NIGERIAN ONLINE JOURNAL OF EDUCATIONAL SCIENCES AND TECHNOLOGY
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To cite this article:
Adenubi, A. O., Samuel, S., Oyenuga, A. O. &Adewale, K. A. (2024). Artificial Intelligence with Agile Teaching Strategies for Personalized Learning. *Nigerian Online Journal of Educational Sciences and Technology (NOJEST)*, 6 (1), 364-379

Nigerian Online Journal of Educational Sciences and Technology (NOJEST)

Volume 6, Number 1,2024

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Article Infor

Article History

Received:
05 May 2024

Accepted:
June 28, 2024

Keywords
Agile, Artificial Intelligence, Personalized Learning, Teaching Strategies.

Abstract
This research is a position paper that explores the integration of Agile teaching strategies with Artificial Intelligence (AI) to foster dynamic and responsive learning environment; and enhancing overall educational experiences. Agile methodologies are known for flexibility and iterative approach and have proven successful in various industries. Therefore, this study provides insights on the synergies between Agile teaching strategies and Artificial Intelligence (AI) to create a dynamic and adaptive educational environment. This study holds significance for educators, policymakers, and other related stakeholders in the field of education as it seeks to explore innovative approaches that can reshape traditional teaching methods. It was recommended that having balanced understanding on how Agile teaching strategies and AI complements each other will offer the potentials to create learning environment that is not only responsive to change but also facilitate optimization for student success through personalized and collaborative learning.

Introduction

The dynamic nature of education, emergence and engagement of newer technologies brought about innovative communication, teaching and learning process to leverage the evolving needs of students. This advancement birthed remote education that revolutionized the field of education in the era of COVID-19 pandemic, thereby influencing pedagogic experiences by accelerating the

adoption of virtual learning environments (Hodges, 2017), for easy data access and storage. According to (Heywood, 2015), successful management of education systems require effective use of ICT tools to enhance policymaking, teaching and learning, research, monitoring and evaluations through access and provision of the needed data and information. The Education Management Information System is widely recognized as an essential tool for improving quality of education and school academic activities for sustainable development. Countries around the world have invested significant resources in collecting, processing, and managing more and better data through Education Management Information System (EMIS) (Korde, 2018)

UNESCO (2019) defined EMIS as system employed for collection, integration, processing, maintenance and dissemination of data and information to support decision-making, policy analysis and formulation, planning, monitoring and management at all levels of an education system. The document further reiterated that EMIS is a system of people, technology, methods, models, procedures, processes, rules and regulations that function together to provide managers at all levels, decision makers and education leaders with broader knowledge on integrating set of relevant, unambiguous and reliable data for successful completion of the assigned tasks. The uniqueness of EMIS is the provision of accurate, timely, reliable and understandable data in order to provide quality education statistics to support selected operational functions in a timely, cost-effective and sustainable manner at every administrative level by bringing people, practices and technology ((Korde, 2018)), provision of archived information in the system for anyone access on outcomes of education researches, micro planning reports, regulations, school mapping and other related information (Vijaya-Kumar, 2016).

EMIS is not only a technological solution that is restricted to operationalised processes, but to facilitate strategic policy formulation and budgeting and routine management decision-making in helping schools (Nkata, 2019). The author further attested that proper planning on EMIS required needed data and information should be supplied in order to provide baseline education statistics about student' demographics (age, gender, grade, teachers**,** textbooks used and type of schools); human resource information (teaching staff, non teaching staff, individual qualifications, experiences, status, service records, career development records, etc.); infrastructural facilities and assets data (classroom, furniture, school area, other facilities and assets); performance measures

data (results of national examinations and local examination, repetition rates, transition), financial management information (cash flow of school finance, audit report, expenditure reports, implementation of school plans and school contributions); and studies, researches, information materials, results of school inspection, documents, education policy, acts and regulations. Therefore, EMIS plays a big role in monitoring individual learner's performance and how such could be helped. Hence, information and data collected via EMIS will go a very long way in solving pedagogic related challenges when the strategy of agile learning is being employed.

