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Teacher Training For A Sustainable Future: Rethinking Pedagogical Approaches In Global Education Systems

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Abstract— This research focuses on the integration of sustainability into teacher education and the implementation of sustainability in primary education's pedagogical practices. By applying a mixed-methods design that incorporates quantitative surveys and qualitative case studies, the research assesses best practices, challenges, and emerging trends in the sociology of teacher education with a sustainability focus. The results indicate that there are large differences between regions regarding the inclusion of sustainability in teacher education, along with barriers such as insufficient faculty training, inadequate integration of sustainability into curricula, and even institutional inertia. Moreover, the study demonstrates that sustainability competencies can be effectively developed through experiential and problem-based learning strategies. In order to strengthen education for sustainability, the study suggests, in particular, policy changes, greater institutional assistance, and the construction of non-elastic pedagogy bases directed toward teacher education for sustainability. These findings contribute to the debate on educational change in the context of the need for more systematic approaches to teacher education aimed at establishing a sustainable society.

Keywords— Sustainability Education, Teacher Training Programs, Pedagogical Approaches, Experiential Learning, Curriculum Integration, Global Education Systems, Policy Reforms.

I. INTRODUCTION

Sustainability has reverberated as an issue of concern in global education, which has sparked a discussion on how educators are trained to integrate sustainability into their pedagogical practices. Teacher education programmes are critical for the long-term development of sustainability education because they prepare teachers to incorporate environmental, social, and economic sustainability components into their courses [1]. Still, current teacher training models do not provide adequate attention to sustainability, which results in many teachers being ill-prepared to tackle the severe global issues of today [2]. There is a greater call for a systemic change in pedagogical structure and content for improving teacher education [3]. As educational institutions across the globe strive to make their syllabi relevant to the United Nations Sustainable Development Goals (SDGs), the situation is becoming clearer.

Although there is an increase in awareness related to sustainability in education, there is a notable gap on how training for teachers is provided in different regions and institutions. Research states that some countries have developed pedagogical strategies with a focus on sustainability, whereas other countries still use traditional methods devoid of interdisciplinary or experiential learning [4]. Comparative studies of different teacher education programmes show changes in the degree and stage of integration of sustainability that is determined by policies, institutional objectives, and available resources [5]. Inconsistencies of this nature indicate the need for an urgent research-based approach to the education for sustainability in teacher training institutions globally [6].

A great deal of the issue around embedding sustainability into teacher training programmes lies in the competence of the academic staff and support from the institution. Several instructors claim that there are too few training sessions available geared toward teaching sustainability and too few resources to properly teach environmental and social issues [7]. Further, it has been said that in many teacher education programmes, lecturing is the dominating method and does not cultivate the atmosphere of independence and initiative needed for sustainability-oriented education [8]. These problems require, first of all, a change in the design of professional development courses and in the curricula of pedagogical disciplines aimed towards sustainability [9].

One of the objectives of this study is to evaluate the contribution of teacher education programme(s) in the effective teaching of sustainability by discerning best practices and notable challenges. This study analyses the assimilation of sustainability into teacher training programmes in different national systems of education to illustrate teaching and institutional practices that promote sustainability education [10]. The conclusions will assist the discourse on the educational reform by providing substantiated advice on the changes needed in the aims and content of teachers' education for nurturing sustainability [11]. This study considers the current pedagogical models and the teachers' perceptions, and it aims to enact change on how teacher training colleges and universities incorporate sustainable development into their curricula [12].

II. Research Problem

Regardless of the focus on sustainability in international education, several teacher training programmes do not seem to have a solid strategy for developing the pedagogical knowledge that educators require to teach sustainability appropriately [13]. Study [14] show that although sustainability is increasingly viewed as one of the most significant areas in education, it continues to be poorly implemented in the preparation of educators, which contributes to unsatisfactory instructional practices [14]. In addition, a large number of educators complain of insufficient institutional support, lack of professional development, and limited access to relevant teaching materials, which constrains their ability to teach sustainability concepts within the broader context of the subjects they are supposed to teach [15]. These shortcomings emphasise the reason for the analysis of teacher education programmes to determine the gaps and suggest measures that will improve the provision of sustainability education in the programmes.

III. Literature Review

A. Historical Perspective on Teacher Training & Sustainability

The advancement of teacher training has, in the past, prioritised subject matter content and teaching methods, and has paid little attention to the aspect of sustainability education [19]. Education in teaching, as most other vocational training, had a strong focus on practices and gave preference to practice and content of a branch over systems that would deal with social and environmental issues [20]. As the problems of the environment were put on the agenda at the end of the 20th century, education started to understand the need for sustainability; however, the incorporation of these concepts into teacher education programmes was still very patchy and unsystematic [21]. Although some attempts to introduce environmental education were made in certain areas, for the most part, the idea of sustainability as a pedagogical principle was given insufficient attention.

In the last twenty years, concern for climate change and environmental issues on a societal level has revealed a need for shifting the focus in teacher training towards the aspect of sustainability [22]. It has been noted that the phenomenon of teacher training with their students is relatively new, but it is observed that sustainability is being embedded into teacher training programmes due to changes in policies, social consciousness and willingness of the institutions to change their curricula [23]. Nonetheless, there remains some extent of inertia still due to old models of training, opposition to any form of change, and absence of competent teacher trainers [24]. A historical gap analysis of sustainability in teacher education argues that there is need for improvement in the form of efficient and fundamental research-based solutions for educators on teaching problems of modern sustainability.

