International Journal of Management Research and Social Science (IJMRSS)
Volume 13, Issue 1, January – March 2026
ISSN 2394-6407(Print)
ISSN 2394-6415(Online)

Digital Transformation, Artificial Intelligence, and Learner-Centred Education: Implications for Primary School Performance in Zambia

Chani Nyambe S[*1], Dr. J. Arockia Venice[2]
[1]*Student, DMI St. Eugene University, Zambia*
[2]*Professor, DMI St. Eugene University, Zambia*

Abstract — The convergence of artificial intelligence (AI), digital transformation, and learner-centred pedagogy has redefined educational practice globally. In Zambia, despite national policy mandating learner-centred instruction, rural primary schools continue to face significant implementation gaps. This article synthesises findings from a descriptive survey conducted in three primary schools in Sioma District, Western Province, with global scholarship on AI-powered personalised learning, blockchain-enabled credentialing, and adaptive curriculum design. Findings confirm that learner-centred methods enhance critical thinking, motivation, and academic mastery among primary pupils, while resource deficits, time constraints, and limited teacher professional development remain primary barriers. The study argues that strategically deploying AI and digital technologies in contextually appropriate ways can substantially advance learner-centred reform in developing nations. Policy and practice recommendations are offered.

Keywords — *Learner-Centred Education; Artificial Intelligence; Digital Transformation; Primary Education; Zambia; Personalised Learning; Cognitive IoT.*

1. Introduction

Global education systems are undergoing fundamental transformation driven by artificial intelligence, machine learning, and digital innovation (Venice et al., 2025a; Arockia et al., 2025). AI-powered learning analytics, recommendation systems, and blockchain-enabled credentialing are reshaping the boundaries between instructional paradigms, compelling educators and policymakers to reconsider how knowledge is constructed, assessed, and transferred (Venice et al., 2025b; Vasantha et al., 2025). These advances carry particular significance for developing nations, where pedagogical reform intersects with persistent challenges of resource scarcity, teacher capacity, and educational inequity. In Zambia, the 2013 revised national curriculum and the Educating Our Future policy formally institutionalised learner-centred instruction across all levels of schooling. Yet empirical evidence continues to document a persistent gap between policy intent and classroom reality in rural primary settings (Namangolwa, 2013; Banda et al., 2014).

Teachers in districts such as Sioma, Western Province, frequently revert to transmission-based methods owing to inadequate resources, large class sizes, and insufficient professional development challenges that digital transformation initiatives have the potential to meaningfully address (Vettriselvan & Rajan FSA, 2019; Swadhi et al., 2025a). This article bridges the Zambian primary school context with the global digital education discourse by integrating empirical findings from Sioma District with scholarship on AI, blockchain, adaptive learning, and inclusive education. The objective is to identify how strategic technology adoption can advance learner-centred reform in resource-constrained developing country settings, while acknowledging the structural barriers that limit such adoption. The article offers evidence-based policy recommendations and directions for future inquiry.

2. Literature Review

2.1 Constructivism and Learner-Centred Pedagogy

Learner-centred education is theoretically grounded in constructivism, which posits that learners actively construct knowledge through interaction between new information and existing cognitive schemas (Slavin, 2018; Cakir, 2018).

Piaget's concepts of assimilation and accommodation describe how learners integrate or restructure knowledge when cognitive disequilibrium occurs processes directly analogous to the adaptive mechanisms embedded in contemporary AI learning systems (Basha et al., 2025; Venice et al., 2025c). Vygotsky's Zone of Proximal Development further introduced scaffolded instruction, wherein learners progress through calibrated challenges with diminishing teacher support, a principle now instantiated in AI-driven adaptive learning platforms (Vasantha et al., 2025; Akila et al., 2025). Learner-centred pedagogy encompasses cooperative group work, project-based learning, peer interaction, inquiry-based science, and field-based study approaches that position learners as active co-constructors of knowledge rather than passive recipients (McCombs & Whistler, 2017). The growing evidence base confirms that these strategies produce measurable gains in critical thinking, academic motivation, and content

DOI: 10.30726/ijmrss/v13.i1.2026.13102

retention across diverse educational contexts (Vettriselvan et al., 2025a; Gayathri et al., 2025b).