The traditional method of delivery is challenged with students struggling to recall what they've learned some few months back in order attain considerable success in the given examination. Agile learning in education is known to be flexible and student-centric, that facilitate tutors to tailor teaching methods in order to better address individual student's needs. It is characterized by teamwork, indispensability, collaboration, adaptability and focusing on personalized learning experiences, based on the premise that the traditional educational methods is becoming less effective in the delivery of pedagogic experiences while using emerging technologies (Parsons, 2019). Agile learning exemplifies a paradigm shift in educational methodologies in enhancing the adaptation to the evolving pressing needs and expectations of students in technology-driven world (Nkata, 2019); in order to ensure the delivery of high quality systems with customer satisfaction.

Agile in education placed high premium on human-centric approach to learning that education stakeholders has major roles to play on improved performance of the learner. It is aimed at revolutionizing learning in such a way that the best must be attained by the stakeholders (teachers, parents, administrators, and policymakers) that are involved (Royle, 2016). Traditional education focus on individualized learning (Parsons, 2019), however, agile learning focus much on collaboration, interaction and the deployment of emerging technologies. The implication is that Agile in education presuppose that collaborative and interactive learning is more effective through cross-breeding of ideas various individuals as team. This mode of learning builds teamwork, communication and social skills via interaction and the deployment of emerging technologies.

Considering roles played by stakeholders in agile education, teachers are driving force and pillars that supports to educational system that are well equipped to tailor-fit pedagogic experiences

towards having better comprehension of students' weaknesses, strengths and probable inclinations. Students are exemplified as the recipients of knowledge, whose needs and expectations must be met in all ramifications. Principals and head of schools are in a better position to manage and work through competing priorities. Parents are more involved and better informed of how their students are taught. Students have a say on what and how they learn.

The embedded benefits of agile project management as attested by (Kaufman, 2019) are students' learning objectives and expectations are better of met; improved work performance and transparency; reduction of risk of failing to deliver the assigned task and accumulating high costs; metrics for efficiency and data-driven decision-making; and better team collaboration and continuous improvement. The implication is that adopting Agile practices enhances students ability to manage changing educational priorities in unpredictable learning environment; provision of instant feedback on learning attainments is received technologically and instantaneously, unlike the conventional mode of assessments that are pushed to the end of the term, semester or session where exams are designed to gauge a student's learning through months of rigorous lectures and quizzes. Hence the use of myriads of online instructional platforms encourages individualistic and experiential learning, especially employing the use of emerging technologies like artificial intelligence.

Artificial Intelligence (AI) refers to the development of computer systems that can perform tasks that typically require human intelligence. These tasks include learning, reasoning, problem-solving, perception, understanding natural language, and even interacting with the environment. AI aims to create machines that can simulate human intelligence and adapt to new information or situations (Knight, 2018). Artificial intelligence plays myriads of roles in influencing learning through diverse of ways. For instance, AI supports personalized learning by adapting educational content to individual student needs (Chebil, 2021); AI-powered adaptive learning systems dynamically adjust content and difficulty based on individual student progress (Baker, 2014); automates grading and assessment, by providing timely feedback to both students and educators (Shute & Kim, 2014); provide instant support to students via answering questions and assisting with coursework through AI-driven virtual assistants and chatbots (Manyika, 2011); analyzes educational data to provide insights into student performance, engagement, and learning patterns

(Hodges, 2017); creates intelligent tutoring systems that offer customized guidance and feedback to students (VanLehn, 2011); enhance accessibility for students with diverse learning needs (Knight, 2018); assists in designing curricula and creating educational content (Sutherland, 2017); supports collaborative learning through virtual collaboration tools and platforms (Dillenbourg, 2013); and AI algorithms enhances prediction of student's success based on historical data, and enabling targeted interventions (Mizoguchi, 2015). The myriads of benefits of artificial intelligence when wisely harnessed with agile teaching strategies will in no small measure facilitate personalised learning by the students.

Application of Agile in Education

Agile teaching strategies were inspired by agile methodologies in project management and software development, which is an adaptive and collaborative approach to prioritize flexibility, responsiveness to change and continuous improvement in education (Beck, 2001). Agile teaching emphasizes on iterative development of curriculum materials, allow educators to review and update instructional contents regularly based on student' feedback and evolving educational needs; promotes learning collaboration, team-based activities in order to foster sense of community and enhances the social aspects of learning (Bennett, 2001). Students' assessments in agile teaching are continuous and adaptive. Formative assessments are most used to provide continuing feedback that will enable tutors to make appropriate adjustments to teaching methods and address individual learning needs (Sutherland, 2017).

