Adaptive Leadership as a Catalyst for Educational Digitization

Zuraidah Juliana Mohamad Yusoff[1], Maslinda Hani Zainal Abidin[1], Wan Marfazila Wan Mahmud[1], Siti Hajar Mohamad Yusoff[2], Norhashimah Yahya[2]

[1]Pusat Pengajian Pendidikan, Fakulti Pengajian Kontemporari Islam, [2]Pusat Pengajian Usuluddin, Fakulti Pengajian Kontemporari Islam, Universiti Sultan Zainal Abidin, Malaysia
Email: zuraidahjuliana@unisza.edu.my

Abstract
The world of education today is constantly changing in line with the needs of the Industrial Revolution globally so that digital transformation is linked to the implementation of technology and modern solutions to enhance student experience in the learning and teaching process. Following digital technology, learning methods have traditionally changed to the use of electronic tools, systems or devices such as social media, online games, multimedia and mobile phones. At the same time, the country's education policy is being formulated by focusing on improving student mastery in digital technology, enriching quality digital content, enabling teacher competence, and making the use of digital technology as a culture among educational leaders. This leads to problems among teachers such as incompetence in using digital technology, difficulties in integrating technology into teaching and learning, as well as concerns about the negative effects that may arise from the use of digital technology. So this concept paper aims to discuss digital issues and effective leadership styles as a driving force for the successful application of educational digitization in schools. This concept paper involves focusing on data through literary studies conducted to discuss the challenges and necessities in ensuring the success of education digitization. As a result, aspects related to digital transformation in education, the importance of digitalization in the education system, methods and types of digitization of teaching, and the challenges of teachers in applying digital education were discussed. In conclusion, the discussion of this concept paper discusses the theory and model of adaptive leadership as an incentive to the implementation of education digitization in schools, and further able to contribute in supporting and preparing teachers for the digitization of education.
Keywords: Adaptive Leadership, Educational Digitization, Digital Transformation

Introduction

Digital transformation has revolutionized the global education industry, making it more accessible and inclusive compared to traditional education delivery. With the assistance of advanced technology, students can now access a variety of information and resources at their fingertips, regardless of their location or family background. Online learning platforms have become increasingly popular in line with Surges 3 and 9 in the Malaysian Higher Education Blueprint (PPPM) 2013-2025, offering a flexible and lifelong learning experience (PPPM, 2013-2025). Artificial intelligence and machine learning have also played a crucial role in transforming education, providing intelligent teaching systems that can adapt to each student's unique learning style (Li, 2021). Additionally, virtual reality and augmented reality technologies have enabled students to explore complex concepts more effectively and engagingly (Iatraki & Mikropoulos, 2023). As a result, digital transformation not only enhances the quality of education but also opens up new opportunities for lifelong learning and skill development, leading to higher understanding and critical thinking.

However, the revolution and transformation of education now require educators to develop new skills for effectively using these digital tools (Almelweth & Alkahtani, 2018). Consequently, it is crucial for teachers to receive appropriate training and support to ensure they are equipped with the necessary skills to integrate technology effectively into their teaching practices (Berger & Wolling, 2019). Overall, digital transformation in education has opened new opportunities for both students and teachers to delve into the realm of educational digitization. In conclusion, it is the responsibility of educational leaders to provide teachers with the readiness to embrace change and adapt quickly and efficiently through creative and innovative adaptation of existing technology management strategies and practices (Afandi, 2020).

Digital Transformation in Education

Digital transformation in education has been a topic of discussion in recent years. Given the rapid advancement of technology, educators are seeking ways to incorporate digital tools and resources into their teaching practices. The digital transformation in school education refers to the integration of technology into the processes of learning and teaching (Raman et al., 2019). It involves the use of digital tools such as computers, tablets, and smartphones as aids in enhancing the learning experience for students. This transformation aims to provide students with a more engaging and interactive learning environment that fosters critical thinking and problem-solving skills (Zulham, 2020). It also enables teachers to provide guidance and immediate feedback to students.

