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AI-Driven Leadership: A Conceptual Framework for Educational Decision-Making in the AI Era

Dean Collin Langeveldt[1]

[1] School of Education, Sol Plaatje University, Kimberley, South Africa.

ABSTRACT

Artificial Intelligence (AI) is changing the way students are educated in many ways, like improving teaching and learning, personalizing learning experiences, making things more efficient and effective, and promoting creativity and inclusivity. AI can cause problems for educational leaders. It can bring up ethical, legal, social, and cultural issues. It also requires leaders to learn new skills and abilities for the AI age. There is a need for Educational leaders to be proactive and strategic in order to make the most of the advantages and find solutions for the issues related to AI in education. This article aimed to examine how artificial intelligence is used in leadership in education. It also proposed a framework to understand and develop AI-based leadership in education. The basic idea of the conceptual framework relies on the theories of AI, leadership, and decision-making. It has four parts: inputs, processes, outputs, and feedback. The impact of the conceptual framework on education practices and policies was also examined. The article also discussed how education practices and policies are influenced by the conceptual framework. Additionally, the article explored the relationship between the conceptual framework and its effects on education practices and policies. The article highlighted the framework's limitations and suggests potential areas for future research. This study contributes to the existing literature on enhancing learning through technology.

Keywords: *Artificial Intelligence, Educational Leadership, Decision-Making, Conceptual Framework.*

Correspondence
Dean Collin Langeveldt
Email:
dean.langeveldt@spu.ac.za

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INTRODUCTION

Artificial Intelligence (AI) refers to various technologies that can perform tasks similar to human thinking, learning, decision-making, and creativity.[1] AI can transform education in many ways. As Rose Luckin, Professor of Learner Centred Design at UCL Knowledge Lab, states, "AI is not just a tool for education, but a partner in the learning process. AI can augment human intelligence, enhance human creativity, and empower human agency. AI can also help us address the grand challenges of education, such as access, quality, equity, and sustainability."[2] AI can transform education in many ways. It can make teaching and learning better, customize learning experiences, improve efficiency and effectiveness, and help foster innovation and diversity in the education sector.[3] AI can help teachers with education, like creating and giving lessons and giving feedback to students. It can also help students work together and communicate with each other.[4] Learners may also use AI to access personalized and adaptive learning content, connect

[1] S.J. Russell and P. Norvig, *Artificial Intelligence: A Modern Approach* , 4th ed. (London: Pearson Education, 2023).
[2] Rose Luckin, "Towards Artificial Intelligence-Based Assessment Systems," *Nature Human Behaviour* 1, no. 3 (2017): 0028.
[3] UNESCO, " Artificial Intelligence in Education," 2023, https://en.unesco.org/artificial-intelligence/education.
[4] Luckin R. et al., *Intelligence Unleashed: An Argument for Artificial Intelligence in Education* (Pearson, 2023).

with intelligent tutors and mentors, and build 21st-century abilities such as critical thinking, problem-solving, and creativity.[5]

However, AI provides various problems and hazards for educational leaders, such as ethical, legal, social, and cultural concerns, as well as the necessity to build new skills and competencies for the AI age.[6] The fairness, transparency, accountability, and privacy of AI systems and data in education are all ethical concerns.[7] (Regulation of the ownership, liability, and duty of AI systems and data in education is one of the legal challenges.[8] Addressing the influence of AI on the job market, the digital gap, and the social inclusion of various learners are all examples of societal challenges.[9] Respecting the values, beliefs, and conventions of various educational environments and stakeholders is one example of a cultural challenge.[10] Furthermore, educators must learn new skills and competencies for the AI future, such as data literacy, computational thinking, digital leadership, and ethical awareness.[11]

To make the most of AI in education and successfully address its difficulties, educational leaders must be proactive and deliberate. They must understand the fundamental concepts and processes of AI, as well as how it may be employed in education. They must also comprehend the ramifications of education, as well as the ethical and societal repercussions. They must make intelligent and responsible decisions about AI systems and data, as well as how they are utilized, assessed, and improved in education.[12] They must also foster a culture that encourages humans and AI to collaborate and advance education. Holmes et al. emphasize the importance of understanding the ethical and societal implications of education.[13] They must make informed and responsible decisions regarding AI systems and data, their usage, assessment, and improvement in education.[14]

Despite the increased interest in and research on artificial intelligence in education and educational leadership, there is a lack of a comprehensive and cohesive conceptual framework that connects these two areas and handles their benefits and difficulties. Most present research on AI in education focuses on the technical or pedagogical elements of AI systems and data while ignoring the ethical or social components of AI in education.[15] Furthermore, the majority of present research on educational leadership focuses on the human or organizational components of leadership practice and growth while ignoring the technical or digital aspects of leadership in the AI era.[16]

There is therefore a need to develop a conceptual framework to make AI in education work with educational leadership. This approach of thinking should provide a comprehensive and systematic knowledge of how artificial intelligence is applied in educational leadership. It should offer practical and ethical guidance and proposals for establishing AI-powered educational leadership. The goal of this research is to address the issue by offering a conceptual framework for incorporating artificial intelligence into educational leadership.

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[5] Emily A Holmes et al., "Mental Imagery in Depression: Phenomenology, Potential Mechanisms, and Treatment Implications," *Annual Review of Clinical Psychology* 12, no. 1 (2016): 249–80.

[6] Yinying Wang, "Artificial Intelligence in Educational Leadership: A Symbiotic Role of Human-Artificial Intelligence Decision-Making," *Journal of Educational Administration* 59, no. 3 (2021): 256–70.