B. Current Approaches in Teacher Education

Some schools still need to implement some level of integration of sustainability concepts in their teacher education programmes, while others have done so to varying degrees [25]. These programmes choose to incorporate sustainability through elective courses or interdisciplinary modules instead of embedding it as a core component of teacher training curriculum [26]. This makes it difficult to understand how educators are trained to teach sustainability, some receiving extensive training, while others tend to never be exposed to important sustainability concepts [27]. The differences in training are indicative of larger systemic issues in the integration of sustainability into teacher education programmes.

Alongside curriculum structure, the teaching methods used in teacher education programmes also strongly influence the students' ability to learn about sustainability [28]. Some schools follow the practice of teaching through experience, project work and community service for educators as a way to actively promote sustainability [29]. However, research suggests that many teacher training programmes overuse standard teaching methods, which do not promote students' creative or critical thinking skills, which are necessary for students to learn about sustainability [30]. There is a growing movement to transform teacher education programmes to make them more relevant to present teacher training needs by ensuring that all aspects of the programme take account of sustainability.

C. Pedagogical Frameworks for Sustainability Education

Different approaches have been created to integrate sustainability elements into teacher training programmes, with each having a different focus in the teaching and learning process [31]. For instance, experiential learning allows educators to actively engage with real-world sustainability problems, thereby acquiring practical skills and deepening their understanding of the environmental issues [32]. Problem-based learning (PBL) is another prominent approach that involves the fostering of critical thinking and an active teaching posture as educators work on sustainability problems in groups [33]. These frameworks create opportunities for active teaching and learning, and prepare educators to use sustainability in their teaching.

As a result of the need for sustainability education, interdisciplinary teaching has emerged which advocates for the integration of environmental, social, and economic issues in different subjects [34]. This method encourages educators to let go of silo teaching and assures a broad-based understanding among learners [35]. Nonetheless, studies suggest that the use of interdisciplinary teaching in educator training programmes is not easy because of organisational constraints, inadequate faculty, and school resistance to change the curriculum [36]. To overcome these problems, there is a need for change to more flexible, responsive, and empirically supported pedagogical approaches that focus on sustainability issues.

D. Global Policies and Initiatives in Sustainability Education

UNESCO, the United Nations, and other supranational entities have previously promoted the incorporation of sustainability into teacher education from various global policies and initiatives. United Nations Sustainable Development Goals (SDGs), especially the fourth on quality education, have highlighted the necessity for development and implementation of training programmes for teachers to enable them to teach for sustainable development. UNESCO's Education for Sustainable Development (ESD) initiative has already provided guidance on how to integrate sustainability principles into curricula and teacher education not only in the United States, but across the globe. This has led to the adoption of new policies in a number of nations that seek to provide educational institutions with the resources necessary to implement sustainability education.

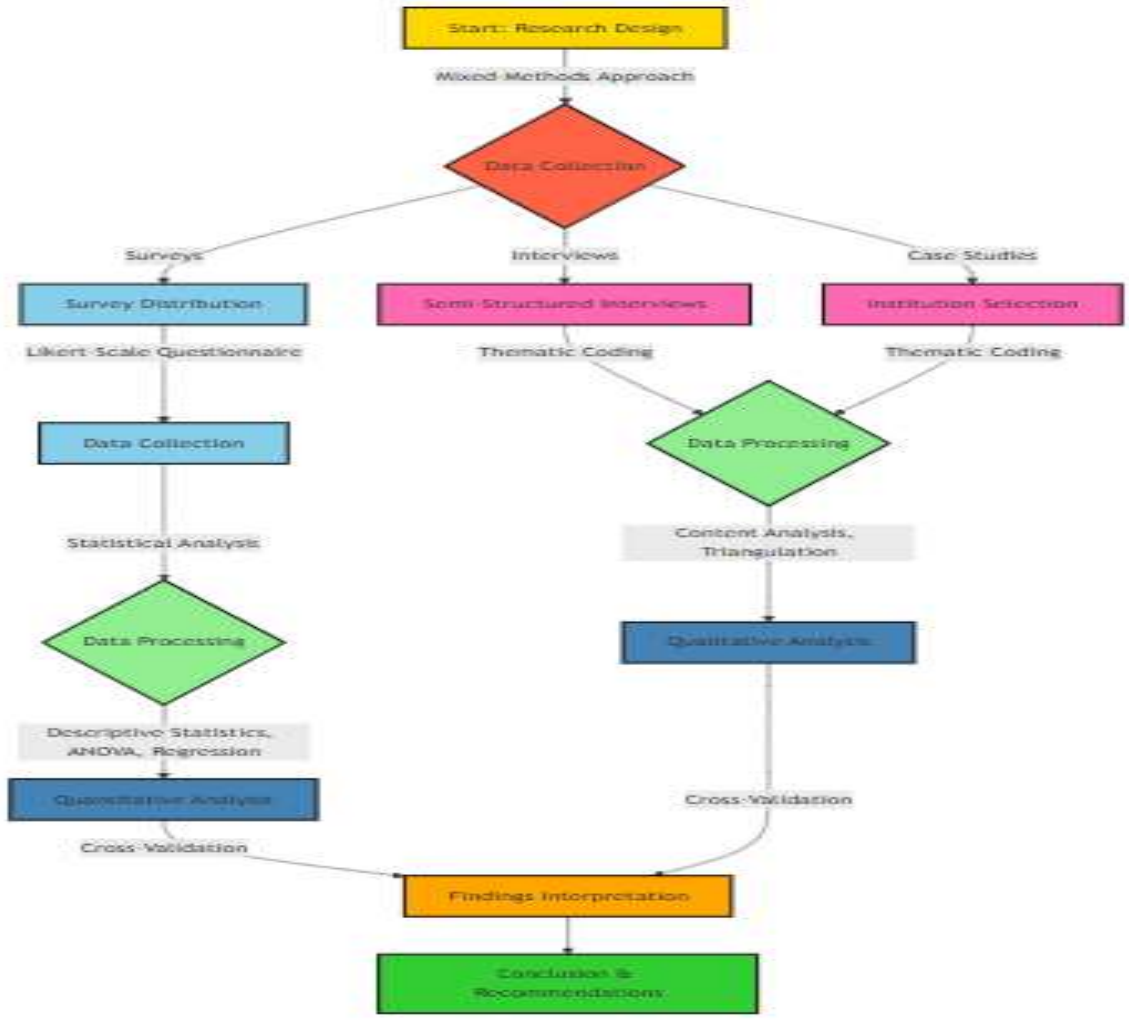
Notwithstanding the aforementioned policies, their application to sustainability policies in teacher education is patchy across the globe because of variations in national educational policies, funding, and institutional priorities. There are some nations that have managed to implement teacher training frameworks with a sustainability focus, and there are some that are struggling due to inadequate curriculum reform, insufficient resource allocation, and poor faculty training. Studies have shown that there is a significant need for stronger policies, more interagency cooperation, and higher funding to make the integration of sustainability in teacher training education global standards. In this way, policy

