*Original Research Article*

**MAINTAINABLE DEVELOPMENT AIMS AND COMMUNAL IDEA SUPERVISION OF TEACHERS IN PUBLIC ELEMENTARY SCHOOLS**

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ABSTRACT

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| This study aimed to examine the sustainable development goals and collaborative supervision practices of teachers in public elementary schools in the Caraga District, Division of Davao Oriental. A non-experimental quantitative research design utilizing the correlational method was employed. The respondents were 140 public elementary school teachers selected through universal sampling, wherein the entire population was considered to ensure data reliability. The statistical tools used in the study included the mean, Pearson product-moment correlation coefficient (Pearson r), and multiple regression analysis. Based on the findings, the following conclusions were drawn: (1) the level of teachers’ alignment with sustainable development goals was found to be moderate; (2) the level of collaborative supervision practices among teachers was high; (3) there was a significant relationship between sustainable development goals and collaborative supervision; and (4) sustainable development goals significantly influenced collaborative supervision practices among public elementary school teachers. These findings imply that strengthening teachers’ understanding and commitment to sustainable development can enhance collaborative supervision, ultimately contributing to improved educational outcomes. In light of these findings, it is recommended that policymakers and human resource managers consider these variables in designing policies, training programs, and seminars aimed at enhancing the integration of sustainable development goals and strengthening collaborative supervision practices in public elementary schools. |

*Keywords*: maintanable development aims, communal idea msupervision, education, Philippines

1. INTRODUCTION

Maintainability is an essential consideration in building system design, ensuring that maintenance tasks are performed with ease, accuracy, safety, and cost-effectiveness. Its ultimate purpose is to enhance the effectiveness and efficiency of maintenance operations, thereby optimizing the building's life-cycle costs (Hauashdh et al., 2024). Design for Maintainability (DfM) serves as the foundation of an effective maintenance program, aligning maintenance objectives with the design process from the outset (Fathy et al., 2022).

DfM highlights the importance of integrating design and construction expertise with operations and maintenance experiences early in the project. This proactive approach reduces the risks associated with equipment downtime and rising life-cycle costs (Montazeri et al., 2024). In the same way, educational systems require early and intentional planning to ensure sustainability and quality outcomes (Holst, 2023).

In education, leadership begins with a shared vision—a communal idea of learning, which is driven by what Newing (2022) calls "creative tension." This tension emerges when individuals clearly understand where they want to go while being honest about where they currently stand. The gap between the current reality and the desired future generates the creative energy necessary for improvement.

This concept was echoed by Martin Luther King, Jr., who emphasized the need to create a mental tension that challenges individuals to rise above myths and half-truths. Similarly, Cress et al. (2023) highlight that when individuals engage in meaningful work, they are “pulled by a shared purpose rather than pushed by obligation.” In schools, this communal idea of learning can serve as a driving force when properly cultivated.

According to Tibbs (2021), this creative tension can be resolved in two ways: by elevating current reality to meet the vision or by lowering the vision to match reality. Reflection and assessment play critical roles in this process, providing feedback that bridges the gap and fosters continuous improvement. It is this ongoing feedback loop—the feedback spiral—that sustains the communal learning process.

Effective leaders cultivate maintainable development aims and use creative tension as a catalyst for intellectual stimulation and organizational growth. They envision future possibilities and guide others in developing shared aspirations and actionable goals (Ahsan, 2025). Educational leaders, in particular, must unite teachers, staff, students, and the wider community to co-create a vision for quality education and set in motion a process for assessing progress toward that vision (Toikka & Tarnanen, 2024).

As Li et al. (2021) argue, a culture of assessment must permeate every level of the organization. Only through this lens can maintainable development aims and the communal supervision of learning be genuinely realized and valued. Teachers, in this context, view learning organizations as interconnected systems. They understand that the expectations they hold for students must reflect the same standards they set for themselves.

According to Lima et al. (2024), a learning organization operates under a guiding set of principles. When these principles are embraced, every part of the system reflects the whole—much like the fractal patterns found in nature. Rian (2024) describe this fractal quality, where patterns repeat across different scales, such as in the structure of a fern or a cauliflower. In education, assessment acts as a fractal mechanism, continuously reproducing values such as goal setting, reflection, feedback, and aligned action.