[7] N. Bostrom and E. Yudkowsky, "The Ethics of Artificial Intelligence ," in *The Cambridge Handbook of Artificial Intelligence*, ed. K. Frankish and W. Ramsey (Cambridge: Cambridge University Press, 2023).

[8] R. Susskind and D. Susskind, *The Future of Professions: How Technology Will Transform the Work of Human Experts* (London: Oxford University Press, 2023).

[9] Erik Brynjolfsson and Andrew McAfee, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies* (WW Norton & Company, 2014).

[10] Neil Selwyn et al., "What Might the School of 2030 Be like? An Exercise in Social Science Fiction," *Learning, Media and Technology* 45, no. 1 (2020): 90–106.

[11] T.H. Davenport and J. Foutty, "AI-Driven Leadership," MIT Sloan Management Review, 2023, https://sloanreview.mit.edu/article/ai-driven-leadership/.

[12] Luckin R. et al., *Intelligence Unleashed: An Argument for Artificial Intelligence in Education*.

[13] Wayne Holmes, Maya Bialik, and Charles Fadel, *Artificial Intelligence in Education Promises and Implications for Teaching and Learning* (Center for Curriculum Redesign, 2019).

[14] B. Williamson, *Big Data in Education: The Digital Future of Learning, Policy and Practice* (London: Sage, 2018).

[15] Bostrom and Yudkowsky, "The Ethics of Artificial Intelligence ."

[16] Davenport and Foutty, "AI-Driven Leadership"; Doniwen Pietersen, Dean Langeveldt, and Arrie Van Wyk, "The Multidimensional Role of the Principal in Post-Apartheid-South-Africa," *Research in Educational Policy and Management* 5, no. 2 (December 13, 2023): 263–74, https://doi.org/10.46303/repam.2023.30.

The article thus seeks to investigate the use of AI in educational leadership. Using a literature-based research design it aims to provide a framework for understanding and developing AI-driven educational leadership. The fundamental principles underlying AI, leadership, and decision-making form the foundation of the whole system. The discussion will unfold under four themes: inputs (data sources and systems that use AI to make choices), processes (algorithms and procedures that use AI to make decisions), outputs (results and consequences of using AI to make decisions), and feedback (evaluation and refinement of using AI to make decisions).

The paper begins by discussing artificial intelligence in education and educational leadership. Secondly, it offers an idea of how artificial intelligence can be used in educational leadership. It will finally investigate the conceptual framework's implications and make recommendations for educational practice and policy.

LITERATURE REVIEW

This section explores the literature on artificial intelligence in education and educational leadership. It identifies and investigates the types, instances, advantages, restrictions, difficulties, responsibilities, functions, abilities, competencies, challenges, and trends of these two domains. It also emphasizes the research gap that supports the necessity for an AI-driven leadership conceptual framework in education.

AI in Education

AI in education refers to the use of AI technologies to support and enhance various aspects of teaching and learning processes.[17]

Types and Examples of AI Technologies in Education

There are different types and examples of AI technologies that can be applied in education. According to Luckin et al., these can be classified into four categories:[18]

Learner-facing AI: These are AI systems that interact directly with learners, such as intelligent tutors, adaptive learning platforms, chatbots, virtual assistants, games, simulations, etc. They can deliver personalized and adaptive learning content, feedback, coaching, scaffolding, assessment, and motivation, among other things.

AI systems that support instructors in activities such as curriculum design, lesson preparation, material delivery, student monitoring, assessment, feedback, professional development, and so on. They can help instructors save time, decrease effort, improve efficiency, and improve quality, among other things.

Peer-facing AI systems, such as social networks, online communities, collaborative learning platforms, peer assessment tools, and so on, allow cooperation and communication among learners or teachers. They can assist students or teachers in sharing knowledge, resources, ideas, and experiences, among other things.

Data-facing AI refers to AI systems that evaluate data from many sources, such as student behavior, performance, progress, preferences, and so on, or instructor practice, effectiveness, and needs, among others. They can give insights, suggestions, forecasts, visualizations, and so forth.

Benefits and limitations of AI for teaching and learning

AI technologies can offer various benefits for teaching and learning, such as:

- Enhancing learning outcomes by providing personalized and adaptive learning experiences that cater to individual learner needs, interests, goals, styles, etc.[19]
- Improving learning efficiency by optimizing learning paths and pacing that suit learner abilities and readiness.[20]

[17] Luckin R. et al., *Intelligence Unleashed: An Argument for Artificial Intelligence in Education*.
[18] Luckin R. et al., *Intelligence Unleashed: An Argument for Artificial Intelligence in Education*.
[19] Holmes, Bialik, and Fadel, *Artificial Intelligence in Education Promises and Implications for Teaching and Learning*.
[20] Luckin R. et al., *Intelligence Unleashed: An Argument for Artificial Intelligence in Education*.

