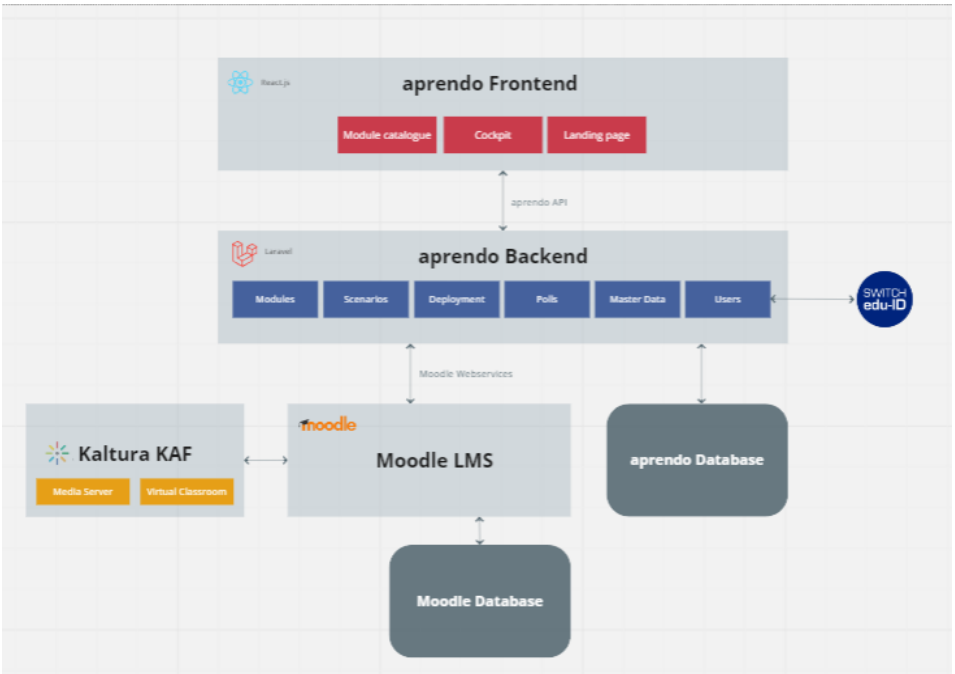

Figure 1: System infrastructure

The frontend has been developed in-house and is the interface that users see and interact with. It includes the essential navigation and interaction elements of the platform, such as module catalog (see Figure 2), personal learning cockpit, support, and personal profile. The frontend is responsible for displaying modules and general platform information and serves as the starting point to access features such as user registration and module content itself. It provides a user-friendly and attractive interface to offer users an intuitive and engaging learning experience. Users have the possibility to personalize their profile and to use filter options available in the catalog. By doing so users actively influence the display of the modules as well as the respective order.