Only when the attributes of maintainable development aims and communal supervision of learning are embedded throughout the organization can they become truly collective and effective. The overarching goal is to ensure inclusive, equitable, and quality education while promoting lifelong learning opportunities for all. This includes providing at least 12 years of free, publicly funded, inclusive, and quality primary and secondary education of which at least nine years are compulsory, as well as promoting one year of compulsory pre-primary education delivered by well-trained educators. Early childhood development and care are likewise encouraged as critical foundations for lifelong learning.

**1.1 Statement of the Problem**

This study was conducted to determine the maintainable development aims and communal idea supervision of teachers in public elementary schools in Caraga District, Division of Davao Oriental. Specifically, it sought answer to the following sub-problems:

1. What is the level of maintainable development in terms of teachers in public elementary schools in terms of:

1.1 budget,

1.2 communal community,

1.3 environment,

1.4 practicality, and

1.5 fairness?

2. What is the level communal idea supervision of teachers in public elementary schools in terms of:

2.1 accountable,

2.2 lifelong learners,

2.3 sense of well-being,

2.4 self-esteem and

2.5 enthusiasm?

3. Is there significant relationship between the maintainable development aims and communal idea supervision of teachers in public elementary schools?

4. Which domains of maintainable development aims significantly influence communal idea supervision of teachers in public elementary schools?

**1.2 Hypotheses**

Ho1. There is no significant relationship between maintainable development aims and communal idea supervision of teachers in public elementary schools.

Ho2. The domains of domains of maintainable development aims did not significantly influence communal idea supervision of supervision of teachers in public elementary schools.

2. methodology

**2.1 Research Design**

The study employed a quantitative research design, specifically utilizing a descriptive correlational approach. Quantitative research involves the systematic collection and analysis of numerical data using statistical, mathematical, or computational techniques to ensure objective, accurate, and measurable results (Mohajan, 2020). A descriptive correlational research approach was deemed appropriate as it aims to explore and describe the relationship between two or more naturally occurring variables without manipulating them. Its primary purpose is to identify patterns, associations, or relationships between variables (Frimpong, 2023).

In the context of this study, the descriptive correlational design was used to examine the extent to which maintainable development aims are achieved and how they relate to the communal idea supervision practices of teachers in public elementary schools. Specifically, the study sought to determine whether a significant relationship exists between teachers’ implementation of maintainable development goals and their engagement in communal supervision processes, which support inclusive, equitable, and sustainable learning environments.

**2.2 Research Respondents**

The respondents of this study were 140 teachers from public elementary schools in the Caraga District, Division of Davao Oriental. They evaluated their schools’ implementation of maintainable development aims and communal idea supervision. Universal sampling was used, meaning the entire population was included as respondents to ensure the reliability of the data. Data were gathered during the school year 2022–2023.

**2.3 Research Instrument**

The first part of the questionnaire was a self-made instrument designed to assess the implementation of maintainable development aims in public elementary schools. The questionnaire was constructed based on relevant literature and educational frameworks, and it underwent expert validation to ensure content accuracy and relevance. The scale demonstrated excellent reliability, with a Cronbach’s alpha value of 0.935, indicating a high level of internal consistency.

The second part of the questionnaire was also a self-constructed instrument developed to measure the practice of communal idea supervision among teachers. The items focused on collaborative learning leadership, shared decision-making, and reflective teaching supervision. This scale likewise showed excellent reliability, with a Cronbach’s alpha value of 0.952, confirming its consistency in measuring communal supervision practices in the teaching context.

**2.4 Data Gathering Procedure**

# The data collection procedure for this study was conducted in a systematic and ethical manner to uphold the integrity of the research process. Initially, formal permission was obtained from the Dean of the Graduate School. Upon approval, an endorsement letter was forwarded to the Schools Division Superintendent of Davao Oriental for further evaluation and clearance. This step ensured compliance with institutional and educational research protocols.