Some scholars argue that digital transformation has the potential to revolutionize education by providing access to various information and resources that were previously unavailable (Prijana & Yanto, 2018). The rapid pace of technological change can be highly encouraging, and teachers must be cautious not to sacrifice quality for innovation. Despite these concerns, it is evident that digital transformation will persist in the field of education, and teachers must adapt if they want to remain relevant in today's rapidly changing world. Whether through online learning platforms, interactive educational software, or other innovative tools, there are many ways technology can be used to enhance the educational experience for students of all ages and backgrounds (Pilaniwala, 2022). Ultimately, the key to the success of digital transformation in education is finding the right balance between innovation and tradition, and ensuring that technology is used in curriculum development.

Curriculum development is crucial, as it is a complex process that requires careful consideration of many factors (Fajri, 2019). One of the most important considerations is finding the right balance between innovation and tradition. Innovation is essential to adapting to the changing needs of students and society. New technologies in teaching methods and subject areas can help make education more relevant and engaging for students. On the other hand, tradition provides a sense of continuity and stability that can reassure both students and teachers. By using established practices and knowledge, teachers can ensure that their curriculum is based on a strong foundation while being open to new ideas and approaches. Ultimately, finding the right balance between innovation and tradition requires continuous planning, collaboration, and assessment (Mustapa & Miskon, 2023). By working together to create the best curriculum that incorporates both traditional and innovative concepts, educators can help ensure that students are prepared to face future challenges while still respecting the wisdom of genuine educational knowledge.

The Importance of Digitization in the Current Education System
The importance of digital transformation in school education includes enabling students to access educational resources from anywhere with an internet connection. This ease of access facilitates self-paced learning initiatives, allowing students to learn at their own rate and time, in addition to focusing on the traditional classroom setting. Heckadon and Tuzlukova (2021) argue that digital transformation in the classroom offers various advantages, including student engagement, learning motivation, and collaboration in accessing educational resources. This enables teachers to create a dynamic, interactive environment, monitor progress, identify weaknesses, and provide targeted support necessary to enhance learning understanding.

Furthermore, digital transformation can also be used to create more engaging and interactive learning experiences, such as virtual field trips and gamified learning activities (Rospigliosi, 2020). These experiential approaches not only make learning more enjoyable but also help enhance knowledge retention and understanding of learning content.

Additionally, digital transformation also enables teachers to monitor students' progress more effectively and provide relevant feedback tailored to the individual needs of each student. Digital transformation in education is also supported by research (Syah & Busra, 2018), which suggests that technology allows lesson plans and teaching activities to be personalized, enhancing academic performance and self-awareness through affective learning activities. It provides students with diverse resources beyond the classroom, enhancing understanding and fostering independent and extensive learning skills.

Overall, the importance of digital transformation in school education is evident, making it a crucial approach in contemporary teaching and learning practices, aligning with global trends in education globalization. Collaborative learning through online discussion forums, group projects, and virtual simulations is aimed at enhancing communication and teamwork. Technology also makes learning more engaging and enjoyable, with interactive whiteboards, gamification techniques, and other tools that enhance the learning experience.

Therefore, it is possible to connect the technology generation with Tyler's educational model (2001), which conceptualizes the curriculum from printed materials and distance learning to electronic content and flexible learning models. However, the educational process still goes through the phases of educational objective development, learning practice, and assessment of content objective achievement. In this regard, the reinforcement of technology in the education process is done by applying the use of various software products for exercises in

the educational process, such as tutorial programs and electronic textbooks, business games, semantic networks, glossaries, simulations and digital twins, subject-oriented systems, virtual reality and augmentation, artificial intelligence, and testing programs (Gillpatrick, 2020; Newman, 2017).

Methods and Types of Digital Teaching

The digitization of education has resulted in various new methods and types of teaching and learning. One popular digital education approach is blended learning, which combines traditional classroom teaching with online learning activities. Blended learning is becoming increasingly popular due to its flexibility, adaptability, and personalized instruction. Students can access online resources, complete assignments at their own pace, and receive guidance from teachers. Teachers can use data from assessments to tailor lessons to individual needs. Despite challenges such as equitable technology access and ongoing teacher training, blended learning has the potential to revolutionize education by offering a dynamic and engaging learning experience.