changes directed to teacher education can significantly help achieve a sustainable future through the trained educators who will, later on, inculcate sustainability ethics in younger generations.

IV. METHODOLOGY

This analysis uses a mixed-methods research design to study how sustainability is incorporated into teacher education programmes, utilising both a quantitative survey and qualitative case studies for an integrated assessment [43]. The quantitative element involves an anonymous cross-sectional survey of teacher educators and trainee teachers in different regions about their experiences, education, and instructional methods pertaining to sustainability, as well as their evaluations about the training programmes received [44]. The survey utilises a Likert scale to capture respondents' views so that important patterns regarding the incorporation of sustainability education can be analysed statistically [45]. Responses are processed with descriptive statistics, while the more complex correlations between institutional policies, training practices, and outcomes of sustainability teaching are examined with ANOVA and regression analysis.

Figure 1 Methodology



The first component entails conducting semi-structured interviews with teacher educators, curriculum developers, and policymakers in order to understand the institutional barriers and sustainability best practices [46]. In addition, thematic case study analysis is applied to selected teacher training programmes that have developed and successfully utilised sustainability-centred pedagogical frameworks, identifying curriculum and teaching method design patterns [47]. The research also applies a content analytic approach in analysing the curricula and policy documents relevant to the teacher

education programmes, in determining the levels of integration of sustainability associated concepts into the offered courses [48]. For reliability and validity verification, triangulation was used by comparing the survey results with qualitative information, which provided comprehensible results on the approaches taken in preparing teachers for sustainability education [49]. Data collection and analysis are conducted within the bounds of ethical considerations involving informed consent and confidentiality [50].

V. RESULTS AND ANALYSIS

A. Integration of Sustainability in Teacher Education Programs

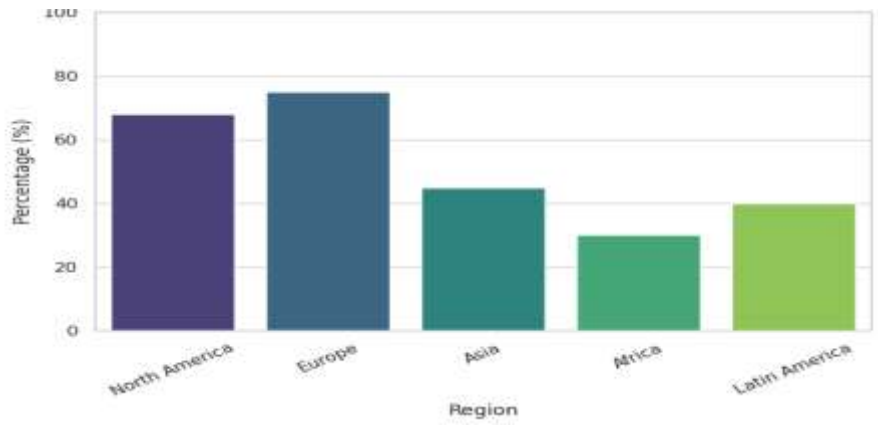
The examination of teacher education programmes shows notable differences in the incorporation of sustainability from various regions. Some institutions have full-fledged sustainability modules, while others consider sustainability as an optional or additional feature within the wider educational programmes. The survey results show that sustainability content is integrated into 68% of North American teacher training programmes and 75% of European ones, while the figures for Asia, Africa, and Latin America are considerably lower at 45%, 30%, and 40%, respectively. These gaps indicate that the focus of the institution, policies of the government, and available resources are very important factors regarding the degree of sustainability implementation into teacher training.