- Fostering learning engagement by offering interactive and immersive learning environments that stimulate learner curiosity and motivation.[21]
- Developing 21st-century skills by exposing learners to complex and authentic problems that require critical thinking problem-solving creativity collaboration etc.[22]
- Supporting lifelong learning by enabling learners to access diverse and updated learning resources anytime anywhere and at any pace.[23]

However, AI technologies also have some limitations for teaching and learning, such as:

- Lacking human touch by replacing or reducing human interaction and emotion that is essential for social and emotional learning.[24]
- Raising ethical concerns by posing risks to learner privacy security consent trust etc., or teacher autonomy accountability responsibility etc.[25]
- Creating technical challenges by requiring reliable and robust infrastructure connectivity hardware software etc., that may not be available or affordable for all learners or teachers.[26]
- Generating pedagogical issues by relying on data-driven[27] or algorithmic decision-making that may not be transparent explainable, or aligned with learning objectives or values.[28]

Ethical, Legal, Social, and Cultural Issues of AI in Education

AI in education also raises various ethical, legal, social, and cultural issues that need to be addressed by educational leaders, such as:

- Ethical issues: These include ensuring the fairness, transparency, accountability, and privacy of AI systems and data in education.[29] For example, how to prevent or mitigate bias or discrimination in AI systems or data that may affect learner outcomes or opportunities? How to ensure or verify the accuracy or validity of AI systems or data that may influence learner assessment or feedback? How to protect or respect the rights or interests of learners or teachers who use or are affected by AI systems or data?
- Legal issues: These include regulating the ownership, liability, and responsibility of AI systems and data in education.[30] For example, who owns or controls the AI systems or data that are used or generated in education? Who is liable or accountable for the harms or damages caused by AI systems or data in education? Who is responsible for the quality or standards of AI systems or data in education?
- Social issues: These include addressing the impact of AI on the labour market, the digital divide, and the social inclusion of diverse learners.[31] For example, how to prepare learners or teachers for the changing skills or competencies required by the AI era? How to ensure access or equity of AI systems or data for all learners or teachers regardless of their socio-economic status or location? How to promote diversity or inclusion of learners or teachers from different backgrounds or cultures in AI systems or data?
- Cultural issues: These include respecting the values, beliefs, and norms of different educational contexts and stakeholders.[32] For example, how to align AI systems or data with the educational goals or values of different countries or regions? How to accommodate AI systems or data with

[21] Luckin R. et al., *Intelligence Unleashed: An Argument for Artificial Intelligence in Education*.
[22] Luckin R. et al., *Intelligence Unleashed: An Argument for Artificial Intelligence in Education*.
[23] Luckin R. et al., *Intelligence Unleashed: An Argument for Artificial Intelligence in Education*.
[24] Selwyn et al., "What Might the School of 2030 Be like? An Exercise in Social Science Fiction."
[25] Bostrom and Yudkowsky, "The Ethics of Artificial Intelligence ."
[26] Selwyn et al., "What Might the School of 2030 Be like? An Exercise in Social Science Fiction."
[27] Dean Collin Langeveldt and Doniwen Pietersen, "Data-Driven Strategies for Addressing Challenges in Teacher Placement: A Legal and Pedagogical Analysis for Inclusive Education in South Africa," *E-Journal of Humanities, Arts, and Social Sciences (EHASS)* 39, no. 3 (2023): 1–121.
[28] Bostrom and Yudkowsky, "The Ethics of Artificial Intelligence ."
[29] Bostrom and Yudkowsky, "The Ethics of Artificial Intelligence ."
[30] Susskind and Susskind, *The Future of Professions: How Technology Will Transform the Work of Human Experts*.
[31] Brynjolfsson and McAfee, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*.
[32] Selwyn et al., "What Might the School of 2030 Be like? An Exercise in Social Science Fiction."

the learning preferences or styles of different learners or teachers? How to communicate AI systems or data with the expectations or perceptions of different parents or communities?

Educational Leadership

Educational leadership is the process of enlisting and guiding the talents and energies of teachers, students, and parents toward achieving common educational aims. [33] Educational leadership is often used synonymously with school leadership in the United States and has supplanted educational management in the United Kingdom.[34]

Roles and Functions of Educational Leaders

Educational leaders can perform various roles and functions in different settings and levels of education. According to Bush, these can be classified into six types:[35]

- Instructional leadership: This type focuses on improving teaching and learning by setting clear goals, monitoring curriculum and instruction, evaluating student progress, and providing feedback and support. According to Pietersen et al. instructional leadership, which promotes a culture of teaching and learning, is gaining importance as a strategy for enhancing schools in South Africa.
- Transformational leadership: This type focuses on inspiring and motivating teachers and students by creating a shared vision, fostering a culture of collaboration and innovation, empowering and developing leaders, etc.
- Distributed leadership: This type focuses on sharing and delegating leadership tasks and responsibilities among multiple actors, such as teachers, students, parents, etc., based on their expertise, skills, interests, etc.
- Moral leadership: This type focuses on promoting ethical values and principles in education by modeling moral behavior, fostering a climate of trust and respect, addressing ethical dilemmas, etc.
- Strategic leadership: This kind is concerned with the planning and implementation of educational reform and improvement by examining internal and external issues, formulating strategic goals and plans, mobilizing resources and stakeholders, and so on.
- Postmodern leadership focuses on embracing variety and complexity in education by acknowledging many viewpoints and realities, questioning prevailing discourses and practices, promoting critical thought and conversation, and so on.

Skills and Competencies of Effective Educational Leaders

Educational leaders need to possess various skills and competencies to perform their roles and functions effectively. According to Leithwood et al., these can be grouped into four categories:[36]

- Cognitive skills: These include skills such as problem-solving, decision-making, critical thinking, creativity, etc., that enable educational leaders to analyze information, generate solutions, evaluate alternatives, etc.
- Interpersonal skills: These include skills such as communication, collaboration, negotiation, conflict resolution, etc., that enable educational leaders to interact with others, build relationships, influence outcomes, etc.
- Intrapersonal skills: These include skills such as self-awareness, self-regulation, self-motivation, resilience, etc., that enable educational leaders to manage themselves, cope with stress, overcome challenges, etc.
- Technical skills: These include skills such as data literacy, computational thinking, digital leadership, etc., that enable educational leaders to use and integrate technology in education, such as AI systems and data.