Furthermore, another method is gamification, an educational approach that uses game design elements to make learning more engaging and interactive. Gamification is a powerful tool that has proven to enhance motivation and engagement in the learning process. Ramlan (2021) states that by incorporating game design elements such as points, badges, and leaderboards, students are incentivized to complete tasks and compete through these elements. This approach can be effective, especially for students who may face challenges with traditional teaching methods. Additionally, gamification can be used to reinforce positive behavior and encourage healthy engagement. Overall, gamification is a valuable technique that can enhance the learning experience and promote positive behavioral changes (Laffey, 2022).

Among other methods is the flipped classroom approach, which has become increasingly popular, where students watch lectures or complete assignments online before coming to class to engage in collaborative activities. This approach allows for self-directed learning and focuses on student-centered activities. It encourages accountability and responsibility among students, as they are expected to come prepared with knowledge and questions for discussion. According to Zhong et al (2022), this approach can be beneficial, especially for students who struggle with traditional lecture-based teaching, as it allows them to proceed with reading, review, or make additional clarifications related to the learning content at their own pace. Moreover, the flipped classroom model can allocate classroom time to more practical learning experiences, such as labs, group projects, or discussions on current issues. Overall, the flipped classroom model offers a promising alternative to traditional teaching methods and has the potential to enhance student engagement and success in the classroom. Lastly, among the teaching methods favored by students is virtual reality-based learning, which involves a novel and immersive learning experience. Virtual reality technology is a highly captivating and innovative teaching method (Ayob & Jainal, 2021). It provides a fresh and profound learning experience for students. With this technology, students can see and feel a real situation or environment in the virtual realm. This experience allows them to gain a clearer understanding of the topics being studied. Moreover, virtual reality technology also helps enhance students' imagination and creativity. They can generate new ideas that may not be possible through conventional teaching methods. Therefore, virtual reality technology is a highly sought-after teaching method among students today.

Based on the discussion, it is evident that the digitization of teaching has brought significant changes to the world of education today. Directly, it has revolutionized the approach to the

education process, requiring teachers to be willing to design more meaningful teaching and learning methods. Therefore, teachers need to go through an adaptive learning phase, which requires adapting to the needs of technology by connecting it to the individual progress of students (Sunita, 2019). Teachers in 21st Century Education (PAK-21) now need strong technological skills and high creativity to design innovative and effective learning methods (Pasaribu et al., 2019). In this digital era, students tend to be more motivated by technology-based learning. Therefore, teachers need to ensure that the teaching and learning methods used can capture students' interest and facilitate their learning more effectively. In conclusion, with the digitization of teaching, the learning process becomes more interactive.

Challenges Faced by Teachers in Educational Digitization
Today's teachers face significant challenges in digital education. Teachers must ensure that their students have access to the necessary technology and resources to continue online learning. Additionally, teachers need to master technology and digital learning tools to provide a high-quality learning experience for their students (Syifa & Julia, 2023). However, the main challenge for teachers is how to maintain students' motivation and interest in digital learning. This is because students may quickly get bored with online learning due to a lack of social interaction and the physical presence of the teacher in the classroom. Therefore, teachers need to find more creative methods to motivate students (Mitro, 2019). Nevertheless, teachers still play a crucial role in addressing the rapidly evolving challenges of digital education in this era of globalization. In the digital age, teachers need to master technology and understand the best ways to integrate it into their teaching. In the context of digital education, teachers need to help students develop the skills required to succeed in the digital world. This includes skills such as digital literacy, creativity, and innovation, as well as critical and analytical thinking (Zaharah et al., 2022).