2.2 AI, Personalised Learning and Recommendation Systems

Artificial intelligence has introduced a new paradigm of personalised, adaptive, and data-driven instruction in education (Venice et al., 2025a; Vettriselvan, 2025). AI-powered learning analytics platforms collect and interpret learner interaction data to generate individualised instructional pathways, identify at-risk students, and support teacher decision-making (Arockia et al., 2025; Swadhi et al., 2025b). Recommendation systems derived from collaborative filtering and machine learning continuously analyse learner behaviour to generate content suggestions calibrated to demonstrated competencies and knowledge gaps (Venice et al., 2025b; Catherine et al., 2025).

The pedagogical logic of AI-driven recommendation systems is consonant with learner-centred principles: effective instruction must be responsive to individual differences rather than calibrated to an assumed average learner (Vasantha et al., 2025; Vinodh et al., 2026a). In resource-constrained settings such as Zambia's rural primary schools, AI-mediated tutoring platforms and offline-capable digital content repositories could substantially compensate for shortages of qualified teachers and specialised instructional materials that currently impede learner-centred implementation (Arockia et al., 2025; Vettriselvan et al., 2025b).

2.3 Blockchain, Cognitive IoT, and Educational Data Analytics

Blockchain technology has emerged as a significant force in educational credentialing, record security, and performance analytics (Venice et al., 2025c; Rajeswari et al., 2026). Blockchain-enabled systems offer tamper-proof, decentralised academic records that address systemic challenges of credential fraud and administrative inefficiency prevalent in developing nation educational systems. The application of blockchain to cognitive Internet of Things (CIoT) in educational networks enables real-time monitoring of learning outcomes and institutional performance at granular levels previously unattainable through conventional systems (Venice et al., 2025d; Akila et al., 2025). For Zambia, blockchain-enabled performance tracking across schools and districts could provide the Ministry of Education with longitudinal pupil outcome data of unprecedented precision, enabling evidence-based identification of schools requiring targeted pedagogical support and resource allocation (Venice et al., 2025e; Devi et al., 2025). These systems represent a structural technological infrastructure within which learner-centred reform initiatives could be monitored, evaluated, and iteratively refined at scale.

2.4 Digital Transformation, Inclusion, and Teacher Professional Development

Digital transformation in education encompasses systemic integration of technology into curriculum design, instructional delivery, and institutional management (Vettriselvan et al., 2026a; Swadhi et al., 2025c). Scholars emphasise that effective digital transformation requires not merely technology adoption but a fundamental reconceptualisation of organisational culture, pedagogical philosophy, and leadership practice (Gayathri et al., 2025a; Vettriselvan, 2025). The strategic role of human resource management in facilitating sustainable pedagogical reform is well-established: teacher professional development quality is the primary determinant of instructional innovation success or failure (Gayathri et al., 2025b; Vettriselvan & Anto, 2018).

Digital transformation also carries significant implications for educational inclusion. When appropriately designed, digital technologies can democratise access to quality resources, reduce geographic barriers to qualified instruction, and provide learners with disabilities adaptive learning supports previously unavailable in resource-constrained settings (Meena et al., 2025; Ashifa, 2019). For Zambia, where historical educational inequity along lines of gender, geography, and socioeconomic status persists, technology-mediated learner-centred approaches offer a promising equity pathway (Ashifa, 2021a; Vettriselvan et al., 2025c).

2.5 Well-Being, Health, and the Learning Environment

An established body of scholarship connects learner health, nutritional status, and emotional well-being to academic participation and performance outcomes (Ashifa, 2020a; Ashifa, 2022; Ranganathan et al., 2024). Emotional intelligence and self-leadership are significant moderators of stress and academic resilience, particularly in high-pressure or resource-scarce educational contexts (Zahoor et al., 2025; Elkin et al., 2025). Learner-centred pedagogical approaches that cultivate collaborative skills, peer interaction, and inquiry-based problem-solving have documented benefits for psychosocial development alongside academic achievement (Vettriselvan et al., 2025a; Kariveliparambil et al., 2026a). In Zambia's rural primary school context, the intersection of poverty, food insecurity, and limited healthcare access creates compounded vulnerability among learner populations that directly constrains the effectiveness of pedagogical interventions (Ashifa, 2021b; Ashifa et al., 2019; Rasi & Ashifa, 2019). Effective learner-centred reform must therefore be embedded within a broader social equity and health support

DOI: 10.30726/ijmrss/v13.i1.2026.13102

framework that attends to the holistic needs of the primary school child (Vettriselvan et al., 2025d; Kariveliparambil et al., 2026b).