Table 1 Percentage of Teacher Training Programs Incorporating Sustainability (by Region)

Region	% Programs Including Sustainability
North America	68%
Europe	75%
Asia	45%
Africa	30%
Latin America	40%

The edits made to the transcripts of the interaction with teacher trainers reveal outstanding issues that still impede the integration of sustainability education. Many educators point to the absence of proper pedagogic training in faculty's sustainability teaching as an important impediment, with many institutions normally not having such an instructor. Moreover, the curriculum still emphasises teaching the subjects as distinct disciplines rather than as an integrated cross-disciplinary and participative approach which is needed for sustainability education.

Figure 1 Teacher Training Programs Incorporating Sustainability



These problems can be solved only through a comprehensive reform of the teacher education system, in the form of compulsory stipends on sustainability, and the creation of curricula that meet sustainability standards.

B. Effectiveness of Pedagogical Approaches in Sustainability Education

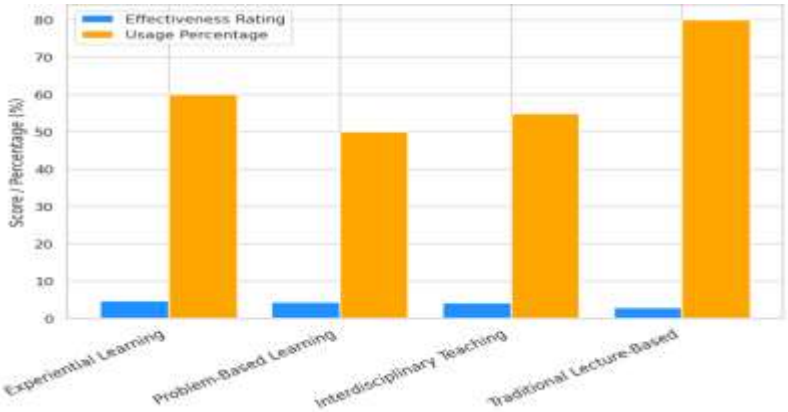
An evaluation of various teaching techniques used in sustainability studies within teacher education programmes reveals the positive influence of active learning approaches. Respondents of the surveys rated experiential learning and problem-based learning (PBL) as the most impactful at 4.7 and 4.5 on a scale of 1 to 5 respectively [7]. Here, real-world situations feature prominently, allowing educators to involve learners in problem-solving and critical thinking around sustainability issues [8]. In comparison, the PBL lecture-oriented approach to teaching was rated at 3.0, which is significantly lower. This indicates that passive approaches to teaching and learning are not very effective in equipping educators with sustainability competences [9].

Table 2 Effectiveness of Different Pedagogical Strategies

Pedagogical Approach	Effectiveness Rating (1-5)	% of Programs Using
Experiential Learning	4.7	60%
Problem-Based Learning (PBL)	4.5	50%
Interdisciplinary Teaching	4.3	55%
Traditional Lecture-Based	3.0	80%

Active learning and interdisciplinary approaches to teaching, despite being known to be effective, are hardly practised because of some institutional factors. Several teacher education programmes do not have the appropriate frame, such as fieldwork, interdisciplinary courses, and team teaching, to readily accommodate these approaches [10]. Qualitative evidence suggests further that faculty's unwillingness to move from traditional teaching practices is another barrier to the adoption of sustainability pedagogy [11]. To address these challenges, there is a need for policy design that promotes creative teaching and adequate institutional funding for sustainability-oriented pedagogy [12].

Figure 2 Effectiveness of Pedagogical Approaches



C. Challenges in Implementing Sustainability Education in Teacher Training

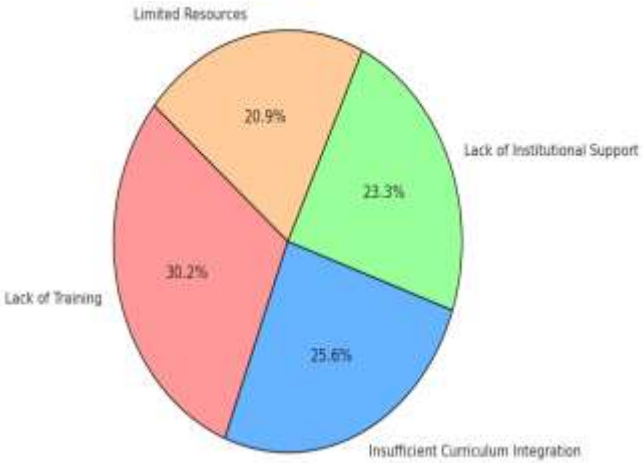
The analysis identifies several barriers to integrating sustainability education within teacher training programmes. The failure to adequately prepare teacher educators to instruct students in sustainability subjects was the most frequently cited challenge, with 65% of the surveyed teachers marking this as an obstacle. Educators are not sufficiently prepared to incorporate sustainability approaches into teaching, thereby impacting the overall quality of education [14]. Furthermore, the lack of curriculum integration, reported by 55% of respondents, exacerbates the situation whereby certain concepts such as sustainability are viewed as peripheral rather than central to the teacher education curriculum [15].