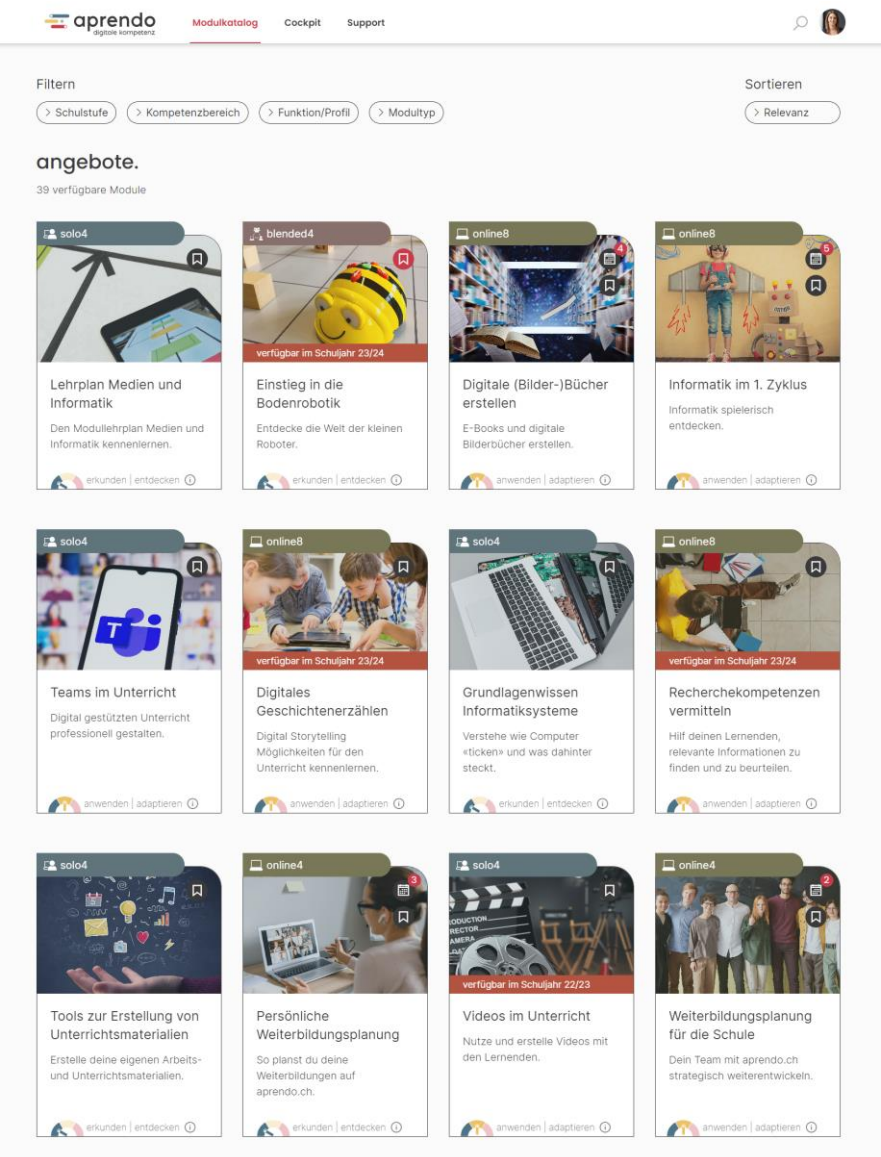

Figure 2: Module catalog

Within a dedicated section of the catalog, users are presented with modules currently under development. This allows users to consider this information while planning their personal training goals. The personal cockpit provides an overview of a users' current, planned, and completed modules. Additionally, it displays the total number of hours already studied on the platform. Future enhancements in this area will incorporate gamification strategies.

The backend is also an in-house development and is the technical infrastructure that operates behind the scenes of the platform. It includes databases and other components required for storing, administering, and processing all essential data related to offering, implementing, and completing modules. The backend processes user requests, stores user data, learning materials, and other information, manages security and authorization/authentication, enables scalability of the platform, and ensures seamless integration with other surrounding systems and services (LMS, APIs to *Kaltura*, frontend).

The Learning Management System (LMS) is the core element of the learning platform. It is based on a modified version of the open-source software application *Moodle*, specifically developed for the management and organization of learning content. The LMS allows module authors and instructors to create modules, upload learning materials, track the progress of users, conduct assessments, and issue module certifications.

In addition to the software component, *aprendo* is primarily distinguished by its team. Currently, around 30 employees work on the project, divided into three teams that focus on different aspects. The entire software development is done in-house, offering advantages such as customization, quality control, security, and above all high flexibility and speed in implementing new features and user requests. This internal development of all components and integrations allows for tailored solutions, efficient maintenance, ongoing support, and seamless integration. Overall, it ensures a comprehensive and effective platform. The small in-house software development team consists of two full stack developers and one application engineer.

Another team is responsible for the administrative processes of the platform. In addition to coordinating online and blended modules, the team, currently consisting of three employees, handles support cases and public relations. Furthermore, as the team members are power users of the backend they contribute to the continuous improvement of administrative processes within the platform.

The third and largest team within *aprendo* focuses on managing and developing learning content. The team, currently comprising around ten members, is responsible for developing content in the six competency dimensions. They either develop content themselves or

coordinate with external module authors and oversee quality management too. To ensure a high quality of the published module, a rigor instructional design process is applied. The process starts with a subject analysis, in which intensive didactic and content research is conducted. Based on the findings, an initial rough planning is made for the respective module. This is followed by detailed planning, in which the concrete content and structures for the module are developed.
The next step is to produce the educational media and embed them in the LMS. This is followed by an initial assessment and test run of the module. If necessary, adjustments are made, otherwise the module can be finally reviewed and released. After this final review, the module is published on the frontend and can be booked by the users. In the further course, the module will be maintained and, if necessary, revised and adjusted after the next feedback phase.