2.6 Global and Regional Perspectives

Internationally, learner-centred education is endorsed through UNESCO's Education for All framework, the UN Sustainable Development Goal 4, and the International Institute for Capacity Building in Africa (IICBA) standards. These frameworks advocate participatory, inquiry-based approaches that prioritise learner agency over rote memorisation (Vettriselvan et al., 2026b; Venice et al., 2025f). Across sub-Saharan Africa, implementation of learner-centred curricula has been constrained by overcrowded classrooms, inadequate teacher training, and insufficient instructional materials (Shanthi et al., 2025; Mohanbabu & Vettriselvan, 2025a). Zambia's national experience reflects this regional pattern, with documented implementation gaps attributable to teacher attitude, resource availability, and institutional support (Nyimbili et al., 2018; Vettriselvan & Rajan FSA, 2019).

3. Methodology

The empirical component draws from a descriptive survey conducted in three selected primary schools in Sioma District, Western Province, Zambia. A mixed-methods design was employed, integrating qualitative and quantitative approaches to achieve a comprehensive account of learner-centred pedagogy in context (Kombo & Tromp, 2014; Orodho & Kombo, 2012). The target population comprised approximately 750 teachers and pupils. Stratified random sampling yielded a sample of 75 participants: 21 teachers (7 per school, selected purposively) and 54 pupils (18 per school, selected by simple random sampling), representing 10% of the total population. Data were collected through semi-structured teacher interviews and structured pupil questionnaires. Teacher interviews elicited qualitative data on attitudes toward learner-centred methods, perceived implementation challenges, and enhancement recommendations. Pupil questionnaires generated quantitative attitudinal and perceptual data. Ethical clearance was obtained from the District Education Board Secretary prior to fieldwork, with written school consent and pupil verbal assent secured. Quantitative data were analysed through descriptive statistics; qualitative data underwent thematic analysis cross-referenced against the scholarly literature (Slavin, 2018; Gredler, 2017).

4. Findings and Analysis

4.1 Effects on Pupil Academic Performance

Findings reveal a consistently positive association between learner-centred instruction and pupil academic outcomes. Among 21 teacher respondents, 38% identified improved critical thinking and problem-solving as the primary effect; 29% cited increased engagement and motivation; 19% highlighted personalised learning benefits; and 14% noted greater learner independence. These outcomes align with global evidence that AI-powered adaptive systems enhance academic engagement through the same mechanisms calibrated challenge, personalised pathways, and inquiry-based activities (Arockia et al., 2025; Venice et al., 2025a; Swadhi et al., 2025b). Pupil respondents corroborated teacher perceptions: the majority reported improved learning experiences, enhanced interest, better academic performance, and stronger concept mastery through learner-centred activities. Fewer than 17% found these methods burdensome, contrasting with earlier African studies reporting significantly higher learner resistance (Olana & Amante, 2017). This finding suggests that contextually sensitive implementation can achieve high learner acceptance even in low-resource primary settings.

4.2 Teacher Attitudes

Teacher attitudes toward learner-centred methods were predominantly positive. All 21 teachers strongly agreed that learner-centred approaches enhance pupil recall and lesson enjoyment findings consistent with research demonstrating that pedagogically confident teachers develop positive orientations toward constructivist instruction and implement it with greater fidelity (Gayathri et al., 2025b; Vettriselvan et al., 2025a). A minority expressed concern that learner-centred methods insufficiently prepare pupils for examination-oriented assessment systems, reflecting the documented tension between constructivist pedagogy and behaviourist assessment paradigms a tension that competency-based digital assessment platforms have the potential to resolve (Venice et al., 2025c; Venice et al., 2025d).

4.3 Implementation Challenges

Six primary implementation challenges were identified: lack of instructional resources (28%), time constraints (24%), noisy classroom environments (14%), risk of learners missing content (14%), learner discomfort in collaborative settings (10%), and teacher unfamiliarity with field trip venues (10%). Resource deficits represent the most critical structural barrier, directly impeding the diversity and quality of learner-centred activities available to teachers in rural Sioma District schools (Nyimbili et al., 2018; Gijbels, 2019). Digital technologies including offline-capable tablet devices, solar-powered learning centres, and AI-driven content platforms offer a practical pathway to addressing these resource deficits without the infrastructure investments characteristic of high-income contexts (Venice et al., 2025b; Vinodh et al., 2026b; Vettriselvan et al., 2025b). Time constraints reflect a

DOI: 10.30726/ijmrss/v13.i1.2026.13102

structural curriculum design challenge requiring systemic policy intervention, as individual teacher adaptation is insufficient to resolve timetabling pressures generated by comprehensive syllabus coverage requirements (Selvi et al., 2026; Vettriselvan et al., 2026a).