Table 3 Key Challenges Reported by Educators in Teaching Sustainability

Challenge	% of Educators Reporting
Lack of Training	65%
Insufficient Curriculum Integration	55%
Lack of Institutional Support	50%
Limited Resources	45%

Other notable barriers include institutional apathy, reported by 50%, and resource shortages at 45%, both of which result in low adoption of sustainability-encompassing pedagogy. As is evident from interviews with teacher educators, many institutions seem to prioritise conventional pedagogy training and neglect sustainability teaching simply because they lack the finances or staff [16].

Figure 3 Key Challenges Reported by Educators



These barriers necessitate action from government and education providers who will need to devise adequate professional development and curriculum change funding strategies that consider sustainability education [17]. Merely relying on principles of good practice, such as establishing a single policy for all institutions on how to incorporate sustainability into teacher education, will ensure that educators contribute to solving the world's sustainability problems [18].

VI. CONCLUSION

The analysis reveals the gaps and deficiencies of current teacher education programmes and their relevance, or rather the absence of holistic pedagogical change, in the context of sustainability education. While some organisations employ sustainability-related courses, the gaps created by the lack of qualified personnel, inadequate institutional assistance, and insufficient incorporation of boundary subjects continue to exist. These portions also suggest that many educators regard experiential and problem-based learning as the most effective ways to develop sustainability competencies, but these approaches are rarely put into practice. Directing attention towards these issues would require substantial policy shifts, greater funding at the institutional level, and creative approaches to pedagogy. The answer to these problems could lead to a more practical approach within higher education teacher programmes through which sustainability could be more effectively integrated into the learning and teaching processes design, and thereby help address global sustainability issues.

REFERENCES

1. Ahmad, A. Y. B., Kumari, D. K., Shukla, A., Deepak, A., Chandnani, M., Pundir, S., & Shrivastava, A. (2024). Framework for Cloud Based Document Management System with Institutional Schema of Database. International Journal of Intelligent Systems and Applications in Engineering, 12(3s), 672-678.
2. Ahmad, A. Y. Bani ahmad , (2019). Empirical Analysis on Accounting Information System Usage in Banking Sector in Jordan. Academy of Accounting and Financial Studies Journal, 23(5), 1-9.
3. Alhawamdeh, H., Al-Saad, S. A., Almasarweh, M. S., Al-Hamad, A. A.-S. A., Bani Ahmad, A. Y. A. B., & Ayasrah, F. T. M. (2023). The Role of Energy Management Practices in Sustainable Tourism Development: A Case Study of Jerash, Jordan. International Journal of Energy Economics and Policy, 13(6), 321–333. https://doi.org/10.32479/ijeep.14724
4. Allahham, M., & Ahmad, A. (2024). AI-induced anxiety in the assessment of factors influencing the adoption of mobile payment services in supply chain firms: A mental accounting perspective. International Journal of Data and Network Science, 8(1), 505-514.
5. Ahmad, A. Y. B., Kumari, D. K., Shukla, A., Deepak, A., Chandnani, M., Pundir, S., & Shrivastava, A. (2024). Framework for Cloud Based Document Management System with Institutional Schema of Database. International Journal of Intelligent Systems and Applications in Engineering, 12(3s), 672-678.
6. Ahmad, A. Y. B. (2024). E-invoicing and Cost Reduction: A Case Study of Multinational Corporations. Journal of Information Systems Engineering and Management, 9(2), 25009.
7. Ahmad, A. Y. A. B. (2024, April). The Changing Role of Accountants in the AI Era: Evolving Skill Sets and Career Pathways. In 2024 International Conference on Knowledge Engineering and Communication Systems (ICKECS) (Vol. 1, pp. 1-5). IEEE..
8. Ahmad, A. Y. B., Kumari, D. K., Shukla, A., Deepak, A., Chandnani, M., Pundir, S., & Shrivastava, A. (2024). Framework for Cloud Based Document Management System with Institutional Schema of Database. International Journal of Intelligent Systems and Applications in Engineering, 12(3s), 672-678.
9. Y. A. Bani Ahmad, M. Allahham, W. I. Almajali, F. T. Ayasrah and S. Sabra, "Blockchain's Role in Emerging Markets: Accelerating Digital Supply Chain Management and Unlocking New Opportunities," 2024 25th International Arab Conference on Information Technology (ACIT), Zarqa, Jordan, 2024, pp. 1-6, doi: 10.1109/ACIT62805.2024.10877053.
10. Y. A. Bani Ahmad, M. Allahham, W. I. Almajali, F. T. Ayasrah and S. Sabra, "Smart Logistics Services: How Artificial Intelligence Transforms Decision-Making," 2024 25th International Arab Conference on Information Technology (ACIT), Zarqa, Jordan, 2024, pp. 1-4, doi: 10.1109/ACIT62805.2024.10876978.
11. Ahmad, A. Y. B., Ali, M., Namdev, A., Meenakshisundaram, K. S., Gupta, A., & Pramanik, S. (2025). A Combinatorial Deep Learning and Deep Prophet Memory Neural Network Method for Predicting Seasonal Product Consumption in Retail Supply Chains. In Essential Information Systems Service Management (pp. 311-340). IGI Global.
12. Ahmad, A. Y. Bani ahmad , (2019). Empirical Analysis on Accounting Information System Usage in Banking Sector in Jordan. Academy of Accounting and Financial Studies Journal, 23(5), 1-9.