To discuss in detail the challenges faced by today's teachers, Hebert et al (2021) argue that one of the challenges in the digital world is insufficient infrastructure access to technology. This has become a major issue for teachers in integrating technology into the learning process. Limited access to digital infrastructure can hinder teachers' ability to leverage the latest technology to provide a more interactive and effective learning experience for students. Therefore, educational management is responsible for improving digital infrastructure in every school so that teachers and students can have better access to educational technology. Furthermore, as technology continues to advance, it is crucial for teachers to keep up with the latest tools and methods of educational digitization. In the era of digital education, teachers require comprehensive training and support to integrate technology effectively into their teaching practices (Kariki@Gerald et al., 2022). This training involves not only technical skills but also pedagogical strategies using technology to enhance student learning. Additionally, continuous support is essential to ensure that teachers feel confident and capable of applying technology. Therefore, educational leaders need to provide opportunities for professional development, access to resources and experts, and a culture of collaboration among fellow teachers (Ben-Peretz et al., 2018; Tack & Vanderlinde, 2019). With proper training and support, teachers can leverage the advantages of technology to engage students, tailor the learning experience, and prepare them for success in a rapidly changing world.

Therefore, adaptive leadership among teachers is critical in the current digital era. Teachers must be willing to embrace new technologies and approaches to education to keep up with the rapidly changing landscape of digital learning (Yusro & Diamah, 2022; Kusumadewi, 2018). Innovation is also crucial, as educators must continuously seek new methods to engage

students and enhance their learning experiences. A clear direction is needed to ensure that every teacher understands the goals and objectives of digital education. Teachers must be willing to try new things, take risks, and learn from their mistakes to foster a culture of innovation and growth in digital education (Mubarokah, 2022). Therefore, adaptive leaders are required to shape adaptive teachers so that schools can create a dynamic educational environment that prepares students for success in the 21st century.

Theory of Adaptive Leadership

Adaptive leadership in education is a crucial approach aimed at fostering positive change within the education system. The adaptive leadership model is a framework that emphasizes the importance of flexibility and responsiveness in leadership. This approach recognizes that leaders must be able to adapt to changing circumstances and environments to lead their teams effectively (London, 2023). The model underscores the need for leaders to identify issues, mobilize support, and facilitate change. It also highlights the importance of building strong relationships with team members and stakeholders outside the organization. By embracing this approach, leaders can cultivate a culture of innovation and creativity while promoting accountability and transparency. Ultimately, the adaptive leadership model can provide a direction for leaders seeking to navigate complex challenges and make meaningful decisions in today's rapidly changing world.

There are two ways to understand and address complex problems in organizations, systems, and communities, conceptually and practically. The theory of adaptive leadership proposes two distinctions regarding the nature of leadership and the types of problems leadership aims to solve. Firstly, it distinguishes between authority and leadership. Those with formal authority or power may not necessarily exercise leadership as a skill or as a set of guidelines and practices that can be employed by anyone (Heifetz, 1994; Heifetz et al., 2009; Heifetz & Linsky, 2017). It also makes a distinction between technical problems and adaptive challenges. Technical problems are usually quickly and easily solved with existing knowledge.

Complex problems known as adaptive challenges require a new approach to solving problems known as adaptive work because they are too vast (Heifetz, 2006). To address complex adaptive challenges, the model defines adaptive leadership as an activity involving others in the process of doing adaptive work. Adaptive leadership is a model used by some organizations to tackle the most difficult issues. Heifetz et al (2009) define adaptive leadership as the practice of mobilizing people to tackle challenging and continuously evolving issues. This adaptive leadership model is based on the idea that anyone who is part of the problem or system where the problem exists must engage in finding a solution. It emphasizes that anyone can exercise leadership, with or without formal power or expertise, and provides a framework for leadership processes and behaviors that are useful for moving forward, adapting, and addressing challenging issues (Northouse, 2019).