4.4 Methods Used and Recommended Enhancements

Group work was the dominant learner-centred method, employed by 16 of 21 teachers. Project-based learning was used by 4 teachers; field trips by only 1. The limited use of high-impact methods — particularly project-based learning and field trips reflects financial and logistical constraints that restrict pedagogical diversity (Blumenfeld et al., 2011; Zakaria, 2018). Recommended enhancements included provision of teaching and learning materials (66%), financial support for project activities (19%), financial support for field trips (10%), and learner guidance and counselling (5%). These recommendations align with international evidence that resource availability is the primary organisational determinant of learner-centred implementation quality (Simui et al., 2017; Mkandawire, 2015).

5. Discussion

The findings from Sioma District primary schools, situated within the global digital education discourse, reveal important convergences and tensions. The consistently positive learner and teacher attitudes documented here provide robust empirical support for continued constructivist pedagogical reform in Zambian primary schools, reinforced by the extensive international evidence base on AI-mediated personalised learning (Venice et al., 2025a; Arockia et al., 2025; Vasantha et al., 2025). The resource and capacity constraints identified as primary implementation barriers underscore the largely untapped transformative potential of digital technologies in Zambian primary education. Blockchain-enabled performance monitoring, AI-driven adaptive platforms, and offline digital content repositories represent concrete technological pathways toward democratising access to high-quality learner-centred instruction in rural settings (Venice et al., 2025e; Akila et al., 2025; Rajeswari et al., 2026). However, bridging this digital divide requires coordinated policy commitment, sustained public investment, and equitable infrastructure development that explicitly targets underserved rural districts (Vettriselvan et al., 2026b; Vijayalakshmi et al., 2025b). Teacher professional development emerges as the most critical organisational lever for advancing learner-centred reform. Research consistently demonstrates that teachers with adequate pedagogical knowledge and digital literacy are significantly more likely to implement constructivist strategies with fidelity and consistency (Gayathri et al., 2025b; Mohanbabu & Vettriselvan, 2025b). In Zambia, this translates into a clear imperative for sustained, contextually relevant in-service training that integrates learner-centred pedagogical skills with digital tool literacy (Vettriselvan & Rajan FSA, 2019; Jenifer et al., 2025).

The health and well-being dimensions of effective learner-centred practice deserve explicit policy attention. Evidence linking nutritional status, chronic stress, and emotional well-being to academic outcomes in primary school populations (Ashifa, 2020a; Ashifa, 2022; Zahoor et al., 2025; Elkin et al., 2025) suggests that narrowly cognitive pedagogical interventions yield limited returns in contexts of compounded social vulnerability. Holistic learner-centred reform must address the physical, emotional, and social dimensions of learner development alongside cognitive outcomes (Vettriselvan et al., 2025d; Kariveliparambil et al., 2026a). Finally, the social deviance and digital risk research conducted in comparable Zambian school contexts (Venice et al., 2025f) highlights that technology integration in primary education must be accompanied by comprehensive digital citizenship education. Introducing internet-enabled devices without appropriate safeguarding frameworks and digital literacy programmes risks exposing young learners to harmful online content — an outcome antithetical to the equity and development goals of learner-centred reform (Vijayalakshmi et al., 2025a; Vettriselvan et al., 2025c).

6. Conclusion and Recommendations

This article has examined the effects of learner-centred teaching methods on primary school pupil performance in Sioma District, Zambia, contextualising empirical findings within global scholarship on AI, digital transformation, blockchain, and personalised learning. The study confirms significant positive effects of learner-centred instruction on critical thinking, academic motivation, and content mastery, while identifying resource deficits, time constraints, and teacher capacity limitations as persistent structural barriers to effective implementation. The theoretical coherence between constructivist pedagogical principles and the adaptive, personalised logic of AI-driven educational systems provides a compelling intellectual foundation for technology-mediated learner-centred reform in developing nations. For Zambia, realising this potential requires strategic, equity-oriented policy leadership that prioritises digital infrastructure investment in rural schools, sustained teacher professional development, and the integration of holistic well-being supports within the learner-centred reform agenda. The following recommendations are offered: (1) The Ministry of Education should prioritise digital instructional resource provision in rural primary schools, including offline-capable devices and AI-adaptive learning platforms (Vettriselvan et al., 2025b; Venice et al., 2025a); (2) sustained, nationally coordinated in-service teacher