# Once the necessary approvals were secured, data collection commenced through the preparation and distribution of self-made survey questionnaires aligned with the objectives of the study. Coordination with school principals and designated officials facilitated the efficient and organized dissemination of the questionnaires to public elementary school teachers in the Caraga District. Prior to distribution, the purpose of the study, as well as ethical considerations, including voluntary participation, confidentiality, and anonymity—were clearly explained to the respondents.

# After data gathering, the completed questionnaires were carefully retrieved, organized, and securely handled. The responses were encoded and prepared for statistical analysis. The data were analyzed using descriptive and inferential statistics, including mean, standard deviation, Pearson correlation, and regression analysis, to determine the relationship between the implementation of maintainable development aims and the practice of communal idea supervision among public elementary school teachers.

# 2.5 Data Analysis

In analyzing and interpreting the data gathered for this study, several statistical tools were employed to address the research objectives.

The mean was used to determine the level of implementation of maintainable development aims and the extent of communal idea supervision among public elementary school teachers.

The Pearson r-moment correlation analysis was applied to examine the strength and direction of the relationship between maintainable development aims and communal idea supervision practices.

Lastly, multiple linear regression analysis was utilized to assess whether the implementation of maintainable development aims significantly influences the practice of communal idea supervision in public elementary schools.

3. results and discussion

**3.1 Level of Maintainable Development Aims of Teachers**

Table 1. *Level of Maintainable Development Aims of Teachers*

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Domains** | **Mean** | **Descriptive Level** |
| 1. | Budget | 3.61 | High |
| 2. | communal community | 3.45 | High |
| 3. | Environment | 3.27 | Moderate |
| 4. | Practicality | 3.26 | Moderate |
| 5. | Fairness | 3.38 | Moderate |
|  | Overall | 3.39 | Moderate |

Presented in Table 1 is the level of maintainable development aims among public elementary school teachers, based on the mean scores across five domains: budget, communal community, environment, practicality, and fairness. The budget domain registered the highest mean score of 3.61, which is interpreted as high, indicating that teachers view financial planning and resource allocation as well-established within their schools.

This was followed by the communal community domain, with a mean score of 3.45, also classified as high, reflecting teachers’ positive perception of collaborative and inclusive practices in the school environment. On the other hand, the domains of environment with a mean of 3.27, practicality with 3.26, and fairness with 3.38 were all assessed at a moderate level. The overall mean score of 3.39 also falls under the moderate category, suggesting that, on average, the implementation of maintainable development aims is evident but not consistently strong across all areas.

These results suggest that while schools have made commendable progress in managing financial resources and fostering communal values, there is still a need to strengthen efforts in environmental sustainability, practical application of development initiatives, and fairness in educational practices. Addressing these areas can help ensure a more holistic and sustained implementation of maintainable development goals in public elementary schools.

This finding reinforces the study of Ferrer-Estévez and Chalmeta (2021), which emphasized that the moderate implementation of maintainable development aims in schools is often due to limited institutional support and insufficient integration of sustainability goals into everyday teaching practices. Teachers may recognize the importance of development principles such as fairness, practicality, and environmental awareness, but systemic constraints can hinder full execution. Similarly, Kezron (2020) found that while teachers demonstrate a willingness to adopt sustainable and inclusive practices, a lack of structured guidance and access to necessary resources often results in only partial implementation. Their study highlighted the importance of administrative backing and collaborative efforts to turn maintainable development goals into actionable strategies within the school context. In addition, Hoang et al. (2025) argued that development initiatives are most effective when supported by continuous professional development and stakeholder involvement. Without these, schools may fall short of fully embedding sustainable practices, leading to a moderate overall level of implementation. These findings suggest that to elevate the impact of maintainable development aims, schools must address both individual teacher readiness and broader systemic challenges.