[33] Kenneth Leithwood, Alma Harris, and David Hopkins, "Seven Strong Claims about Successful School Leadership," *School Leadership and Management* 28, no. 1 (2008): 27–42.
[34] T. Bush, *Theories of Educational Leadership and Management*, 5th ed. (Sage Publications, 2023).
[35] Bush, *Theories of Educational Leadership and Management*.
[36] Leithwood, Harris, and Hopkins, "Seven Strong Claims about Successful School Leadership."

Educational Leadership Challenges and Trends

Changing expectations and demands from stakeholders, such as students, parents, teachers, policymakers, and others, who have diverse requirements, interests, objectives, values, and so on.[37]

Growing complexity and unpredictability in the educational environment, such as globalization, diversity, innovation, and competitiveness, all of which necessitate adaptive and flexible responses.[38] Emerging technological opportunities and risks, such as AI, provide new possibilities and difficulties for teaching and learning.[39]

METHODOLOGY

This article used a literature-based research design to develop a framework for AI-driven educational leadership, examining the theoretical connections between AI theory, leadership theory, and decision-making theory. It synthesized existing frameworks from AI, educational leadership, and decision-making fields to create a comprehensive understanding of AI-driven leadership. This study utilized academic literature, reports, and theoretical models to examine AI in education, educational leadership, and decision-making, establishing a comprehensive conceptual framework. This article used thematic analysis to identify recurring themes in literature, providing a theoretical foundation for an AI-driven leadership framework, involving data familiarization, code generation, theme review, and analysis writing. This article adhered to ethical guidelines for attributing and citing sources. This article evaluated the validity of a conceptual framework based on established theories, using rigorous citation practices, peer-reviewed sources, and a comprehensive literature review, assessing its alignment with research questions, coherence, and relevance. The literature review's limitations stemmed from the limited scope of existing literature, the inability to include emerging perspectives, and the inability to capture all relevant sources. Future research could validate the proposed framework through empirical studies in educational settings, explore its practical implementation, and investigate how AI-driven leaders use data, foster innovation, and handle ethical and social challenges in education. This article synthesized AI theories, educational leadership, and decision-making to create a conceptual framework for AI-driven educational leadership, aiming to contribute to the emerging field and offer insights for educational leaders and practitioners.

CONCEPTUAL FRAMEWORK

This section outlines the fundamental ideas for integrating AI technology into educational leadership. There are two elements to it: the basic concepts and the major idea. The examination of important concepts and models of AI, leadership, and decision-making, which provide the theoretical underpinning, guides the research. Based on four elements: inputs, processes, outputs, and feedback, the conceptual model presents a new paradigm for understanding and executing AI-driven leadership in education.

Theoretical Foundations

This work's theoretical underpinnings are founded on three domains: AI theory, leadership theory, and decision-making theory. Each profession has a unique viewpoint on the use of AI in educational leadership.

AI Theory

Artificial intelligence theory is concerned with the principles and methods of artificial intelligence, which is a branch of applied probability theory and analytic philosophy concerned with the theory of making decisions based on assigning probabilities to various factors and assigning numerical consequences to the outcome (Decision theory - Stanford Encyclopedia of Philosophy; Decision theory - Britannica; Decision theory - Oxford Reference). AI theory incorporates a variety of AI technology forms and uses in education, including learner-facing AI, teacher-facing AI, peer-facing AI, and data-facing AI.[40] AI theory also addresses the advantages and disadvantages of AI in teaching and learning, such as improving learning outcomes, increasing learning efficiency, fostering learning engagement, developing 21st century skills, supporting lifelong learning, lacking human touch, raising ethical concerns, creating technical challenges,

[37] Bush, *Theories of Educational Leadership and Management*.
[38] Leithwood, Harris, and Hopkins, "Seven Strong Claims about Successful School Leadership."
[39] Wang, "Artificial Intelligence in Educational Leadership: A Symbiotic Role of Human-Artificial Intelligence Decision-Making."
[40] Luckin R. et al., *Intelligence Unleashed: An Argument for Artificial Intelligence in Education*.

and generating pedagogical issues.[41] Furthermore, AI theory investigates the ethical, legal, social, and cultural issues of AI in education, such as ensuring the fairness, transparency, accountability, and privacy of AI systems and data, regulating the ownership, liability, and responsibility of AI systems and data, addressing the impact of AI on the labor market, digital divide, and social inclusion of diverse learners, and respecting the values, beliefs, and norms of various educational contexts and stakeholders.[42]

Leadership Theory

Leadership theory is concerned with the styles and approaches of leadership, which is the process of enlisting and guiding the talents and energies of teachers, students, and parents toward achieving common educational aims.[43] Leadership theory encompasses different roles and functions of educational leaders in different settings and levels of education, such as instructional leadership, transformational leadership, distributed leadership, moral leadership, strategic leadership, and postmodern leadership.[44] Leadership theory also highlights the cognitive talents, interpersonal skills, intrapersonal skills, and technical abilities of effective educational leaders.[45] Furthermore, leadership theory investigates educational leadership difficulties and trends such as changing stakeholder expectations and demands, rising complexity and unpredictability in the educational environment, and new possibilities and dangers from technology.[46]

Decision-Making Theory

Decision-making theory is concerned with the processes and circumstances that influence decision-making, which is defined as the act or process of selecting one course of action from among multiple choices. (Oxford Bibliographies - Decision Making). Decision-making theory addresses several decision-making kinds and models that may be applied in various circumstances and contexts, such as rational decision-making, limited rationality, intuitive decision-making, heuristic decision-making, and so on. (Stanford Encyclopedia of Philosophy, Decision Making). Individual characteristics, social dynamics, organizational culture, ethical concerns, and other factors all play a role in decision-making theory (Decision Making - The MIT Press). Furthermore, decision-making theory evaluates the quality and efficacy of decision-making in terms of accuracy, consistency, timeliness, and so on. (Oxford Bibliographies - Decision Making)

Conceptual Model

This study's conceptual model is built on the integration of the theoretical underpinnings of AI theory, leadership theory, and decision-making theory. It presents a new paradigm for comprehending and creating AI-driven educational leadership. Inputs, processes, outputs, and feedback are the four components of the framework. Each component reflects a unique facet of AI-powered decision-making in educational leadership.