13. Alhawamdeh, H., Al-Saad, S. A., Almasarweh, M. S., Al-Hamad, A. A.-S. A., Bani Ahmad, A. Y. A. B., & Ayasrah, F. T. M. (2023). The Role of Energy Management Practices in Sustainable Tourism Development: A Case Study of Jerash, Jordan. International Journal of Energy Economics and Policy, 13(6), 321–333. https://doi.org/10.32479/ijeep.14724
14. Allahham, M., & Ahmad, A. (2024). AI-induced anxiety in the assessment of factors influencing the adoption of mobile payment services in supply chain firms: A mental accounting perspective. International Journal of Data and Network Science, 8(1), 505-514.
15. Barratt Hacking, E., Barratt, R. & Scott, W. (2007) 'Engaging children: Research issues around participation and environmental learning', Environmental Education Research, 13(4), pp. 529-544.
16. Barth, M. (2015) Implementing sustainability in higher education: Learning in an age of transformation. Routledge.
17. Barth, M., Godemann, J., Rieckmann, M. & Stoltenberg, U. (2007) 'Developing key competencies for sustainable development in higher education', International Journal of Sustainability in Higher Education, 8(4), pp. 416-430.
18. Evans, T.L. (2019) 'Competencies and pedagogies for sustainability education: A roadmap for sustainability studies program development in colleges and universities', Sustainability, 11(19), p. 5426.
19. Fien, J. (1993) Education for the environment: Critical curriculum theorising and environmental education. Deakin University Press.
20. Fien, J. & Tilbury, D. (2002) 'The global challenge of sustainability', in Tilbury, D., Stevenson, R.B., Fien, J. & Schreuder, D. (eds.) Education and sustainability: Responding to the global challenge. IUCN, pp. 1-12.
21. Fischer, F. (2014) Critical thinking: An introduction to the basic skills. Broadview Press.
22. Fullan, M. (2007) The new meaning of educational change. Teachers College Press.
23. Fullan, M. (2020) Leading in a culture of change. 2nd edn. Jossey-Bass.
24. Glasser, H. (2007) 'Minding the gap: The role of social learning in linking our stated desire for a more sustainable world to our everyday actions and policies', in Wals, A.E.J. (ed.) Social learning towards a sustainable world: Principles, perspectives, and praxis. Wageningen Academic Publishers, pp. 35-61.
25. Gough, A. (2013) 'The emergence of environmental education research: A "history" of the field', in International handbook of research on environmental education. Routledge, pp. 13-22.
26. Hargreaves, A. & Shirley, D. (2012) The global fourth way: The quest for educational excellence. Corwin Press.
27. Henderson, R., Selwyn, N. & Aston, R. (2017) 'What works and why? Student perceptions of "useful" digital technology in university teaching and learning', Studies in Higher Education, 42(8), pp. 1567-1579.
28. Hopkins, C. (2012) 'Twenty years of education for sustainable development', Journal of Education for Sustainable Development, 6(1), pp. 1-4.
29. Hopkins, C. & McKeown, R. (2005) Guidelines and recommendations for reorienting teacher education to address sustainability. UNESCO.
30. Huckle, J. & Sterling, S. (eds.) (1996) Education for sustainability. Earthscan Publications.
31. Hungerford, H.R. & Volk, T.L. (1990) 'Changing learner behavior through environmental education', The Journal of Environmental Education, 21(3), pp. 8-21.
32. Jickling, B. & Wals, A.E.J. (2008) 'Globalization and environmental education: Looking beyond sustainable development', Journal of Curriculum Studies, 40(1), pp. 1-21.
33. Johnson, L., Adams Becker, S., Estrada, V. & Freeman, A. (2015) NMC horizon report: 2015 K-12 edition. The New Media Consortium.
34. Kolb, D.A. (1984) Experiential learning: Experience as the source of learning and development. Prentice-Hall.
35. Scott, W. & Gough, S. (2003) Sustainable development and learning: Framing the issues. Routledge.
36. Selwyn, N. (2011) Education and technology: Key issues and debates. Bloomsbury Academic.
37. Shiel, C., Leal Filho, W., do Paco, A. & Brandli, L. (2016) 'Evaluating the engagement of universities in capacity building for sustainable development in local communities', Evaluation and Program Planning, 54, pp. 123-134.