Moreover, Agile teaching places a strong emphasis on student involvement in the learning process. Hence, students are encouraged to play active role in pedagogic experiences that will foster sense of responsibility and ownership on learning outcomes (Kanabar, 2017). Teachers are facilitated to adapt teaching methods based on student' needs, use of available emerging technologies and evolving educational goals (Conboy, 2011); engage in retrospective approaches to assess effectiveness of teaching strategies and identify areas for enhancement ((Beck, 2001).
Another uniqueness of agile teaching is recognition that students learn at different pace; thus accommodates diverse learning approaches for students to adjust and facilitate mastery before advancing to new material (Baker & Inventado, 2014). It is worth noting that Agile teaching

strategies provides framework for teachers to create dynamic and responsive learning environment that aligns with the principles of agility and continuous improvement. Therefore, embracing these strategies will facilitate teachers to adapt to dynamic changes of education and enhance meeting diverse needs of students.

Enhancing Educational Experience through Integrating Agile Teaching Strategies with Artificial Intelligence (AI)

The term "agile" was derived from the agile methods used in software engineering, which focus on setting clear targets for design, creating rapid prototypes for building application (Schwaber K. &., 2002); sharing responsibility among teams for identifying and achieving sub goals, and creating iterative enhancements based on opportunities and weaknesses identified through continuous gathering of feedback (Cohen, 2003). Agile learning is characterized by indispensability, adaptability, teamwork, collaboration and focusing on personalized learning experiences based on the premise that the traditional educational methods is becoming less effective in the delivery of pedagogic experiences while using emerging technologies (Ringert, 2017). Agile learning exemplifies a paradigm shift in educational methodologies that enhances the adaptation to the evolving pressing needs and expectations of students in technology-driven world. Agile frameworks such as Scrum or Kanban was adapted to manage and prioritize tasks related to curriculum development in an iterative and collaborative manner (Schwaber K. &., The Scrum Guide., 2021).

Agile learning in education is known to be flexible and student-centric, that facilitate tutors to tailor teaching methods in order to better address individual student's needs (Hana, 2021). Integrating Agile teaching strategies with Artificial Intelligence (AI) significantly enhance the overall educational experience by fostering adaptability, personalization, and efficiency (Shen, 2019). (Hodges, 2017)opined that employing Agile teaching strategy encourages identifying educational goals and learning objectives thereby helps in focusing on specific outcomes (Koper, 2014). Integrating Agile teaching strategies with AI-powered Intelligent Tutoring Systems facilitate personalized learning experiences (VanLehn, 2011). These systems encourage adaptation to individual student needs; offered content and feedback, thereby, aligning with Agile's emphasis

on responding to student requirements. AI algorithms facilitate analyzing of student's performance data in real-time. This allows instructors to adapt assessments and interventions based on individual progress.

Engagement and implementing Agile assessment strategies for assessing students' attainment of instruction enhances the use of AI for adaptive and continuous assessment (Chebil, 2021). Integrating agile strategies with the use AI technologies facilitates analyzing data on student engagement, comprehension, and performance and provision of valuable insights for iterative improvements in teaching methods (Koper, 2014). AI algorithms help in analyzing student' performance data and learning styles in order to recommend and deliver content that aligns with Agile principles of flexibility and responsiveness (Hana, 2021). (Baker, 2014) further reiterated that implementing adaptive learning paths facilitate AI algorithms to enhance personalized and dynamic learning experiences by aligning Agile's commitment to responding to changing needs and optimizing learning outcomes. This connotes that application of agile teaching strategies enhances the provision of continuous feedback loops with the use of AI analytics to assess the effectiveness of teaching strategies (Siemens G. &., 2012); to guide and channel students ability towards a desired career or profession in the nearest future (Conboy, 2011). A cursory look on Agile principles emphasized much on collaboration and AI-supported tools enhances students' interactions and group projects. This exemplified that engagement of collaborative learning with the aid of AI-enhanced tools facilitates good communication and teamwork (Dillenbourg, 2013); makes learning experiential and permanent retention of the knowledge attained.