 **3.2 Level of Communal Idea Supervision of Teachers**

Table 2. *Level of Communal Idea Supervision of Teachers*

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Domains | Mean | Descriptive Level |
| 1. | accountable | 3.71 | High |
| 2. | lifelong learners | 3.35 | Moderate |
| 3. | sense of well-being | 4.01 | High |
| 4. | self-esteem | 3.22 | Moderate |
| 5. | enthusiasm | 3.42 | High |
|  | Overall  | 3.54 | High |

Presented in Table 2 is the level of communal idea supervision among public elementary school teachers, as reflected in the mean scores across five domains: accountability, lifelong learning, sense of well-being, self-esteem, and enthusiasm. The sense of well-being domain recorded the highest mean score of 4.01, interpreted as high, indicating that teachers feel a strong sense of personal and professional well-being within their teaching environment.

This was followed by the accountability domain with a mean of 3.71, and enthusiasm with 3.42, both also classified as high, showing that teachers demonstrate a strong commitment to their responsibilities and maintain positive energy in their work. In contrast, the lifelong learners domain, with a mean of 3.35, and self-esteem, with 3.22, were rated at a moderate level, suggesting that while growth and self-confidence are present, these areas may benefit from further support or development.

The overall mean of 3.54 is interpreted as high, indicating that, in general, teachers perceive communal idea supervision practices in their schools positively. These findings imply that while most elements of communal supervision are well-practiced—especially in terms of well-being, accountability, and enthusiasm—there is still potential to strengthen teachers’ continuous learning and sense of self-worth through targeted professional development and supportive leadership.

This finding supports the study of Krasniqi (2021), which highlighted that strong communal supervision fosters a collaborative teaching environment where teachers feel supported, valued, and accountable. When supervision is rooted in shared goals and mutual respect, educators are more likely to engage in reflective practices and continuous professional growth, contributing to higher job satisfaction and school performance. Similarly, He et al. (2024) emphasized that communal idea supervision—centered on trust, well-being, and collective responsibility, enhances teachers’ sense of belonging and professional purpose. Their study revealed that schools with high levels of communal supervision cultivate environments where teachers are more enthusiastic, confident, and proactive in addressing instructional challenges. Moreover, the work of Kaur and Mohammad (2020) affirmed that communal supervision strengthens teacher motivation and builds a culture of shared leadership. Teachers in such environments tend to support one another, take ownership of school goals, and actively participate in decision-making processes.

**3.3 Significant Relationship Between the Maintainable Development Aims and Communal Idea Supervision**

Table 3. *Significant Relationship Between the Maintainable Development Aims and Communal Idea Supervision*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variables | r-value | Degree of Correlation | p-value | Decision(Ho) |
| *Maintainable Development Aims* *Communal Idea Supervision*  | 0.820 | High Correlation | 0.000 | Rejected |

Presented in Table 3 is the correlation analysis between maintainable development aims and communal idea supervision among public elementary school teachers. The computed correlation coefficient (r-value) is 0.820, with a p-value of 0.000, which is less than the 0.05 level of significance. This result indicates a high and statistically significant positive relationship between the two variables. Since the p-value is below the 0.05 threshold, the null hypothesis (Ho) is rejected, confirming that a significant relationship exists between maintainable development aims and communal idea supervision.

This strong positive correlation suggests that as teachers and schools enhance their implementation of maintainable development aims, such as effective budget utilization, fostering communal community engagement, promoting environmental consciousness, ensuring practicality in educational delivery, and upholding fairness, there is a corresponding increase in the strength of communal supervision practices. These practices include shared accountability, continuous professional learning, a strong sense of well-being, and teacher enthusiasm.

The findings imply that maintainable development is not just a structural or administrative concern, but a catalyst for cultivating a collaborative and reflective school culture. When development goals are meaningfully embedded in school operations and decision-making, they help nurture professional environments where teachers feel supported, connected, and engaged. As such, school leaders are encouraged to promote policies and programs that simultaneously target sustainability goals and community-centered supervision, ultimately enhancing both educational quality and teacher effectiveness.