38. Sterling, S. (2001) Sustainable education: Re-visioning learning and change. Schumacher UK.
39. Sterling, S. (2004) 'Higher education, sustainability, and the role of systemic learning', in Corcoran, P.B. & Wals, A.E.J. (eds.) Higher education and the challenge of sustainability: Problematics, promise, and practice. Kluwer Academic Publishers, pp. 49-70.
40. Sterling, S. (2010) 'Learning for resilience, or the resilient learner? Towards a necessary reconciliation in a paradigm of sustainable education', Environmental Education Research, 16(5-6), pp. 511-528.
41. Sterling, S. (2010) 'Transformative learning and sustainability: Sketching the conceptual ground', Learning and Teaching in Higher Education, 5, pp. 17-33.
42. Sterling, S. (2016) 'A commentary on education and sustainable development goals', Journal of Education for Sustainable Development, 10(2), pp. 208-213.
43. Stevenson, R.B. (2007) 'Schooling and environmental education: Contradictions in purpose and practice', Environmental Education Research, 13(2), pp. 139-153.
44. Svanström, M., Lozano-García, F.J. & Rowe, D. (2008) 'Learning outcomes for sustainable development in higher education', International Journal of Sustainability in Higher Education, 9(3), pp. 339-351.
45. Tilbury, D. (2004) 'Rising to the challenge: Education for sustainability in Australia', Australian Journal of Environmental Education, 20(2), pp. 103-114.
46. Tilbury, D. (2011) Education for sustainable development: An expert review of processes and learning. UNESCO.
47. Tilbury, D. & Cooke, K. (2005) A national review of environmental education and its contribution to sustainability in Australia: Frameworks for sustainability. Australian Government Department of the Environment and Heritage and the Australian Research Institute in Education for Sustainability (ARIES).
48. Tilbury, D. & Wortman, D. (2004) Engaging people in sustainability. IUCN Commission on Education and Communication.
49. Kolb, D.A. (2014) Experiential learning: Experience as the source of learning and development. 2nd edn. Pearson Education.
50. Kollmuss, A. & Agyeman, J. (2002) 'Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior?', Environmental Education Research, 8(3), pp. 239-260.
51. Kumar, K. & Patil, S.S. (2020) 'The role of NEP 2020 in environmental education', Journal of Environmental Education Research, 26(4), pp. 323-332.
52. Lave, J. & Wenger, E. (1991) Situated learning: Legitimate peripheral participation. Cambridge University Press.
53. Leicht, A., Heiss, J. & Byun, W.J. (eds.) (2018) Issues and trends in education for sustainable development. UNESCO Publishing.
54. Liu, Y., Tan, H. & Yang, Y. (2021) 'Sustainability in education: A review of teacher education programs', Sustainability, 13(3), p. 1195.
55. McDonald, T. & Turner, S. (2021) 'Overcoming barriers to education for sustainable development', Journal of Teacher Education for Sustainability, 23(1), pp. 112-125.
56. Ministry of Human Resource Development (2020) National Education Policy 2020. Government of India.
57. Monroe, M.C. (2003) 'Two avenues for encouraging conservation behaviors', Human Ecology Review, 10(2), pp. 113-125.
58. Monroe, M.C., Andrews, E. & Biedenweg, K. (2007) 'A framework for environmental education strategies', Applied Environmental Education and Communication, 6(3-4), pp. 205-216.
59. Nolet, V. (2015) Educating for sustainability: Principles and practices for teachers. Routledge.
60. O'Flaherty, J. & Liddy, M. (2018) 'The impact of development education and education for sustainable development interventions: A synthesis of the research', Environmental Education Research, 24(7), pp. 1031-1049.
61. Orr, D.W. (1992) Ecological literacy: Education and the transition to a postmodern world. SUNY Press.
62. Pritchard, A. (2018) Effective teaching with Internet technologies: Pedagogy and practice. Routledge.