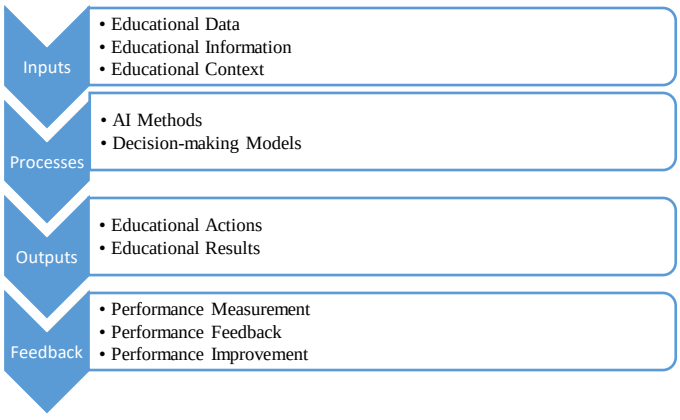

Figure 1: Conceptual Model

[41] Luckin R. et al., *Intelligence Unleashed: An Argument for Artificial Intelligence in Education.*
[42] Bostrom and Yudkowsky, "The Ethics of Artificial Intelligence ."
[43] Leithwood, Harris, and Hopkins, "Seven Strong Claims about Successful School Leadership."
[44] Bush, *Theories of Educational Leadership and Management*.
[45] Leithwood, Harris, and Hopkins, "Seven Strong Claims about Successful School Leadership."
[46] Bush, *Theories of Educational Leadership and Management*.

Inputs

Inputs are the data sources and information systems that serve as the foundation for AI-driven decision-making in educational leadership. These are their names:

- Educational data: This refers to the information that AI systems and data in education collect, store, and analyze, such as learner behavior, performance, progress, preferences, and so on, or teacher practice, effectiveness, and needs. (AI with a data-driven approach).[47]
- Educational information: This includes insights, suggestions, forecasts, visualizations, and other information created, displayed, and conveyed by AI systems and data in education. (AI with a data focus).
- Educational context: These are the elements that form and impact the educational environment and situation, such as educational goals, values, policies, standards, stakeholders, and so on. (AI in education: ethical, legal, social, and cultural challenges).

Processes

Processes are the algorithms and techniques that enable AI-driven decision-making in educational leadership.[48] They include:

- AI methods: These are the methods that apply AI technologies to support and enhance various aspects of teaching and learning processes, such as curriculum design, lesson planning, content delivery, student monitoring, evaluation, feedback, professional development, etc.[49] (Teacher-facing AI), or personalized and adaptive learning content, feedback, guidance, scaffolding, assessment, motivation, etc. (Learner-facing AI), or collaboration and communication among learners or teachers (Peer-facing AI).
- Decision-making models: These are the models that apply decision-making theories to guide and improve the quality and effectiveness of decision-making in educational leadership, such as rational decision-making, bounded rationality, intuitive decision-making, heuristic decision-making, etc. (Decision-making theory).[50]

Outputs

Outputs are the outcomes and impacts of AI-driven decision-making in educational leadership. They include:

- Educational actions: These are the actions that are taken or implemented by educational leaders based on AI-driven decision-making, such as adopting, integrating, evaluating, and improving AI systems and data in education (AI theory),[51] or setting clear goals, monitoring curriculum and instruction, evaluating student progress, providing feedback and support, etc. (Instructional leadership), or creating a shared vision, fostering a culture of collaboration and innovation, empowering and developing leaders, etc. (Transformational leadership), [52] or sharing and delegating leadership tasks and responsibilities among multiple actors (Distributed leadership),[53] or promoting ethical values and principles in education (Moral leadership),[54] or planning and implementing change and improvement in education (Strategic leadership) or embracing diversity and complexity in education (Postmodern leadership).[55]
- Educational results: These are the results that are achieved or expected by educational leaders from AI-driven decision-making, such as improved teaching and learning outcomes (AI theory),[56] or

[47] Holmes, Bialik, and Fadel, *Artificial Intelligence in Education Promises and Implications for Teaching and Learning*.
[48] Luckin R. et al., *Intelligence Unleashed: An Argument for Artificial Intelligence in Education*.
[49] Holmes, Bialik, and Fadel, *Artificial Intelligence in Education Promises and Implications for Teaching and Learning*.
[50] W. K. Hoy and C. J. Tarter, *Administrators Solving the Problems of Practice: Decision-Making Concepts, Cases, and Consequences* , 3rd ed. (Pearson Education, 2008).
[51] Luckin, "Towards Artificial Intelligence-Based Assessment Systems."
[52] Kenneth Leithwood and Doris Jantzi, "Transformational School Leadership for Large-Scale Reform: Effects on Students, Teachers, and Their Classroom Practices," *School Effectiveness and School Improvement* 17, no. 2 (2006): 201–27.
[53] J. P. Spillane, *Distributed Leadership* (San Francisco: Jossey-Bass, 2006).
[54] M. Fullan, *Leading in a Culture of Change* (San Francisco: Jossey-Bass, 2001).
[55] Peter Gronn, *The New Work of Educational Leaders: Changing Leadership Practice in an Era of School Reform* (Sage, 2003).
[56] Luckin, "Towards Artificial Intelligence-Based Assessment Systems."