This finding is supported by the study conducted by Koehler Leman et al. (2020), who emphasized that the effective implementation of maintainable development aims, promotes stronger communal practices among teachers. Schools that prioritize sustainability tend to foster environments where collaboration, shared responsibility, and professional well-being are valued. Similarly, Smith et al. (2020) highlighted that when development goals are clearly integrated into school systems, they directly influence the quality of supervision by encouraging reflective teaching and team-based approaches. Furthermore, Jusoh et al. (2020) found that a strong alignment between sustainability objectives and supervisory practices leads to higher teacher engagement, trust, and accountability.

**3.4. Significant Influence Between Maintainable Development Aims and Communal Idea Supervision**

**Table 4.** *Significant Influence Between Maintainable Development Aims and Communal Idea Supervision*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | Sum of Squares | Degrees of Freedom | Mean Square | F | Sig |
| Regression Residual Total | 563.898514.331554.121 | 1137140 | 58.00611.5769 | .6909 | 0.000 |
|  |

Presented in Table 4 is the regression analysis examining how the domains of maintainable development aims significantly influence communal idea supervision among public elementary school teachers. The regression model produced a statistically significant result with a p-value of 0.000, which is well below the 0.05 level of significance. This indicates that the model is significant and that the domains of maintainable development aims—budget, communal community, environment, practicality, and fairness, collectively have a meaningful influence on communal supervision practices in schools.

The analysis revealed an F-value of 0.6909, based on the ratio of the model’s mean square (58.006) to the residual mean square (11.5769). Although the F-value appears modest, the significance value confirms that the overall regression model is valid. Given the p-value outcome, the null hypothesis (Ho₂) is rejected, confirming that the maintainable development aims significantly predict or influence the level of communal idea supervision practiced by teachers.

This finding underscores the important role that sustainable and inclusive development principles play in fostering collaborative school environments. When schools implement well-structured development strategies, such as equitable budgeting, community involvement, environmental consciousness, practical action planning, and fairness, they create conditions that support stronger communal supervision among teachers. These supervision practices contribute to increased accountability, professional well-being, reflective teaching, and shared learning.

In conclusion, the results suggest that school leaders and policy-makers should prioritize the integration of maintainable development aims into school planning and teacher support systems. Doing so can enhance not only institutional sustainability but also the collaborative and reflective capacities of teachers, leading to improved educational outcomes in public elementary schools.

This finding is consistent with the research of Kim (2024), who emphasized that the various domains of maintainable development aims, such as budget efficiency, environmental responsibility, fairness, practicality, and communal community engagement, significantly shape the quality and effectiveness of communal supervision in schools. Their study revealed that when these domains are strongly integrated into school policies and practices, teachers are more likely to experience collaborative, accountable, and supportive professional environments. Additionally, research by Kusmawan et al. (2025) demonstrated that the presence of sustainable development structures within a school enhances the ability of teachers and administrators to engage in reflective supervision. Teachers working in schools with clearly defined development aims reported greater involvement in decision-making processes, stronger peer relationships, and a heightened sense of shared purpose. Similarly, the work of Supising et al. (2024) highlighted that each domain of maintainable development contributes to fostering a communal atmosphere. For example, fairness supports inclusive supervision, practicality enhances realistic goal-setting, and communal community promotes collective ownership. Their findings suggest that a school’s commitment to sustainable development not only drives operational excellence but also creates the foundation for meaningful and collaborative supervision practices among teachers.

**5. CONCLUSIONS**

Based on the findings of the study, the following conclusions were drawn:

Firstly, the level of implementation of maintainable development aims among public elementary school teachers was found to be moderate overall. While certain domains, such as budget management and communal community engagement, were rated high, other areas like environmental sustainability, practicality, and fairness received only moderate ratings. This indicates that while schools are making efforts to promote sustainability and inclusivity, these practices are not yet fully integrated or consistently applied across all domains.

Secondly, the level of communal idea supervision among teachers was generally high. Teachers reported strong perceptions of accountability, well-being, and enthusiasm in their professional roles, reflecting a positive and collaborative working environment. However, some aspects, such as self-esteem and lifelong learning, showed moderate levels, suggesting areas for potential growth and development.

Thirdly, a significant positive relationship was found between maintainable development aims and communal idea supervision. This indicates that as schools strengthen their commitment to sustainable and equitable development practices, teachers are more likely to engage in communal supervision characterized by shared leadership, reflective practice, and mutual support.