DOI: 10.30726/ijmrss/v13.i1.2026.13102

professional development programmes integrating learner-centred pedagogy and digital literacy should be established (Gayathri et al., 2025b; Vettriselvan & Rajan FSA, 2019); (3) the Ministry of Finance should increase education budget allocations to support project-based learning and field trip activities (Blumenfeld et al., 2011; Venice et al., 2025c); (4) comprehensive digital citizenship education programmes should accompany all technology integration initiatives (Vijayalakshmi et al., 2025a; Vettriselvan et al., 2025c); and (5) future research should investigate the feasibility and outcomes of AI-powered adaptive learning interventions in Zambian primary school contexts, with explicit attention to equity, cultural relevance, and teacher preparedness (Arockia et al., 2025; Swadhi et al., 2025b; Vasantha et al., 2025).

References

[1] Akila, V., Prabhu, G., Akila, R., & Swadhi, R. (2025). Performance metrics in blockchain-enabled AIML for cognitive IoT in large-scale networks: Optimizing data analytics for enhanced network performance. In AI for large scale communication networks (pp. 265–288). IGI Global Scientific Publishing.

[2] Arockia, V. J., Vettriselvan, R., Rajesh, D., Velmurugan, P. R. R., & Cheelo, C. (2025). Leveraging AI and learning analytics for enhanced distance learning: Transformation in education. In AI and learning analytics in distance learning (pp. 179–206). IGI Global Scientific Publishing.

[3] Ashifa, K. M. (2019). Developmental initiatives for persons with disabilities: Appraisal on village-based rehabilitation of Amar Seva Sangam. Indian Journal of Public Health Research & Development, 10(12), 1257–1261.

[4] Ashifa, K. M. (2020a). Effect of substance abuse on physical health of adolescents. European Journal of Molecular & Clinical Medicine, 7(2), 3155–3160.

[5] Ashifa, K. M. (2020b). Physical health hazards of schizophrenia patients. Systematic Reviews in Pharmacy, 11(12), 1848–1850.

[6] Ashifa, K. M. (2021a). Analysis on the determinants of health status among tribal communities. Journal of Cardiovascular Disease Research, 12(3), 531–534.

[7] Ashifa, K. M. (2021b). Health status of primitive tribal women in India. Journal of Cardiovascular Disease Research, 12(5), 772.

[8] Ashifa, K. M. (2022). A situation analysis of the social well-being of elderly during the COVID-19 pandemic. International Journal of Health Sciences, 6(3), 10156–10163.

[9] Ashifa, K. M., & Ramya, P. (2019). Health afflictions and quality of work life among women working in fireworks industry. International Journal of Engineering and Advanced Technology, 8(6S3), 1723–1725.

[10] Banda, D., Mwansa, D., & Mulenga, I. (2014). Challenges of implementing learner-centred pedagogy in Zambian schools. International Journal of Educational Research, 12(1), 44–52.

[11] Basha, R., Pathak, P., Sudha, M., Soumya, K. V., & Arockia Venice, J. (2025). Optimization of quantum dilated convolutional neural networks: Image recognition with quantum computing. Internet Technology Letters, 8(3), e70027.

[12] Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (2011). Motivating project-based learning: Sustaining the doing, supporting the learning. Educational Psychologist, 26(3–4), 369–398.

[13] Cakir, M. (2018). Constructivist approaches to learning in science and their implications for science pedagogy. International Journal of Environmental & Science Education, 3(4), 193–206.

[14] Catherine, S., Gupta, N., Gopi, E., & Swadhi, R. (2025). Enhancing patient engagement and outcomes through digital transformation: Machine learning in medical marketing. In Impact of digital transformation on business growth and performance (pp. 285–312). IGI Global Scientific Publishing.

[15] Devi, M., Manokaran, D., Sehgal, R. K., Shariff, S. A., & Vettriselvan, R. (2025). Precision medicine, personalized treatment, and network-driven innovations: Transforming healthcare with AI. In AI for large scale communication networks (pp. 303–322). IGI Global.

[16] Elkin, N., Mohammed, A. K., Kılınçel, Ş., Soydan, A. M., Tanrıver, S. Ç., Çelik, Ş., & Ranganathan, M. (2025). Mental health literacy and happiness among university students: A social work perspective to promoting well-being. Frontiers in Psychiatry, 16, 1541316.