However, Jason (2007) conducted a study through interviews with 14 faculty members and administrators at Heartland University. The participants included white males, white females, and Hispanic females. Five participants were members of the university's Adaptive Leadership Advancement Team (ALAT), the core team responsible for handling the institution's adaptive leadership initiatives related to the leadership grant from the institution's Leadership Center. Meanwhile, seven participants had completed at least one adaptive leadership training program or workshop either on campus or at the Leadership Center. Jason also reviewed documents that provided general information to complement, enhance, or support the data collected through participant interviews. Thus, he concluded adaptive leadership through the

framework in Figure 1, which encompasses five leadership principles, four broad leadership competencies, and 24 specific leadership dimensions.

LEADERSHIP PRINCIPLES	
1. Leadership is an activity, not a position. 2. Anyone can lead anywhere and at any time. 3. Start with yourself and connect with others. 4. Clear purpose. 5. Takes risks.	
ADAPTIVE LEADERSHIP	
Identifying the Situation • Seeking difficult interpretations. • Distinguishing technical from adaptive work. • Understanding process challenges. • Testing various interpretations and perspectives. • Taking the temperature of the climate. • Determining who needs to do the work.	**Giving Spirit** • Involving extraordinary voices. • Working by division. • Starting where they are. • Talking about losses. • Inspiring collective goals. • Creating a trustworthy process.
Manage Yourself • Recognizing strengths, weaknesses, and motivators. • Knowing others' stories about you. • Choosing competitive values. • Facing uncertainty and conflict. • Experimenting outside the comfort zone. • Managing oneself.	**Interacting Skillfully** • Making clear choices. • Increasing heat. • Returning work. • Having goals. • Speaking from the heart. • Acting experimentally.

Figure 1: Adaptive Leadership Model (Jason, 2007)

Figure 1 illustrates the five competencies in the adaptive leadership model based on Jason's (2007) research, namely the competencies of identifying situations, self-management, motivating others, and implementing skill interventions. Each of these four competencies consists of six dimensions, each containing specific leadership activities for adaptive leaders. These dimensions are situationally based and can be adjusted by leaders through assessing the situation, reflecting on observations, and making decisions based on reflection.

The Influence of Adaptive Leadership on Teacher Readiness Toward Digitization
Adaptive leadership is crucial in the education sector, as it enables leaders to respond to the evolving needs of students, teachers, and the community. It involves the ability to identify challenges and opportunities and then adjust strategies accordingly. Adaptive leaders are flexible, creative, and capable of thinking outside the box (Goller & Tomforde, 2021). They are also effective communicators who can build strong relationships with stakeholders. By

adopting an adaptive stance, leaders can foster a culture of innovation that encourages continuous improvement. This approach can lead to better student performance, increased teacher satisfaction, and stronger community engagement. Additionally, adaptive leadership is vital in crisis or uncertain situations. Leaders who can quickly adapt can help their organizations navigate difficult times with minimal stress. In conclusion, adaptive leadership is critical in the education sector because it empowers leaders to be proactive rather than reactive, empowering them to create positive changes that benefit all involved parties.

Teacher readiness refers to the level of preparedness and competence of teachers in addressing contemporary educational challenges. This includes teachers having a deep understanding of the subject matter, effective communication with students, and a strong sense of empathy and compassion towards them. Together, the practice of adaptive leadership and teacher readiness can help ensure that students receive the best education tailored to their unique needs and learning styles. By cultivating these qualities in educators, we can create a brighter future for generations to come.

In conclusion, adaptive leadership and the readiness of teachers for the digitization of education are crucial aspects for successfully navigating educational digitization (Wang et al., 2020). Given the continuous advancement of technology, teachers must be prepared to adapt their teaching methods and strategies to meet the needs of students. This objective requires teachers' readiness to embrace new technology and a commitment to ongoing professional development. Furthermore, teacher readiness is essential to ensuring that students can fully engage with digital learning tools and resources. Learning resources include providing access to reliable technology and training on how to effectively use these tools in the classroom.

To encourage the readiness and effectiveness of teachers in the digital era, adaptive leadership strategies must be implemented. Mailizar (2022) state that one proactive strategy is to provide continuous professional development opportunities for teachers focusing on the integration of technology and digital literacy skills. This strategy can be achieved through workshops, online courses, and collaborative learning communities. Additionally, leaders need to encourage teachers to take risks and try new approaches to teaching with technology, while providing support and resources for implementation. This readiness can lead to a more dynamic and engaging learning environment for students.