After one year of operation, *aprendo* currently offers 30 modules. By 2027, this offer is planned to grow by approximately 230% to around 100 modules, which equals an average of about 20 new modules per year.

3. Challenges

Developing a continuous learning platform for educators during the COVID-19 pandemic presented several obstacles. These challenges encompassed developing a course program that is catered to a diverse range of stakeholder groups, school types and individual needs, finding new employees, developing a shared culture while dealing with many uncertainties and with tight deadlines at the same time, as well as some technical issues. Here is a more detailed look at these challenges and the successful strategies employed within the project team to overcome them:

Tailored Course Program: Developing a course program that addressed the diverse range of the various stakeholder groups, school types, and individual needs was a substantial challenge. Significant effort has been invested in conducting thorough research and engaging with educators, subject matter experts, and other stakeholders. Several focus groups, surveys, and interviews to gather insights and feedback were conducted. By incorporating a variety of instructional methods, such as interactive modules, video tutorials, and live virtual sessions, the project team created a comprehensive program that is catered to the specific requirements and learning preferences of different target audiences.

Technical Issue Resolution: Like any complex software project, technical issues arose during the development of *aprendo*. The project team established robust quality assurance processes, including rigorous testing procedures at various stages of development. A dedicated team of developers and technical experts promptly addresses and resolves any technical issues

encountered. Regular bug fixing and system optimization activities are carried out to ensure the platform's stability, performance, and security.

Creating a team that shares a spirit to succeed: To meet the project's demands, great importance was placed on recruiting professionals with expertise in remote learning and software development. Implementing targeted recruitment strategies, the project lead reached out to individuals experienced in software development, online education, and instructional design. The project's broad scope and significant multiplier effect served as a motivating factor for the team, inspiring them to build something truly exceptional.

Developing educational content while advancing the platform's technical features: Especially during the initial phase the simultaneous development of content and the platform itself presented multifaceted challenges to the project team. The main challenges were resource allocation, the coordination between diverse teams, and the need to balance content quality and relevance with rapidly evolving technical updates.

Managing tight deadlines: The project team effectively handled tight deadlines and the pandemic's uncertainties by embracing agile project management. It broke down the project into manageable tasks, continuously reassessed priorities, and achieved incremental progress. This approach provided the project team with immediate visibility of smaller successes, which greatly motivates the team.

Public project with fixed parameters: It must be emphasized that *aprendo* is not a profit-driven project. Instead, it operates within the constraints of a fixed budget and specific targets for module development (e.g. a fixed amount of modules that need to be developed). This involves a continuous juggling act to strike the right balance between maintaining quality and managing costs. It's important to note that any financial gains resulting from our efforts, in the event of success, won't necessarily translate into increased resources.

4. First Results and Experiences

Following the successful launch of *aprendo* in May 2022, a comprehensive interim assessment was meticulously conducted in April 2023 to gauge its performance. This assessment was executed by a panel of distinguished experts, appointed by the project steering committee due to their extensive knowledge and experience in the field. Their evaluation of the platform resoundingly affirmed its effectiveness and remarkable quality. Furthermore, a series of regular user tests conducted in tandem consistently yielded similar positive results, showcasing users' high levels of satisfaction. These tests not only reaffirmed the platform's intuitive interface but also underscored the exceptional quality of the learning content it offers.

Moreover, the platform's usage statistics have surpassed the initially projected figures, thereby underscoring its burgeoning popularity and widespread adoption among educators. In fact, user engagement with the platform's features and resources has not only met but often exceeded expectations.

The overwhelmingly positive feedback received from users and the growing interest expressed by other cantons and organizations have spurred the government of St.Gallen, the entity that initiated this visionary project, to take proactive measures. To ensure the continued operation and development of *aprendo* and its invaluable content beyond the initial project timeline, a dedicated committee has been established. The primary objective of this committee is to explore sustainable business models that will guarantee the long-term viability and growth of *aprendo*, safeguarding its role as a cornerstone of education and learning excellence.