[17] Gayathri, R. K., Vettriselvan, R., Rajesh, D., Balakrishnan, R., Kumar, R., & Kavitha, J. (2025a). Striking a balance: Mental health challenges and work-life integration among women faculty in Indian B-Schools. Texila International Journal of Public Health, 13(2).

[18] Gayathri, R. K., Vettriselvan, R., Rajesh, D., Balakrishnan, R., Kumar, R., & Kavitha, J. (2025b). Strategic role of human resource management in enhancing occupational health and safety practices in business schools in India. Texila International Journal of Public Health, 13(2).

[19] Gijbels, D. (2019). Assessment in problem-based learning environments: A review. Journal of Educational Research, 102(4), 272–280.

[20] Gredler, M. E. (2017). Learning and instruction: Theory into practice (6th ed.). Pearson.

[21] Jenifer, R. D., Vettriselvan, R., Saxena, D., Velmurugan, P. R., & Balakrishnan, A. (2025). Green marketing in healthcare advertising: A global perspective. In AI impacts on branded entertainment and advertising (pp. 303–326). IGI Global.

[22] Kariveliparambil, A., Rasi, R. A., Ahmad, M. S., Öztaş, N., & Ayan, F. S. (2026a). Evolving social capital in indigenous communities: Perspectives on trust, reciprocity, and cultural preservation among Irula elders. Journal of Social Service Research, 52(1), 147–166. https://doi.org/10.1080/01488376.2025.2579519

[23] Kariveliparambil, A., R A, R., Ahmad, M. S., Ramesh, S., & Kuriakose, A. (2026b). Invisible burdens of platform work: A qualitative study of food-delivery riders' lived experiences in urban India. International Journal of Qualitative Studies on Health and Well-Being, 21(1). https://doi.org/10.1080/17482631.2026.2644577

[24] Kombo, D. K., & Tromp, D. L. A. (2014). Proposal and thesis writing: An introduction. Paulines Publications Africa.

[25] McCombs, B., & Whistler, J. (2017). The learner-centred classroom and school: Strategies for increasing student motivation and achievement. Jossey-Bass Publishers.

[26] Meena, G., Vettriselvan, R., Rajesh, D., & Velmurugan, P. R. (2025). Diversity and inclusion: Harnessing the power of inclusivity for business success. In Security and strategy models for key-solving institutional frameworks (pp. 203–234). IGI Global Scientific Publishing.

[27] Mkandawire, S. B. (2015). The teaching and learning of reading in Zambia. Journal of Studies in Education, 5(1), 259–275.

[28] Mohanbabu, S., & Vettriselvan, R. (2025a). Focusing supply chain and container terminal challenges from the lens of Indian industries' perspectives with proposed data science interlinked artificial intelligence model. International Journal of Procurement Management, 24(1), 92–114.

[29] Mohanbabu, S., & Vettriselvan, R. (2025b). Will machine learning resolve the issues in container management in ports and logistics industries? International Journal of Process Management and Benchmarking, 20(4), 559–575.

[30] Namangolwa, F. (2013). Teachers' use of learner-centred approach in Zambia. Unpublished M.Ed. Thesis, University of Zambia.

[31] Nyimbili, F., Nyimbili, L., & Banda, D. (2018). Factors affecting implementation of learner-centred teaching in Zambia. International Journal of Education and Literacy Studies, 6(2), 63–73.

[32] Olana, T., & Amante, B. (2017). Students' perception of learner-centred approaches in Ethiopian higher education. Journal of Education and Learning, 6(2), 85–96.

DOI: **10.30726/ijmrss/v13.i1.2026.13102**

[33] Orodho, J. A., & Kombo, D. K. (2012). Research methods. Kenyatta University Press.

[34] Rajeswari, M., Rohini, V., Sathya Aarthi, R., Rameshkumaar, V. P., & Arul Krishnan, S. (2026). Blockchain 2.0 for secure, transparent, and autonomous logistics systems: Next-gen innovation in supply chain systems. In R. Vettriselvan & N. Suresh (Eds.), Intelligent motion control for human-centered systems (pp. 233–258). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3373-8241-8.ch010

[35] Ranganathan, M., Jacob, A., Ashifa, K. M., Kumar, G. J., Anthony, M., Vijay, M., & Kumari, R. B. (2024). An investigation of the effects of chronic stress on attention in parents of children with neurodevelopmental disorders. Universal Journal of Public Health, 12(1), 37–50.