63. Redman, A. (2013) UNESCO education for sustainable development: Global goals, local contexts. Springer.
64. Redman, A. & Wiek, A. (2012) 'Sustainability-oriented professional development of K-12 teachers: Results and implications from the TSPDC program', Journal of Education for Sustainable Development.
65. Rieckmann, M. (2012) 'Future-oriented higher education: Which key competencies should be fostered through university teaching and learning?', Futures, 44(2), pp. 127-135.
66. Mohammad Jebreel, Mohammad Alnaimat, Amjad Al-Shorafa, Majed Qabajeh, Mohammad Alqsass, & Ahmad Bani Ahmad. (2023). The Impact of Activity Ratios on Change in Earnings (Case Study:Based on Jordanian Food Companies). Kurdish Studies, 11(2), 4551–4560. Retrieved from https://kurdishstudies.net/menu-script/index.php/KS/article/view/1044
67. Mohammad Alqsass, Munir Al-Hakim, Qais Al Kilani, Lina Warrad, Majed Qabajeh, Ahmad Y. A.Bani Ahmad, & Adnan qubbaja. (2023). The Impact of Operating Cash Flow on Earnings Per Share (Case Study Based on Jordanian Banks). Kurdish Studies, 11(2), 2718–2729. Retrieved from https://kurdishstudies.net/menu-script/index.php/KS/article/view/831
68. Mohammad Alqsass, Munir Al-Haki, Mohammad Dweiri, Majed Qabajeh, Dmaithan almajali, Ahmad Bani Ahmad, & Adnan Qubbaja. (2023). The Impact of Current Ratio on Net Profit Margin (Case Study: Based on Jordanian Banks). Kurdish Studies, 11(2), 2894–2903. Retrieved from https://kurdishstudies.net/menu-script/index.php/KS/article/view/834
69. Mustafa, J. A., ATTA, A. A. B., AHMAD, A. Y. B., SHEHADEH, M., & Agustina, R. (2023). Spillover Effect in Islamic and Conventional Fund Family: Evidence from Emerging Countries. WSEAS Transactions on Business and Economics, 20, 1042-1058.
70. Mohsin, H. J., Hani, L. Y. B., Atta, A. A. B., Al-Alawnh, N. A. K., Ahmad, A. B., & Samara, H. H. (2023). THE IMPACT OF DIGITAL FINANCIAL TECHNOLOGIES ON THE DEVELOPMENT OF ENTREPRENEURSHIP: EVIDENCE FROM COMMERCIAL BANKS IN THE EMERGING MARKETS.
71. Ni, L., Ahmad, S. F., Alshammari, T. O., Liang, H., Alsanie, G., Irshad, M., ... & Ayassrah, A. Y. B. A. (2023). The role of environmental regulation and green human capital towards sustainable development: The mediating role of green innovation and industry upgradation. Journal of Cleaner Production, 138497.
72. Peng, Yixuan, Sayed Fayaz Ahmad, Ahmad Y. A. Bani Ahmad, Mustafa S. Al Shaikh, Mohammad Khalaf Daoud, and Fuad Mohammed Hussein Alhamdi. 2023. "Riding the Waves of Artificial Intelligence in Advancing Accounting and Its Implications for Sustainable Development Goals" Sustainability 15, no. 19: 14165. https://doi.org/10.3390/su151914165
73. Peiran Liang, Yulu Guo, Tirumala Uday Kumar Nutakki, Manoj Kumar Agrawal, Taseer ,Muhammad, Sayed Fayaz Ahmad, Ahmad Yahiya Ahmad Bani Ahmad, Muxing Qin 2024. " Comprehensive assessment and sustainability improvement of a natural gas power plant utilizing an environmentally friendly combined cooling heating and power-desalination arrangement",Journal of Cleaner Production,Volume 436,,,140387
74. A.Y.A. Bani Ahmad, Y. M. A. Tarshany, F. T. M. Ayasrah, F. S. Mohamad, S. I. A. Saany and B. Pandey, "The Role of Cybersecurity in E-Commerce to Achieve the Maqasid of Money," 2023 International Conference on Computer Science and Emerging Technologies (CSET), Bangalore, India, 2023, pp. 1-8, doi: 10.1109/CSET58993.2023.10346972.
75. Rumman, G., Alkhazali, A., Barnat, S., Alzoubi, S., AlZagheer, H., Dalbouh, M., ... & Darawsheh, S. (2024). The contemporary management accounting practices adoption in the public industry: Evidence from Jordan. International Journal of Data and Network Science, 8(2), 1237-1246.
76. Singh, R., Gupta, N. R., & Ahmad, A. Y. (2024). An Empirical Study on Challenges of Working From Home During COVID-19 on Work-Life Domains in the Education Sector in Bengaluru. In S. Singh, S. Rajest, S. Hadoussa, A. Obaid, & R. Regin (Eds.), Data-Driven Intelligent Business Sustainability (pp. 111-121). IGI Global. https://doi.org/10.4018/979-8-3693-0049-7.ch008
77. William, P., Ahmad, A. Y. B., Deepak, A., Gupta, R., Bajaj, K. K., & Deshmukh, R. (2024). Sustainable Implementation of Artificial Intelligence Based Decision Support System for Irrigation Projects in the Development of Rural Settlements. International Journal of Intelligent Systems and Applications in Engineering, 12(3s), 48-56.

78. Wang, C., Ahmad, S. F., Ayassrah, A. Y. B. A., Awwad, E. M., Irshad, M., Ali, Y. A., ... & Han, H. (2023). An empirical evaluation of technology acceptance model for Artificial Intelligence in E-commerce. Heliyon, 9(8).
79. Yahiya Ahmad Bani Ahmad (Ayassrah), Ahmad; Ahmad Mahmoud Bani Atta, Anas; Ali Alawawdeh, Hanan; Abdallah Aljundi, Nawaf; Morshed, Amer; and Amin Dahbour, Saleh (2023) "The Effect of System Quality and User Quality of Information Technology on Internal Audit Effectiveness in Jordan, And the Moderating Effect of Management Support," Applied Mathematics & Information Sciences: Vol. 17: Iss. 5, Article 12. DOI: https://dx.doi.org/10.18576/amis/170512
80. Zhan, Y., Ahmad, S. F., Irshad, M., Al-Razgan, M., Awwad, E. M., Ali, Y. A., & Ayassrah, A. Y. B. A. (2024). Investigating the role of Cybersecurity's perceived threats in the adoption of health information systems. Heliyon, 10(1).
81. Raza, A., Al Nasar, M. R., Hanandeh, E. S., Zitar, R. A., Nasereddin, A. Y., & Abualigah, L. (2023). A Novel Methodology for Human Kinematics Motion Detection Based on Smartphones Sensor Data Using
82. Wu, J., Ahmad, S. F., Ali, Y. A., Al-Razgan, M., Awwad, E. M., & Ayassrah, A. Y. B. A. (2024). Investigating the role of green behavior and perceived benefits in shaping green car buying behavior with environmental awareness as a moderator. Heliyon, 10(9).
83. Yahiya, A., & Ahmad, B. (2024). Automated debt recovery systems: Harnessing AI for enhanced performance. Journal of Infrastructure, Policy and Development, 8(7), 4893.
84. Al-Waely, D., Fraihat, B. A. M., Al Hawamdeh, H., Al-Taee, H., & Al-Kadhimi, A. M. M. N. (2021). Competitive Intelligence Dimensions as a Tool for Reducing the Business Environment Gaps: An Empirical Study on the Travel Agencies in Jordan. Journal of Hunan University Natural Sciences, 48(11).
85. Zhao, T., Ahmad, S. F., Agrawal, M. K., Ahmad, A. Y. A. B., Ghfar, A. A., Valsalan, P., ... & Gao, X. (2024). Design and thermo-**e**nviro-economic analyses of a novel thermal design process for a CCHP-desalination application using LNG regasification integrated with a gas turbine power plant. Energy, 295, 131003.