Leaders must prioritize the use of data-driven decision-making to identify areas that may require additional support or training. By regularly assessing the readiness and effectiveness of teachers, leaders can tailor professional development opportunities to meet specific needs. Lastly, it is important for leaders to recognize the importance of collaboration and communication in fostering teacher readiness and effectiveness. Leaders should facilitate opportunities for teachers to share best practices and collaborate in creating interactive multimedia, planning video conferences, and using social media platforms that encourage community engagement.

Ultimately, the success of digitization in education depends on strong leadership and collective efforts from educators at all levels. Through collaboration and embracing new technologies, teachers can ensure that students are prepared to succeed in an increasingly digital world.

Conclusion

In conclusion, it is evident that adaptive leadership plays a crucial role in the digitization of education. As technology continues to advance, educators must be able to adapt and innovate to keep up with the changing educational landscape. Adaptive leaders can anticipate and

respond to challenges, empowering their teams to do the same. By embracing new technologies and encouraging change, adaptive leaders can help foster a culture of innovation within educational institutions. Ultimately, this approach can lead to improved student performance and a more engaging and effective learning experience for all involved. Looking towards the future of education, it is clear that adaptive leadership will remain a vital component of the success of educational organizations in the digital era.

Therefore, all educational leaders need to prioritize teacher readiness and cultivate adaptive leadership within teachers in an effort to advance educational digitization. Efforts to establish a culture of innovation within educational institutions are crucial for schools and educational leaders. By doing so, teachers can ensure that students receive the best, most engaging, and most effective learning experiences tailored to their individual needs. This approach can lead to improved student performance, including higher exam scores, increased graduation rates, and better preparedness for the workforce. Furthermore, adaptive leadership will continue to be a crucial component of success in the digital era. Given the rapid pace of technological advancement, all education stakeholders must adapt and innovate to keep up with the evolving educational landscape. By practicing adaptive thinking and investing in teacher training and support, schools can create a learning environment that fosters creativity, critical thinking, and lifelong learning for all students.

Reference

Almelweth, H., & Alkahtani, A. (2018). Training Needs in Light of the Digital Revolution to Develop the Skills of Social Studies Female Teachers. *EURASIA Journal of Mathematics, Science and Technology Education*, *14*(10). https://doi.org/10.29333/ejmste/92016

Ayob, A., & Jainal, M. A. (2021). SaraGuVRA : Pemetaan Visual Realiti Maya 360° Secara Kreatif Menerusi Teknologi Digital. *International Journal of Applied and Creative Arts*, *4*(1), 130–142. https://doi.org/10.33736/ijaca.4184.2021

Ben-Peretz, M., Gottlieb, E., & Gideon, I. (2018). Coaching between experts – opportunities for teachers' professional development. *Teacher Development*, *22*(3), 303–313. https://doi.org/10.1080/13664530.2018.1438310

Berger, P., & Wolling, J. (2019). They Need More Than Technology-Equipped Schools: Teachers' Practice of Fostering Students' Digital Protective Skills. *Media and Communication*, *7*(2), 137–147. https://doi.org/10.17645/mac.v7i2.1902

Goller, M., & Tomforde, S. (2021). On the stability of (self-)adaptive behaviour in continuously changing environments: A quantification approach. *Array*, *11*, 100069. https://doi.org/10.1016/j.array.2021.100069

Heckadon, P., & Tuzlukova, V. (2021). Skill-based ESP Classroom: Teaching for Preserving and Enhancing Oman's Comparative Advantages in an Era of Economic and Digital Transformation. Arab World English Journal, 2, 36–48. https://doi.org/10.24093/awej/mec2.3

Sahaluddin, N. S. S. B., & Mokhtar, W. K. A. W. (2019). The Awareness of Zakāt in the Universal Society. International Journal of Academic Research in Business and Social Sciences, 9(11), 647-651.