Personalized Learning with Artificial Intelligence in Instruction

Personalized learning with Artificial Intelligence (AI) is a transformative approach that tailors individual students' educational experiences, preferences, needs and pace of learning towards improved performance. AI technologies has the tendencies of analyzing vast amounts of data, identification of learning patterns, provision of adaptive contents and support, and creating more efficient and effective learning expedition (Mizoguchi, 2015). Study on personalized learning with AI revealed that AI-driven adaptive learning platforms employed algorithms to assess a student's strengths and weaknesses; as the platform dynamically makes self-adjustments on the content,

difficulties on levels and students; learning pace in meeting individual learner's learning needs (VanLehn, 2011); employs AI in providing real-time learning experience, guidance and instant feedback to students. AI algorithms systems facilitate easy identification of learning related misconceptions, suggest additional instructional resources, and adapt the learning path that will suit individual learner's academic progress (Mizoguchi, 2015); enhance analyzing of data on student's learning preferences, previous performances and engagements in order to recommend and deliver relevant content to be directed to each student (Koper, 2014). This is to ensure that students receive relevant and engaging materials that are aligned with their interests and learning styles. Artificial intelligence incorporates designs on individualized learning paths based on each student performance, learning style preferences and instructional objectives (Baker, 2014). This strategy employed allows individual student to make considerable academic progress at their own pace and promotes mastery of concepts before making advancement towards a new concept. Study conducted by (Siemens G. &., 2012) revealed that AI helps greatly in collecting and analyzing relevant data about student's interactions, identification of patterns and trends that teachers will be better of be informed about how each student's progresses. This data-driven approach facilitates provision of timely interventions and personalized learning support to individual learner. (Knight, 2018) found out that Natural Language Processing (NLP) technologies in AI facilitate personalized learning experiences through chatbots and virtual assistants. The deployment and engagement of these tools by students in natural language, offers personalized explanations of concepts, answers related questions, and provides additional learning resources for the learner.

Myriads of benefits were accrued to personalizing learning with AI as it captures students' interests and motivations, increase students' engagement and fosters positive attitude towards learning (Siemens G. &., 2012). Designing AI for instruction incorporates adapting content and learning pattern and styles that will suit individual needs, promote deeper comprehension of concepts in order to facilitate mastery of skills (VanLehn, 2011). AI facilitate personalized learning experiences to accommodates diverse learning styles and allow students to progress at their own pace in order to explore content in ways that appeals with them (Siemens G. &., 2012); provision of instant feedback, timely interventions when students are faced with academic related challenges or misconceptions, thereby preventing accumulation of learning gaps (Baker & Inventado, 2014); fosters self-directed learning and adaptability, personalized learning with AI equips students with

skills needed for continuous learning throughout their lives (Beck, 2001) (Mizoguchi, 2015); (Siemens G. &., 2012); and optimizes the use of instructional resources by channeling content delivery, reduction in redundancy, and focusing on areas where students need high level of support (VanLehn, 2011); (VanLehn, 2011); (VanLehn, 2011). In summary, personalized learning with AI holds great promise in revolutionizing education by channeling instructional experiences to individual students, promoting engagement, and optimizing learning outcomes.

Synergistic Relationship between Agile Teaching Strategies and Personalised Learning with the Support of Artificial Intelligence

The relationship between Agile teaching strategies and personalized learning with the support of Artificial Intelligence (AI) is synergistic, as both approaches share common principles of adaptability, flexibility, and responsiveness to individual needs. The synergistic integration of Agile teaching strategies with AI-driven personalized learning facilitate cutting-edge educational experiences through provisions of tailored contents that will foster collaboration and optimization of learning outcomes. Bennett and (Bennett, 2001)attested to the relationship between agile teaching strategies and personalized learning with the support of Artificial Intelligence (AI) is been characterized by a synergy that enhances educational experiences through adaptability, personalization, and continuous improvement. The authors opined further that specific references on the direct integration of Agile teaching with AI-driven personalized learning might be limited; however, the principles of both approaches align with broader educational research and best practices.