5. The learning outcomes

During its inaugural year of availability to users, the *aprendo* program witnessed a remarkable level of engagement. More than 9,200 individuals, constituting over 76% of the estimated total of approximately 12,000 teachers and principals, actively registered for the program. These usage statistics are particularly noteworthy, given that only 30 out of the planned 100 modules were accessible at that time. Out of a total of 6,868 module completions, 5,962 modules were autonomously completed through online self-study, while 876 modules were completed in moderated online settings. An additional 30 completions stem from the first blended-learning module offered on *aprendo*. Collectively, these completed modules accounted for an impressive 30,042 hours of professional development, equivalent to an astonishing 4,291 calculated professional development days within the program's inaugural year.

The evaluation of *aprendo* is characterized by a comprehensive and multidimensional approach that incorporates various perspectives and encompasses five key components to assess its overall effectiveness. These components encompass both internal and external factors, ensuring a thorough evaluation of the learning platform:

1. Data-driven analysis: User behavior, module availability, and outcomes achieved are meticulously examined through tools such as backend analytics, *Moodle* logs, evaluation analytics, and *Kaltura* statistics.

2. Standardized user evaluations: Participants willingly provide feedback, offering valuable insights into the user experience and the effectiveness of the training content. This feedback encompasses various parameters, including a "net promoter score" reflecting the recommendation rate. An average rating of 3.22 on a four-point Likert scale indicates a remarkably high level of recommendation, with only three out of the 30 modules receiving a rating below three, prompting subsequent content revisions.

3. Rigorous testing: Multiple test iterations involving small focus groups meticulously assess the module content and the user experience within the learning platform. Observations from participants are diligently reported to the project team, and guided focus group interviews facilitate further discussion and evaluation. Automated regression tests ensure technical functionality, and robust security measures, including professional penetration tests, have been rigorously implemented.
4. External expert evaluation: An external advisory group comprised of independent experts critically evaluates the training offerings and consistently provides recommendations for enhancement based on their domain expertise.
5. External implementation evaluation: This component scrutinizes the utilization of *aprendo* across various school types within the canton of St.Gallen, offering valuable insights into its practical application and effectiveness in real-world educational contexts.

This multifaceted evaluation approach ensures a comprehensive understanding of *aprendo*'s impact, effectiveness, and user experience. By amalgamating data analysis, user evaluations, rigorous testing, external expert perspectives, and real-world implementation assessments, *aprendo* undergoes continuous refinement to provide an engaging, effective, and continuously improved learning experience for its users.

6. Plans for further development

aprendo, encompassing both its individual modules and the technological platform, is still in its early stage of development, with the project scheduled to continue until mid-2027. Both components of *aprendo* will undergo agile development processes, evolving in response to user needs and evidence-based findings in the forthcoming years.

Given the ever-evolving landscape of technological innovations, notably the influence of AI in education, we remain committed to continually monitoring and incorporating these advancements into the platform's ongoing development. Consequently, it remains challenging to foresee all potential future developments at this juncture. However, several noteworthy advancements are already on the horizon, either in an advanced stage of internal prototyping or deemed highly likely for implementation.

As *aprendo*'s module catalog expands from the current 30 modules to an estimated of about 100 modules by 2027, users may encounter increasing complexities in navigating the growing array of module offerings, despite the availability of filter options and automated consideration of personal preferences. To tackle this challenge, we are proactively implementing two specific measures aimed at ensuring efficient navigation.

Firstly, we will introduce various pre-defined module paths that include tailored recommendations based on the competencies of different user profiles. This approach will simplify the user experience, particularly for those less familiar with the platform, by providing clear guidance on accessing modules that align with their specific needs.

Secondly, we just launched the additional access method known as the "*aprendo* navigator." This innovative feature employs specialized weak AI designed explicitly for this purpose. The navigator utilizes six motivational questions to intelligently suggest the most suitable modules to users, further enhancing the platform's user-friendliness and ensuring that learners can seamlessly discover content that resonates with their goals and interests (see Figure 3). These strategic developments underscore our commitment to not only keep pace with technological advancements but also to proactively enhance *aprendo*'s user experience as it continues to evolve.