Khairuldin, W. M. K. F. W., Anas, W. N. I. W. N., & Embong, A. H. (2018). Fatwa as a disseminator of Islamic laws among community of Malaysia. International Journal of Academic Research in Business and Social Sciences, 8(11), 516-521.

Mohamad, N. S., & Khairuldin, W. M. K. F. W. (2018). The concept of Halalan Tayyiba in food according to Mufassir. International Journal of Academic Research in Business and Social Sciences, 8(11), 902-909.

Hamid, N. C., & Mokhtar, W. K. A. W. (2019). The Comprehensive Aspect in Islam from Quran and Hadith Perspective. International Journal Of Academic Research In Business And Social Sciences, 9(11).

Hébert, C., Jenson, J., & Terzopoulos, T. (2021). "Access to technology is the major challenge": Teacher perspectives on barriers to DGBL in K-12 classrooms. *E-Learning and Digital Media*, *18*(3), 307–324. https://doi.org/10.1177/2042753021995315

Iatraki, G., & Mikropoulos, T. A. (2023). Augmented Reality in Physics Education: Students with Intellectual Disabilities Inquire the Structure of Matter. *PRESENCE: Virtual and Augmented Reality*, 1–18. https://doi.org/10.1162/pres_a_00374

Kariki @ Gerald, S., Ishak, M. Z., & Fong, S. F. (2020). Keperluan Instrumen Ptpk-Ipg Untuk Merealisasikan Kompetensi Mengintegrasikan Teknologi Maklumat Dan Komunikasi Dalam Pembelajaran Dan Pemudahcaraan. *Jurnal Kinabalu*. https://doi.org/10.51200/ejk.v0i0.1126

Mubarokah, L. (2022). Strategi Guru dalam Mewujudkan Pembelajaran Interaktif Inspiratif dan Menyenangkan untuk Meningkatkan Prestasi Belajar PAI di SMPN 1 Gondang. *Berkala Ilmiah Pendidikan*, *2*(1), 12–17. https://doi.org/10.51214/bip.v2i1.376

Laffey, D. (2022). Gamification and EFL Writing: Effects on Student Motivation. *The English Teachers Association in Korea*, *28*(1), 23–42. https://doi.org/10.35828/etak.2022.28.1.23

Li, W. (2021). Role of machine learning and artificial intelligence algorithms for teaching reform of linguistics. Journal of Intelligent & Fuzzy Systems, 40(2), 3251–3262. https://doi.org/10.3233/jifs-189365

London, M. (2023). Causes and consequences of adaptive leadership: A model of leaders' rapid responses to unexpected events. *Psychology of Leaders and Leadership*, *26*(1), 22–43. https://doi.org/10.1037/mgr0000136

Mailizar, M., Umam, K., & Elisa, E. (2022). The Impact of Digital Literacy and Social Presence on Teachers' Acceptance of Online Professional Development. *Contemporary Educational Technology*, *14*(4), ep384. https://doi.org/10.30935/cedtech/12329

Mitro. (2019). Peranan Guru Dalam Menciptakan Pembelajaran Yang Kreatif. *Bawi Ayah: Jurnal Pendidikan Agama Dan Budaya Hindu*, *8*(1), 1–21. https://doi.org/10.33363/ba.v8i1.298

Mustapa, S. I. S., & Miskon, A. S. (2023). Pedagogical Practices among Teachers in a Private School: A Survey. INTERNATIONAL JOURNAL OF SOCIAL SCIENCE AND EDUCATION RESEARCH STUDIES, 03(06). https://doi.org/10.55677/ijssers/v03i6y2023-01

Pasaribu, F. T., Sofnidar, S., Iriani, D., & Ramalisa, Y. (2019). Pelatihan Merancang Pembelajaran matematika Yang Inovatif. *CARADDE: Jurnal Pengabdian Kepada Masyarakat*, *2*(1). https://doi.org/10.31960/caradde.v2i1.126