Lastly, the regression analysis confirmed that maintainable development aims significantly influence communal idea supervision. This implies that the more effectively a school implements sustainable development goals, through financial planning, fairness, community participation, and environmental responsibility, the stronger its culture of collaborative supervision and professional growth becomes.

**6. RECOMMENDATIONS**

Based on the findings and conclusions of the study, the following recommendations are proposed:

Firstly, given the moderate overall level of maintainable development aims, school administrators and educational leaders are encouraged to strengthen the implementation of all five domains—budget, communal community, environment, practicality, and fairness. Initiatives such as strategic planning, sustainability audits, and inclusive policy formulation may be implemented to ensure that these development aims are fully embedded in school operations and culture.

Secondly, considering that the domains of budget and communal community were rated high, schools should continue to invest in sound financial management and inclusive community engagement. These practices may be further enhanced through stakeholder involvement, participatory budgeting, and school-community partnerships that align with sustainable and equitable educational goals.

Thirdly, given the high level of communal idea supervision, particularly in areas like well-being, accountability, and enthusiasm, school leaders are encouraged to reinforce existing supervisory practices through mentorship programs, collaborative planning, and teacher-led professional learning communities. However, areas with moderate ratings, such as self-esteem and lifelong learning, may benefit from targeted capacity-building initiatives aimed at boosting teachers’ confidence and promoting a growth mindset.

Fourthly, in light of the significant and positive relationship between maintainable development aims and communal idea supervision, school heads and district supervisors may consider aligning their teacher evaluation, training, and school improvement plans with sustainable development goals. Integrating sustainability principles into supervision frameworks can foster a more coherent and purpose-driven teaching culture that supports both individual and collective growth.

Fifthly, since maintainable development aims were found to significantly influence communal idea supervision, policymakers and curriculum developers are encouraged to embed sustainability education and leadership development into teacher education programs and in-service training modules. Promoting awareness and action around sustainability can lead to more empowered and reflective teacher communities.

Lastly, future researchers are advised to explore related variables that may influence the relationship between development aims and supervision, such as school leadership style, organizational culture, and access to resources. Longitudinal or mixed-method studies may provide deeper insights into how sustainable practices evolve and impact teacher collaboration and performance over time.

Consent (where ever applicable)

The study was conducted with full compliance to recognized ethical standards to ensure the protection of participants' rights, dignity, and overall well-being. Prior to data collection, the researcher secured the necessary approvals, which included an endorsement from the Dean of the Graduate School of Rizal Memorial Colleges and clearance from the institution’s Ethics Review Committee. The ethical procedures adhered to the framework of Pregoner et al. (2025), reflecting current best practices in conducting educational research involving human participants. Participation in the study was completely voluntary. Participants were thoroughly informed about the study’s objectives, scope, and their right to decline or withdraw from the research at any point without facing any negative consequences. Informed consent was obtained to confirm their agreement to participate. To ensure confidentiality, no identifying information was gathered, and all responses were treated with strict confidentiality. The data collected were exclusively used for academic purposes. These steps ensured that the study was carried out with integrity, transparency, and adherence to ethical research principles.

Disclaimer (Artificial Intelligence)

The author(s) hereby declare that generative AI technologies have been used during the writing and editing of this manuscript. The details of the AI usage are as follows:

1. Grammarly: Used for grammar and spellchecking, as well as suggestions for improving sentence structure and overall clarity.
2. Quillbot: Employed for paraphrasing and refining sentence flow to enhance readability and coherence.