The key aspects of their relationship are that agile teaching emphasizes on iterative development and continuous improvement (Beck, 2001), while personalized learning with AI adapts to individual student needs (VanLehn, 2011). The synergy between these approaches enables adaptive learning experiences. Both Agile teaching and personalized learning with AI embraces iterative and adaptive approaches. However, Agile methodologies emphasize iterative development and continuous improvement, while AI adapts learning experiences based on real-time data and individual progress. Personalized learning with AI absolutely relies on data analytics to channel content (Siemens G. &., 2012), but, Agile teaching incorporates continuous feedback loops for improvement (Sutherland & Schwaber, 2017); while AI provides real-time feedback to

students and educators. This combination ensures that feedback is not only timely but also personalized, enabling faster and quicker adjustments to teaching strategies and learning paths.

Subsequently, Agile teaching's emphasis on adapting to student needs aligns with AI's capability to create individualized learning paths. This combination ensures that each student makes considerable academic progresses at their own pace, reinforcing mastery of relevant instructional concepts before advancing to new concept. This interaction facilitate data-informed, personalized, and agile educational environment. A cursory look of on agile teaching and and personalized learning with AI shows a thin line of demarcation that Agile teaching fosters collaborative learning environments (Bennett, 2001), while personalized learning with AI facilitates collaborative experiences through group activities (Dillenbourg, 2013). The synergistic relationship between them suggests that Agile teaching encourages collaborative learning environments, and AI-supported personalized learning enhances collaboration by facilitating group activities, peer learning, and interactive projects. Hence, this interrelationship encourages social interaction, collaborative learning, cross-breeding of ideas and knowledge sharing.

Studies revealed that Agile methodologies searches for efficient resource utilization, while Artificial intelligence contribute to the use of instructional resources by optimizing it judiciously (VanLehn, 2011); combination of agile methodologies and AI-supported personalized learning environment enhances the efficiency of educational process by channeling the delivery of content and adapting to each learners' learning pace (Conboy, 2011). The integration enhances teamwork and knowledge sharing. Based on mode of assessment Agile assessment strategies are continuous and adaptive (Chebil, 2021), while AI provides real-time personalized feedback (Mizoguchi, 2015) for the students. These combinations ensure and provide timely and adaptive assessment practices to be employed on the students. Vis-à-vis the information and data collected, AI is facilitated to analyze the data in order to understand each student's academic strengths and weaknesses, thereby enabling the delivery of personalized content that has relationship with Agile's student-focused approach. This combination ensures adaptability and student-centered learning experiences. Engagement of natural language processing and machine learning as one of AI technologies enhances personalization of learning experiences; aligning with the principles of Agile teaching helps these technologies in providing students with intelligent tutoring, adaptive content and

personalized feedback (Knight, 2018) for improved educational outcomes. Agile teaching reiterates flexibility learning (Conboy, 2011) and personalized learning with AI to provide student-centric approach (Kanabar, 2017). However, both Agile teaching and AI-driven personalized learning are student-centric that emphasize on the importance of taking cognizance of individual student's learning needs. Teachers and instructors can have access and use data analytics from AI systems to identify trends of learning, assess student performance and make informed adjustments to teaching strategies in agile manner content (Siemens G. &., 2012). The means that both Agile teaching and AI-driven personalized learning rely on data to inform decision-making. Hence, combination of Agile teaching and AI-driven personalized learning prepares students on adaptability, critical thinking and collaboration being 21st-century skills that aligns with evolving demands of the workforce and society. The relationship between Agile teaching strategies and personalized learning with AI creates a powerful educational framework that adapts to individual needs, leverages technological advancements, and fosters a collaborative and student-centric learning environment. This integration holds great potential for enhancing the overall educational experience and preparing students for success in a rapidly changing world. The synergistic relationship contributes to the understanding of individual components and synthesis of these principles to guide instructors in developing a holistic and responsive learning environment.