[36] Rasi, R. A., & Ashifa, K. M. (2019). Role of community-based programmes for active ageing: Elders self-help group in Kerala. Indian Journal of Public Health Research & Development, 10(12).

[37] Selvi, K., Anbarasan, P., Madhumita, G., Janaki, L., & Devi, K. K. (2026). Governance, security, and ethical considerations in AI-driven motion control systems. In R. Vettriselvan & N. Suresh (Eds.), Methodologies and applications of intelligent motion control systems (pp. 217–242). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-3637-3.ch009

[38] Shanthi, H. J., Gokulakrishnan, A., Sharma, S., Deepika, R., & Swadhi, R. (2025). Leveraging artificial intelligence for enhancing urban health: Applications, challenges, and innovations. In Nexus of AI, climatology, and urbanism for smart cities (pp. 275–306). IGI Global.

[39] Simui, F., Kasonde-Ngandu, S., Cheyeka, A. M., Simwinga, J., & Ndhlovu, D. (2017). Enablers and disablers to academic success of students with visual impairment. British Journal of Visual Impairment, 35(1), 20–31.

[40] Slavin, R. E. (2018). Educational psychology: Theory and practice (12th ed.). Pearson.

[41] Swadhi, R., Gayathri, K., Suresh, N. V., Catherine, S., & Velmurugan, P. R. (2025a). Leveraging machine learning for enhanced patient engagement and outcomes: Revolutionizing healthcare marketing. In Impact of digital transformation on business growth and performance (pp. 313–340). IGI Global Scientific Publishing.

[42] Swadhi, R., Velmurugan, P. R., Gayathri, K., & Catherine, S. (2025b). Evolving critical themes in advanced human resource management: Navigating change in the modern workplace. In Critical aspects in advanced human resource management (pp. 75–102). IGI Global Scientific Publishing.

[43] Swadhi, R., Velmurugan, P. R., Mahalingam, U., Keerthana, R., & Padmavathy, N. (2025c). Embedding fairness and resilience: Human-centered leadership in AI-driven workplaces. In Centering positive organizational cultures through human-centered leadership (pp. 139–162). IGI Global Scientific Publishing.

[44] Vasantha, S., Swadhi, R., Gayathri, K., Selvalakshmi, V., & UmaDevi, A. (2025). Fostering personalized learning and achieving equity in education: The role of AI-powered curriculum development. In Transforming education with AI-powered personalized learning (pp. 201–236). IGI Global Scientific Publishing.

[45] Venice, J. A., Arivazhagan, D., Suman, N., Shanthi, H. J., & Swadhi, R. (2025a). Recommendation systems and content personalization: Algorithms, applications, and adaptive learning. In AI for large scale communication networks (pp. 323–348). IGI Global Scientific Publishing.

[46] Venice, J. A., Vettriselvan, R., Jain, S., Madusudanan, K., & Aarthy, C. C. J. (2025b). Performance evaluation and metrics in blockchain powered AI/ML: Data analytics for cognitive Internet of Things (CIoT). In Transforming education with AI-powered personalized learning (pp. 143–178). IGI Global Scientific Publishing.

[47] Venice, J. A., Vettriselvan, R., Rajesh, D., Suresh, N. V., & Abirami, P. (2025c). Enabling personalized learning and adaptive systems through strategic management: Cloud integration in education. In Bridging academia and industry through cloud integration in education (pp. 49–72). IGI Global Scientific Publishing.

[48] Venice, J. A., Vettriselvan, R., Rajesh, D., Xavier, P., & Shanthi, H. J. (2025d). Optimizing performance metrics in blockchain-enabled AI/ML data analytics: Assessing cognitive IoT. In Enhancing automated decision-making through AI (pp. 97–122). IGI Global.

[49] Venice, J. A., Sripathi, S. K., & Moonga, B. (2025e). Social deviance and the influence of internet exposure: A study of secondary school students in Lusaka. ASET Journal of Management Science, 4(SI-1). https://doi.org/10.47059/AJMS/V4SI01/10

[50] Venice, J. A. A., Jio, W., Kant, S., Sharda, S., & Mittal, S. (2025f). Ethical leadership effect on the regulation of AI in cyber security by mediating OCB by collaborative governance in Ethiopia. In Ethical challenges of AI and warfare (pp. 133–152). IGI Global Scientific Publishing.

[51] Venice, J. A. A., Muthuraman, M., Kant, S., & Mittal, S. (2026). Community engagement effect on school leadership through digital volunteerism. In Strengthening community engagement and school leadership through digital volunteerism (pp. 85–114). IGI Global Scientific Publishing.