better decisions (Decision-making theory),[57] or new products (AI theory),[58] or optimized business processes (AI theory).[59]

Feedback

Feedback is the assessment and enhancement of AI-driven decision-making in educational leadership. Performance measurement is the measuring of the performance of AI systems and data in education and their alignment with educational aims and values (AI theory),[60] or the performance of educational leaders and their accomplishment of educational goals and standards (Leadership theory).[61]

Performance feedback is provided or received by artificial intelligence (AI) systems and data in education and their users or beneficiaries (AI theory), or by educational leaders and their followers or stakeholders (Leadership theory).[62]

Performance improvement: Improvement made or supported by AI systems and data in education and the people who use or benefit from it (AI theory),[63] or by educational leaders and the people who follow or are affected by them (Leadership theory).[64]

DISCUSSIONS

The section discusses the effects and recommendations of the AI-driven leadership framework in the field of education. It provides solutions for these questions:

- How can school leaders use AI to improve their decision-making quality and speed?
- How can educational leaders use AI to foster innovation and inclusion in their educational institutions?
- How can educational leaders use AI to address the ethical, legal, social, and cultural issues of AI in education?
- What are the key skills and competencies that educational leaders need to acquire for the AI era?
- What are the best ways for educational leaders to improve and adapt to the AI era.?
- What are the difficulties and dangers that school leaders need to avoid or handle in the era of AI?

Implications

The idea behind using AI in educational leadership has important implications for how education is practiced and policies are developed. This study explains how AI is used in educational leadership and gives guidelines for using AI in education.

How can people in charge of education use artificial intelligence to make better decisions that are faster and more effective?

The conceptual framework helps educational leaders understand how AI can be used to make better decisions in a more efficient way. Educational leaders can use data and algorithms to help them make better decisions by using AI techniques and decision-making models. They can, for example, use AI methodologies such as data analysis, machine learning, natural language processing, and so on to provide insights, recommendations, projections, visualizations, and so on from a variety of educational data and information (inputs). They can also use decision-making models (outputs) such as rational decision-making, restricted rationality, intuitive decision-making, heuristic decision-making, and so on to guide and evaluate their decision-making processes. They may enhance the quality of their decisions by making more informed, evidence-based, data-driven, objective, valid, and trustworthy decisions. They can also enhance their decision-making efficiency by making faster, easier, simpler decisions.

[57] H. A. Simon, *The New Science of Management Decision* (London: Prentice Hall, 1977).
[58] Luckin, "Towards Artificial Intelligence-Based Assessment Systems."
[59] Luckin, "Towards Artificial Intelligence-Based Assessment Systems."
[60] Luckin, "Towards Artificial Intelligence-Based Assessment Systems."
[61] Philip Hallinger, "Leading Educational Change: Reflections on the Practice of Instructional and Transformational Leadership," *Cambridge Journal of Education* 33, no. 3 (2003): 329–52.
[62] Leithwood and Jantzi, "Transformational School Leadership for Large-Scale Reform: Effects on Students, Teachers, and Their Classroom Practices."
[63] Luckin, "Towards Artificial Intelligence-Based Assessment Systems."
[64] Fullan, *Leading in a Culture of Change*.

How can educational leaders use AI to foster innovation and inclusion in their educational institutions?

Another implication of the conceptual framework is that it shows how educational leaders can use AI to foster innovation and inclusion in their educational institutions. By using AI methods and decision-making models, educational leaders can create and implement new and improved products and processes that enhance teaching and learning in their educational institutions. For example, they can use AI methods such as intelligent tutors, adaptive learning platforms, chatbots, virtual assistants, games, simulations, etc., to provide personalized and adaptive learning experiences that cater to individual learner needs, interests, goals, styles, etc. (Learner-facing AI). They can also use AI methods such as curriculum design, lesson planning, content delivery, student monitoring, evaluation, feedback, professional development, etc., to assist teachers in their tasks and improve their efficiency and effectiveness (Teacher-facing AI). They can also use AI methods such as social networks, online communities, collaborative learning platforms, peer assessment tools, etc., to facilitate collaboration and communication among learners or teachers (Peer-facing AI). By doing so, they can foster innovation by creating a culture of experimentation and exploration that supports the development of human-AI collaboration in education. They can also foster inclusion by providing access and equity of AI systems and data for all learners or teachers regardless of their socio-economic status or location (Data-facing AI), or by promoting diversity and inclusion of learners or teachers from different backgrounds or cultures in AI systems and data (Ethical, legal, social, and cultural issues of AI in education).

How can educational leaders use AI to address the ethical, legal, social, and cultural issues of AI in education?

A further implication of the conceptual framework is that it shows how educational leaders can use AI to address the ethical, legal, social, and cultural issues of AI in education. By using AI methods and decision-making models, educational leaders can ensure and verify the fairness, transparency, accountability, and privacy of AI systems and data in education (Ethical issues). For example, they can use AI methods such as data quality, data governance, data security, data privacy, etc., to ensure or verify the accuracy, validity, reliability, security, privacy, etc., of AI systems and data in education (Data-facing AI). They can also use decision-making models such as ethical decision-making, moral decision-making, value-based decision-making, etc., to guide and evaluate their decision-making processes based on ethical values and principles such as fairness, transparency, accountability, privacy, etc. (Decision-making theory). By doing so, they can address the ethical issues of AI in education by preventing or mitigating bias or discrimination in AI systems or data that may affect learner outcomes or opportunities, or by protecting or respecting the rights or interests of learners or teachers who use or are affected by AI systems or data.