Conclusion

The dynamic nature of education has brought about innovative communication, teaching, and learning processes by employing the use of Education Management Information System (EMIS) for remote learning. EMIS integrates data collection, processing, and management functions to provide timely and reliable information. As EMIS supports decision-making, planning and monitoring of education system at all levels, studies revealed that Agile teaching strategies when judiciously harnessed with the use AI technologies birthed considerable improvement in pedagogic experiences. The synergy between Agile teaching strategies and personalized learning with AI facilitates collaboration, adaptability, efficiency, flexibility in learning and continuous improvement in teaching and learning processes. This method facilitates dynamic content delivery, adaptive assessments and creates dynamic and responsive learning environments that align evolving individual student's educational needs. The synergy in the use of artificial intelligence with Agile teaching strategies offers improved pedagogical experiences and efficiency, better team

collaboration and reduces risks associated with data access, storage and management; thereby fostering engagement, mastery of concepts and self-directed learning.

Recommendations

This study provides some recommendations as thus:

1. Educational institutions should be encouraged to adopt innovative technologies in facilitating teaching and remote learning.
2. Educational institutions should be encouraged to adopt Agile teaching and project management strategies in order to improve efficiency, reduce risks and foster cutting edge team collaboration initiatives in educational projects.
3. Educational institutions should organize seminar to train staff and students on optimizing educational resources and judicious integration of Artificial Intelligence (AI) technologies to support adaptive content delivery, personalized learning and instant feedback.
4. Governments and non-governmental organization should prioritize the implementation and continuous improvement of Education Management Information Systems (EMIS) to ensure reliable and timely collection, processing and management of education data.
5. Educational institutions should encourage both teachers and students to promote Agile learning methodologies in prioritizing flexibility, adaptability, personalized and collaborative learning, creating a dynamic and responsive learning environment that is aligned with student's evolving educational needs.
6. Educational stakeholders (teachers, students, parents, government and non-governmental organizations) should provide adequate funding in supporting the procurement of the needed technologies, infrastructural facilities and conducive learning environment that will promote Agile teaching and learning methodologies via the use of artificial intelligence technologies.

References

Armbrust, M., Fox, A., Griffith, R., et al. (2010). A View of Cloud Computing." In Communications of the ACM.

Attewell, J., & Savill-Smith, C. (2004). Mobile Learning and Social Inclusion: Focus on Learners and Learning. In Journal of Computer Assisted Learning.

Baker, R. S., & Inventado, P. S. (2014). Educational data mining and learning analytics. In *Handbook of research on educational communications and technology, 414-425*.

Beck, K., Beedle, M., van Bennekum, A., Cockburn, A., Cunningham, W., Fowler, M., ... & Thomas, D. (2001). Manifesto for agile software development. Agile Alliance.

Bennett, B., & Rolheiser, C. (2001). Beyond Monet: The artful science of instructional integration. Book Station.

Chebil, J., Méndez, J. A., Paredes, P., Guerrero, J. D., & Durán, A. (2021). Using machine learning to predict academic performance: A systematic literature review. *Computers in Human Behavior*, 116, 106648

Cohen, D., Lindvall, M., & Costa, P. (2003). *Agile software development.* Rome, NY: Data and Analysis Center for Software.

Conboy, K., & Morgan, L. (2011). Beyond the customer: Opening the agile systems engineering conversation. In 2011 6th IEEE International Conference on Global Software Engineering, 238 - 247.

Dillenbourg, P., Järvelä, S., & Fischer, F. (2013). The evolution of research on computer-supported collaborative learning: From design to orchestration. In *Handbook of research on educational communications and technology*, 873 - 885.

Heywood, A. & Boone, D. (2015). *Guidelines for Data Management Standards in Routine Health Information Systems*. Measure Evaluation, Carolina Population Center, Chapel Hill, NC.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2017). The difference between emergency remote teaching and online learning. *Educause Review, 27*.

Kanabar, V. (2017). Agile methodology and project management. *Journal of Computer Applications*, 1(3), 57-61.

Kaufman, A. (2019). How holograms are transforming learning. EdTech Magazine. Retrieved from https://edtechmagazine.com/k12/article/2019/06/how-holograms-are-transforming-learning

Knight, S. (2018). Artificial Intelligence in Education: Promises and Implications for Teaching and Learning. Springer.

Koper, R. (2014). Use of the Learning Path concept to guide design and implementation of the next generation of e-learning. *Open Praxis*, 6(2), 149-162.