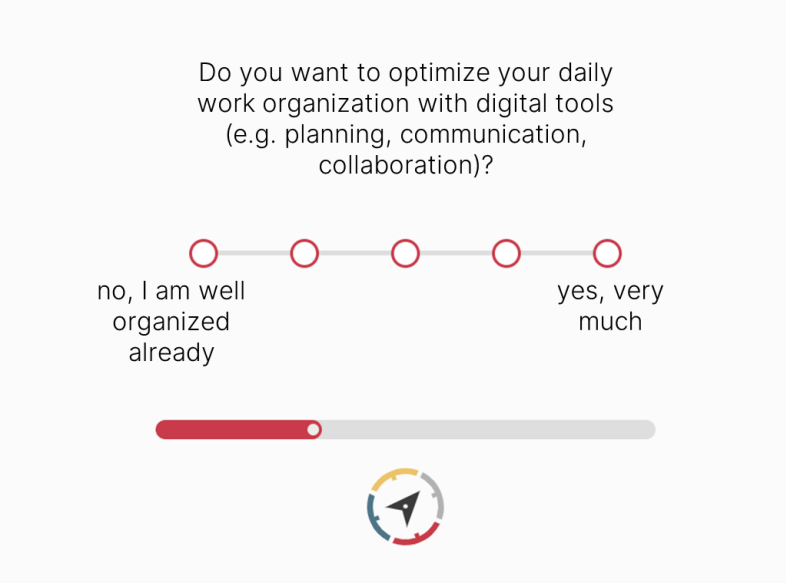

Figure 3: Example question *aprendo* navigator

The navigator primarily considers user interests rather than their existing competencies, following the principle that motivational aspects should be weighted as heavily as current competency levels in professional development, as discussed by Hidi (2006) and proved in a recently published study by Fütterer et al. (2023). The innovative algorithm does not follow a conventional tree structure or if-then logic; instead, it selects the next question from the question pool based on each previous answer of the user to provide the most personalized module recommendation.

Furthermore, to boost user acceptance of the platform, gamification features are being explored. Integrating elements like point systems, rewards, and challenges can significantly enhance learner motivation (see Figure 4). The effectiveness of gamification in increasing motivation has been documented in multiple studies (Huang et al. 2020).

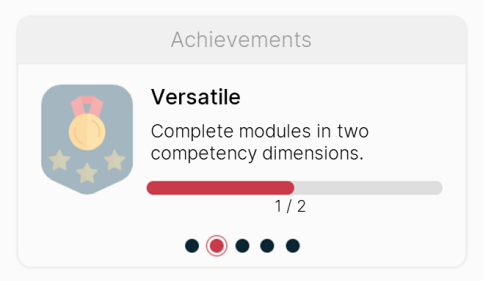

Figure 4: Example gamification badge

Lastly, the aspect of networking and learning from others within and beyond *aprendo* is mentioned. In teacher professional development, the exchange of experiences is particularly important. The introduction of two additional module types, blended learning, and specials will address this aspect. Furthermore, a networking platform developed and integrated into the module design. This will allow teachers to connect with one another, learn from their experiences, and gather new ideas, even after modules have been completed.

7. Conclusion

In our rapidly evolving technological landscape, there is an increasing urgency to equip educators with the essential skills required to effectively navigate the digital realm. The development of *aprendo* represents a significant milestone in addressing this crucial need among teachers and school principals in the canton of St.Gallen. *aprendo* stands as a pioneering platform that offers a comprehensive and user-centric approach, empowering educators to enhance their digital competencies at their own pace and convenience and for teachers of all levels.

What makes *aprendo* truly remarkable is its adaptability and scalability, ensuring that it can meet the evolving needs of educators in an ever-changing technological landscape. The platform's success has reverberated beyond the borders of the canton of St.Gallen, drawing attention from other regions and organizations. This widespread recognition underscores the platform's profound importance and relevance in the broader context of education and digital transformation.

In summary, *aprendo* emerges as a pivotal instrument in supporting educators as they confront the challenges posed by the ongoing digital transformation. It not only equips them with the skills needed to thrive in a digital age but also serves as a beacon of innovation and progress in the field of education.

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