By using AI methods and decision-making models, educational leaders can also regulate and monitor the ownership, liability, and responsibility of AI systems and data in education (Legal issues). They can, for example, utilize AI approaches such as data ownership, data licensing, data sharing, data auditing, and so on to govern or oversee the ownership, control, access, and use of AI systems and data in education (Data-facing AI). They may also utilize decision-making models like legal decision-making, regulatory decision-making, compliance decision-making, and so on to guide and analyze their decision-making processes that are based on legal rules and regulations like laws, policies, standards, and so on (Decision-making theory). They can handle the legal challenges of AI in education by ensuring or validating the quality or standards of AI systems and data in education or assigning or enforcing liability or accountability for injuries or damages caused by AI systems or data in education.

Educational leaders may handle the social and cultural concerns of AI in education by applying AI methodologies and decision-making models. They can do so by employing AI methods such as data analysis, machine learning, natural language processing, and so on to analyze and comprehend the impact of AI on the labor market, the digital divide, and the social inclusion of diverse learners (Social issues), or by employing AI methods such as natural language processing, computer vision, speech recognition, and so on to respect and accommodate the values, beliefs, and norms of various educational contexts and stakeholders (Cultural issues). They may also utilize decision-making models like social decision-making, cultural decision-making, stakeholder decision-making, and so on to guide and assess their decision-

making processes based on social and cultural aspects including needs, interests, objectives, and values (Decision-making theory). They can address the social issues of AI in education by preparing learners or teachers for the changing skills or competencies required by the AI era,[65] or by ensuring access or equity of AI systems or data for all learners or teachers regardless of socioeconomic status or location,[66] or by promoting diversity or inclusion of learners or teachers from different backgrounds or cultures in AI systems or data.[67] They can also address the cultural issues of AI in education by aligning AI systems or data with the educational goals or values of various countries or regions, or by accommodating AI systems or data with the learning preferences or styles of various learners or teachers, or by communicating AI systems or data with the expectations or perceptions of various parents or communities.[68]

RECOMMENDATIONS

The conceptual framework for AI-driven education leadership also includes some ideas for building AI-driven education leadership. It offers some critical skills and competencies that educational leaders should develop for the AI age, as well as some best practices and tactics that educational leaders should implement for the AI era, as well as some potential pitfalls and dangers that educational leaders should avoid or minimize for the AI era.

What are the critical abilities and competencies that educational leaders must develop for the AI era?

One of the conceptual framework's main recommendations is that it defines numerous important skills and abilities that educational leaders would need in the AI future. Here are a few examples:

- Data literacy means being able to understand and use data in different forms and situations.[69] Being able to understand and work with data is really important for educational leaders. They need this skill to use AI technology and data in education, and to make smart choices based on evidence.
- Computational thinking is the ability to generate and solve problems using computer science concepts and methods such as abstraction, decomposition, and algorithms.[70] Understanding and utilizing AI technologies in education, as well as promoting innovation and creativity, need computational thinking on the part of educational leaders.
- Digital leadership means being able to guide and oversee the use of technology and data in education. This involves tasks like introducing and using AI technology, evaluating its effectiveness, and improving it.[71] To take full advantage of the advantages and conquer the obstacles of AI in education, educational leaders need to have digital leadership. This will also help them create an atmosphere that encourages creativity and diversity.
- Ethical awareness means recognizing and addressing the ethical problems related to using AI in education, like making sure it is fair, transparent, accountable, and respects privacy.[72] Ethical awareness is essential for educational leaders to assure and verify the ethical ideals and principles of AI systems and data in education, as well as to defend and respect learners' and instructors' rights and interests.

What are the best practices and strategies that educational leaders need to adopt for the AI era?

Another recommendation of the conceptual framework is that it proposes certain best practices and tactics that educational leaders should embrace for the AI era:

- Creating a vision and a plan for artificial intelligence in education: Educational leaders must have a clear vision and strategic plan for AI in education that is consistent with their educational aims

[65] Brynjolfsson and McAfee, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*.
[66] Selwyn et al., "What Might the School of 2030 Be like? An Exercise in Social Science Fiction."
[67] Selwyn et al., "What Might the School of 2030 Be like? An Exercise in Social Science Fiction."
[68] Selwyn et al., "What Might the School of 2030 Be like? An Exercise in Social Science Fiction."
[69] Davenport and Foutty, "AI-Driven Leadership."
[70] Jeannette M. Wing, "Computational Thinking ," *Communications of the ACM* 49, no. 3 (2023): 33–35.
[71] Eric C. Sheninger, *Digital Leadership: Changing Paradigms for Changing Times*. 2nd ed. (Thousand Oaks, CA: Corwin), 2019.
[72] Bostrom and Yudkowsky, "The Ethics of Artificial Intelligence ."

and values and meets their educational requirements and difficulties.[73] They must also convey their vision and goal to their stakeholders, such as teachers, students, parents, legislators, and others, and solicit input and support from them.