Korde, B. (2018). Role of Management Information System (MIS) in Education Sector. Available from: https://www.iitms.co.in/blog/role-ofmanagement- information-system-in-education.html

Lane, H. C., & VanLehn, K. (2005). Teaching the Tacit Knowledge of Programming to Novices with Natural Language Tutoring. In *Journal of Educational Computing Research*.

Manyika, J., Chui, M., Brown, B., et al. (2011). Big Data: The Next Frontier for Innovation, Competition, and Productivity. McKinsey Global Institute.

Mell, P., & Grance, T. (2011). The NIST Definition of Cloud Computing. In National Institute of Standards and Technology.

Mizoguchi, R., Ikeda, M., & Seta, K. (2015). Intelligent Tutoring Systems: Past, Present, and Future. *Journal of Educational Technology & Society*, 18(4), 3–20.

Nkata, A. S. & Dida, M. A. (2019). Centralized Education Management Information System for Tracking Student's Academic Progress in Tanzanian Secondary Schools, *International Journal of Modern Education and Computer Science (IJMECS)*,11(10), 25-32. DOI: 10.5815/ijmecs.2019.10.03

Parsons, D., & MacCallum, K. (2019). Agile education, Lean learning. In Agile and lean concepts for teaching and learning, 3–23). Springer, Singapore. https://doi.org/10.1007/978-981-13-2751-3_1

Peha, S. (2011). Agile Schools: How Technology Saves Education (Just Not the Way We Thought it Would). Retrieved from https://www.infoq.com/articles/agile-schools-education.

Power, D. J. (2013). Big Data and Education. In Big Data & Society.

Royle, K., & Nikolic, J. (2016). *Agile work practices for learning and teaching: What we can learn form agile work practices about learning and teaching in schools*. Un-published white paper. doi: 10.13140/RG.2.1.3501.0161.

Sala, A., Punie, Y., Garkov, V., & Cabrera Giraldez, M. (2020). *LifeComp: The European framework for personal, social and learning to learn key competence*. Luxembourg: Publications Office of the European Union.

Sanahuja, M. S. (2020). Towards lean teaching: non-value-added issues in education. *Education Sciences*, 10(6), 160.

Schwaber, K., & Sutherland, J. (2021). The Scrum Guide. 2020. Retrieved from https://scrumguides.org/docs/scrumguide/v2020/2020-Scrum-Guide-US.pdf

Siemens, G., & Baker, R. S. (2012). Learning Analytics and Educational Data Mining: Towards Communication and Collaboration. In Proceedings of the 2nd International Conference on Learning Analytics and Knowledge.

Siemens, G., & Gasevic, D. (2012). Guest editorial—learning and knowledge analytics. *Educational Technology & Society*, 15(3), 1-2.

Shen, Z., Yu, H., & Lee, L. (2019). Application of Scrum in the teaching of software engineering courses. In 2019 IEEE/ACIS 18th International Conference on Computer and Information Science (ICIS), 627-632).

Stewart, J. C., DeCusatis, C. S., Kidder, K., Massi, J. R. & Anne, K. M. (2009).Evaluating agile principles in active and cooperative learning, Proceedings of Student-Faculty Research Day, CSIS, Pace University.

Sutherland, J., & Schwaber, K. (2017). The Scrum guide. Scrum.org.

Traxler, J. (2009). Current State of Mobile Learning. In International Review of Research in Open and Distributed Learning.

UNESCO. (2019). Retrieved from: https://learningportal.iiep.unesco.org/en/glossary/educational-management-information-system-emis. Accessed November 2019.

VanLehn, K. (2011). The relative effectiveness of human tutoring, intelligent tutoring systems, and other tutoring systems. *Educational Psychologist*, 46(4), 197-221.

Vijaya Kumar,T., Deepa, N. & Lalitha, V. (2016). Education Management Information System:Post Enumeration Survey of U-Disein Telangana State. *International and Educational Research Journal*, 2(10), 47-52.

Wilson, H., & Turner, G. (2021). Assessing Teacher Practices: An Implicit Pedagogy Framework. Educational Assessment, 48(1), 55-78.