Pilaniwala, P. (2022). Gamification Enhances Learning Experience of STEM Courses. *International Journal for Research in Applied Science and Engineering Technology*, *10*(8), 529–535. https://doi.org/10.22214/ijraset.2022.46227

Prijana, P., & Yanto, A. (2018). Analisis hubungan prestasi akademik mahasiswa dengan akses sumber informasi. *Berkala Ilmu Perpustakaan Dan Informasi*, *14*(1), 87. https://doi.org/10.22146/bip.17501

Raman, A., Thannimalai, R., & Ismail, S. N. (2019). Principals' Technology Leadership and its Effect on Teachers' Technology Integration in 21st Century Classrooms. International Journal of Instruction, 12(4), 423–442. https://doi.org/10.29333/iji.2019.12428a

Rospigliosi, P. A. (2020). Digital transformation of education: can an online university function fully? Interactive Learning Environments, 28(8), 945–947. https://doi.org/10.1080/10494820.2020.1843240

Sunita, I. W. (2019). Peningkatan Kemampuan Guru Normatif dan Adaptif dalam Menyusun Program Pembelajaran melalui Pelaksanaan In House Training. *Jurnal Pedagogi Dan Pembelajaran*, *2*(1), 16. https://doi.org/10.23887/jp2.v2i1.17603

Syah, N., & Busra, N. (2018). Penerapan Pembelajaran Konstruktivisme Untuk Meningkatkan Konsep Diri Dan Hasil Belajar Siswa. *Jurnal Pendidikan Teknologi Kejuruan*, *1*(1), 8–12. https://doi.org/10.24036/jptk.v3i1.523

Syifa, N., & Julia, J. (2023). Persepsi Guru Sekolah Dasar Terhadap Inovasi Pembelajaran Berbasis Informasi Teknologi Sebagai Alat Bantu Pencapaian Pembelajaran. *Al-Madrasah: Jurnal Pendidikan Madrasah Ibtidaiyah*, *7*(1), 271. https://doi.org/10.35931/am.v7i1.1707

Tack, H., & Vanderlinde, R. (2019). Capturing the relations between teacher educators' opportunities for professional growth, work pressure, work related basic needs satisfaction, and teacher educators' researcherly disposition. *European Journal of Teacher Education*, *42*(4), 459–477. https://doi.org/10.1080/02619768.2019.1628212

Wang, T., Olivier, D. F., & Chen, P. (2020). Creating individual and organizational readiness for change: conceptualization of system readiness for change in school education. *International Journal of Leadership in Education*, 1–25. https://doi.org/10.1080/13603124.2020.1818131

Yusro, M., & Diamah, A. (2022). Workshop Pemanfaatan Teknologi Internet of Things (IoT) menggunakan Mikrokontroler ESP32 untuk Guru-Guru SMK. *Sarwahita*, *19*(01), 83–92. https://doi.org/10.21009/sarwahita.191.8

Zaharah, Z., GI, K., Wati, R., & Sina, I. (2022). Inovasi Pendidikan Dan Penggunaan Video Pembelajaran Bagi Guru Dalam Menghadapi Era Digital. *Rausyan Fikr : Jurnal Pemikiran Dan Pencerahan*, *18*(1). https://doi.org/10.31000/rf.v18i1.6050

Zhong, J., Li, Z., Hu, X., Wang, L., & Chen, Y. (2022). Effectiveness comparison between blended learning of histology practical in flipped physical classrooms and flipped virtual classrooms for MBBS students. *BMC Medical Education*, *22*(1). https://doi.org/10.1186/s12909-022-03740-w

Zulham, M. (2020). Keefektifan Multimedia Interaktif Berbasis Mobile dengan Pendekatan Kontekstual untuk Meningkatkan Social Skill dan Kemampuan Berfikir Kritis Pada Materi Gerak dan Gaya. *Jurnal Penelitian Pembelajaran Fisika*, *11*(2), 209–214. https://doi.org/10.26877/jp2f.v11i2.6138