- Creating a team and a network for AI in education Creating a team and a network for AI in education involves bringing together different people with different skills, backgrounds, and interests, like teachers, students, researchers, and developers, to work together and collaborate.[74] They need to encourage teamwork and communication among team and network members. They also need to give them the power to grow as leaders and learners.
- Choosing and integrating artificial intelligence (AI) systems and data in education: Educational leaders must choose and integrate AI systems and data in education that are appropriate and relevant for their educational context and situation, such as learner-facing AI, teacher-facing AI, peer-facing AI, or data-facing AI.[75] They must also assess and enhance the quality and efficacy of AI systems and data in education, including correctness, consistency, timeliness, and so on (decision-making theory).
- Developing and implementing new and improved educational products and processes: Educational leaders must develop and implement new and improved educational products and processes that improve teaching and learning in their institutions, such as personalized and adaptive learning experiences, interactive and immersive learning environments, complex and authentic problems, and so on (AI theory). They must also assess and track the consequences and impacts of their educational goods and processes, such as enhanced learning outcomes, smarter judgments, new products, streamlined business processes, and so on (AI theory).

What are the potential pitfalls and risks that educational leaders need to avoid or mitigate for the AI era?

A final recommendation of the conceptual framework is that it warns about some potential pitfalls and risks that educational leaders need to avoid or mitigate for the AI era. These include:

- Relying too much or too little on AI systems or data in education: Educational leaders need to find a balance between trusting or distrusting AI systems or data in education. They should not rely too much on AI systems or data in education without questioning or verifying their validity or reliability. They should also not rely too little on AI systems or data in education without utilizing or benefiting from their insights or recommendations.[76]
- Replacing or reducing human interaction or emotion in education: Educational leaders need to maintain or enhance human interaction or emotion in education. They should not replace or reduce human interaction or emotion in education with AI systems or data in education. They should also not ignore or neglect the social and emotional needs and aspects of learners and teachers.[77]
- The misuse or violation of ethical, legal, social, and cultural considerations surrounding AI in education.: Educational leaders must address the important ethical, legal, social, and cultural problems related to using AI in education. They should not overlook or violate these issues. They must evaluate the ethical, legal, social, and cultural implications of AI in education and not ignore or violate the regulations governing them. They should also ensure that their actions do not contradict the values and beliefs of their institution and the persons involved.[78]

CONCLUSION

This study looked at how AI is used in educational leadership and gave a way to understand and create AI-based educational leadership. The basic idea behind the conceptual framework is to combine ideas from AI, leadership, and decision-making. It has four main parts: inputs, processes, outputs, and feedback.

[73] UNESCO, " Artificial Intelligence in Education."
[74] Luckin R. et al., *Intelligence Unleashed: An Argument for Artificial Intelligence in Education.*
[75] Luckin R. et al., *Intelligence Unleashed: An Argument for Artificial Intelligence in Education.*
[76] Bostrom and Yudkowsky, "The Ethics of Artificial Intelligence ."
[77] Selwyn et al., "What Might the School of 2030 Be like? An Exercise in Social Science Fiction."
[78] Bostrom and Yudkowsky, "The Ethics of Artificial Intelligence "; Susskind and Susskind, *The Future of Professions: How Technology Will Transform the Work of Human Experts*; Brynjolfsson and McAfee, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*; Selwyn et al., "What Might the School of 2030 Be like? An Exercise in Social Science Fiction."

The article also explores how the conceptual framework affects and suggests improvements for education practice and policy.

The conceptual framework has many benefits and useful ideas for improving artificial intelligence in education and educational leadership. This text helps people understand how AI is important in educational leadership and gives some advice on how to use AI effectively in education. It connects AI in education with educational leadership, dealing with the good things and challenges. It also helps with new ideas and different types of people by promoting working together with AI in education.

However, there are some problems and shortcomings in the plan that need to be recognized and fixed. This information is from a survey of the literature, but it might not have all the important sources or viewpoints about AI in education and educational leadership. This is also based on a study that is based on theory and may not show the actual reality or complexity of using AI to make decisions in education leadership. This text means that it is believed that using AI technology in education is a good and helpful thing for all educational settings and people involved in education. This means researchers have to do more research or create a better plan for using AI in education leadership. Doing research studies to test and prove a theoretical framework in different educational settings and levels, like schools, universities, districts, etc. This will be done by using different ways and sources of information, such as surveys, interviews, observations, experiments, and so on. The goal is to make tools and resources that are helpful for using AI to make decisions in education leadership. These tools can be things like guidelines, checklists, and dashboards. They can be used on the internet or on mobile devices.

Stakeholders are looking into different approaches to AI-driven leadership in education, like ethical and cultural frameworks, and taking into account different theories like critical theory and postmodern theory. As a result, there is a need for more research or to expand the ideas behind AI-driven leadership in education. There is also the need to conduct research in different schools and universities to see if the ideas proposed by this researcher are true. Surveys, interviews, observations, and experiments to collect data and test my ideas can be used. Creating helpful tools and resources, like frameworks, guidelines, checklists, rubrics, dashboards, and more, to assist and improve AI-driven decision-making in educational leadership. These tools can be accessed online, on mobile devices, through cloud computing, and similar methods. Different ways to use AI in education where people lead, like ethical practices, cultural practices, and involving everyone affected by the decisions are explored. Different ideas and approaches such as looking critically at things, thinking about the world today, and understanding how different parts fit together were used.

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ABOUT AUTHOR

Dr. Dean Collin Langeveldt is a Lecturer in Psychology of Education at Sol Plaatje University's Faculty of Education. With a teaching career spanning from 1994 to 2021, he has extensive experience in education, law, management, work-integrated learning (WIL), and human rights. His research focuses on bullying, inclusive education, pre-service teacher education, and educational leadership. Dr. Langeveldt holds a BA, HDE, ACE, Hons (cum laude), MEd, and PhD.