[52] Vettriselvan, R. (2025). Harnessing innovation and digital marketing in the era of industry 5.0: Resilient healthcare SMEs. In The future of small business in industry 5.0 (pp. 163–186). IGI Global.

[53] Vettriselvan, R., & Anto, M. R. (2018). Pathetic health status and working condition of Zambian women. Indian Journal of Public Health Research & Development, 9(9), 259–264.

[54] Vettriselvan, R., & Rajan FSA, A. J. (2019). Occupational health issues faced by women in spinners. Indian Journal of Public Health Research & Development, 10(1).

[55] Vettriselvan, R., Deepan, A., Jaiswani, G., Balakrishnan, A., & Sakthivel, R. (2025a). Health consequences of early marriage: Examining morbidity and long-term wellbeing. In Social, political, and health implications of early marriage (pp. 189–212). IGI Global.

[56] Vettriselvan, R., Velmurugan, P. R., Varshney, K. R., EP, J., & Deepika, R. (2025b). Health impacts of smartphone and internet addictions across age groups. In Impacts of digital technologies across generations (pp. 187–210). IGI Global.

[57] Vettriselvan, R., Velmurugan, P. R., Suresh, N. V., & Catherine, S. (2025c). Strategies, best practices, and pitfalls in the era of digital transformation: Mastering mobile marketing. In Impact of digital transformation on business growth and performance (pp. 67–98). IGI Global Scientific Publishing.

[58] Vettriselvan, R., Selvi, K., Kumar, A. S., Ranjani, R. D., & Varshney, K. R. (2025d). Ranking methodologies: Criteria and controversies in global higher education. In Global university ranking systems: Methodologies, impact, and repercussions (pp. 109–140). IGI Global Scientific Publishing.

[59] Vettriselvan, R., Gokuldas, P. G., & Sambamoorthy, N. (2025e). Designing language materials to motivate, engage, and empower learners: An emotion-driven approach. In Exploring the psychology of language materials development (pp. 279–302). IGI Global Scientific Publishing.

[60] Vettriselvan, R., Ramya, R., Selvalakshmi, V., Jyothi, P., & Velmurugan, P. R. (2026a). Empowering patients through knowledge: Educational strategies in rehabilitation. In Holistic approaches to health recovery (pp. 263–290). IGI Global Scientific Publishing.

[61] Vettriselvan, R., Velmurugan, P. R., Savariapitchai, M., & Swadhi, R. (2026b). AI and international volunteering: Redefining global engagement in the digital age. In Impacts of AI on international volunteering (pp. 1–24). IGI Global Scientific Publishing.

[62] Vijayalakshmi, M., Subramani, A. K., Vettriselvan, R., Catherin, T. C., & Deepika, R. (2025a). Sustainability and responsibility in the digital era: Leveraging green marketing in healthcare. In Digital citizenship and building a responsible online presence (pp. 285–306). IGI Global.

[63] Vijayalakshmi, M., Subramani, A. K., Vettriselvan, R., Velmurugan, P. R., & Hasine, J. (2025b). Strategic collaborations in medical

DOI: **10.30726/ijmrss/v13.i1.2026.13102**

innovation and AI-driven globalization: Advancing healthcare startups. In Navigating strategic partnerships for sustainable startup growth (pp. 85–110). IGI Global.

[64] Vinodh, N., Subramani, A. K., & Vettriselvan, R. (2026a). Navigating ethics, society, and governance in the digital age: Human rights and digital futures. In Ethics, justice, and governance in the age of AI and digital societies (pp. 1–26). IGI Global Scientific Publishing.

[65] Vinodh, N., Subramani, A. K., & Vettriselvan, R. (2026b). Transforming the future of management and medical education: AI-driven innovations in curriculum design. In AI education strategies for future-proofing curriculum design (pp. 459–476). IGI Global Scientific Publishing.

[66] Zakaria, E. (2018). The effects of cooperative learning on students' mathematics achievement and attitude towards mathematics. Journal of Social Sciences, 6(2), 272–275.

[67] Zahoor, H., Mustafa, N., Ashifa, K. M., Safaei, M., & El Gamil, R. (2025). Unlocking resilience: Emotional intelligence and self-leadership shape stress perception among health students. International Journal of Innovation and Learning, 38(4), 395–419.

DOI: **10.30726/ijmrss/v13.i1.2026.13102**