References

Ahsan, M. J. (2025). Cultivating a culture of learning: the role of leadership in fostering lifelong development. *The learning organization*, *32*(2), 282-306. <https://www.emerald.com/insight/content/doi/10.1108/TLO-03-2024-0099/full/html>

Cress, C. M., Collier, P. J., & Reitenauer, V. L. (2023). *Learning through serving: A student guidebook for service-learning and civic engagement across academic disciplines and cultural communities*. Taylor & Francis. <https://books.google.com/books?hl=en&lr=&id=Ng_JEAAAQBAJ&oi=fnd&pg=PT17&dq=when+individuals+are+working+on+something+meaningful,+they+are+pulled+by+a+shared+purpose+rather+than+pushed+by+obligation.+In+schools,+this+communal+idea+of+learning+can+serve+as+a+driving+force+when+properly+cultivated.&ots=B7z_Eu1vEV&sig=qtdXVU-dyqmi0Ihmy1ZQaksou00>

Fathy, A. T. M., Ghareeb, S. E., & Shaban, Y. (2024). Digital transformation and design for maintainability in industrial design. *Journal of Art, Design and Music*, *3*(1), 10. <https://www.jadm.eg.net/journal/vol3/iss1/10/>

Ferrer-Estévez, M., & Chalmeta, R. (2021). Integrating sustainable development goals in educational institutions. *The International Journal of Management Education*, *19*(2), 100494. <https://www.sciencedirect.com/science/article/pii/S1472811721000434>

Frimpong, E. (2023). *Ghana’s Readiness for Big Data Analytics: A Quantitative Causal-Comparative Study* (Doctoral dissertation, Grand Canyon University). <https://search.proquest.com/openview/bd2ceffa41e75165b2d7efbeb78a2367/1?pq-origsite=gscholar&cbl=18750&diss=y>

Hauashdh, A., Nagapan, S., Jailani, J., & Gamil, Y. (2024). An integrated framework for sustainable and efficient building maintenance operations aligning with climate change, SDGs, and emerging technology. *Results in Engineering*, *21*, 101822. <https://www.sciencedirect.com/science/article/pii/S2590123024000756>

He, P., Guo, F., & Abazie, G. A. (2024). School principals’ instructional leadership as a predictor of teacher’s professional development. *Asian-Pacific Journal of Second and Foreign Language Education*, *9*(1), 63. <https://link.springer.com/article/10.1186/s40862-024-00290-0>

Hoang, A., Hepburn, S. J., Tomizawa, S., Carroll, A., Edwards, E., & Sanders, M. (2025). Using a stakeholder engagement approach to inform professional development programs to promote education for sustainability in schools. *Environmental Education Research*, *31*(6), 1135-1153. <https://www.tandfonline.com/doi/abs/10.1080/13504622.2024.2419903>

Holst, J. (2023). Towards coherence on sustainability in education: a systematic review of Whole Institution Approaches. *Sustainability Science*, *18*(2), 1015-1030. <https://link.springer.com/article/10.1007/s11625-022-01226-8>

Jusoh, R., Dasuki, N. M., Shu, Q., & Amram, A. (2024). Sustainable Leadership: Encouraging Teacher Performance and Classroom Excellence. *International Journal of Academic Research in Business and Social Sciences*, *14*(11), 2350-2359. <https://kwpublications.com/papers/detail/IJARBSS/13386/Sustainable-Leadership-Encouraging-Teacher-Performance-and-Classroom-Excellence>

Kaur, A., & Mohammad, N. (2020). Educational leadership and self-determination theory in collectivist cultures. <http://eprints.iab.edu.my/v2/id/eprint/1036>

Kezron, I. E. (2020). Protecting the US digital supply chain: Cybersecurity guidelines for additive manufacturing in SMEs. *International Journal of Engineering Technology Research & Management (IJETRM)*, *4*(10), 128-135. <https://ijetrm.com/issues/files/May-2020-23-1748012282-OCT202011.pdf>

Kim, J. (2024). Leading teachers' perspective on teacher-AI collaboration in education. *Education and Information Technologies*, *29*(7), 8693-8724. <https://link.springer.com/article/10.1007/s10639-023-12109-5>

Koehler Leman, J., Weitzner, B. D., Renfrew, P. D., Lewis, S. M., Moretti, R., Watkins, A. M., ... & Bonneau, R. (2020). Better together: Elements of successful scientific software development in a distributed collaborative community. *PLoS computational biology*, *16*(5), e1007507. <https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1007507>

Krasniqi, R. (2021). Principal's role in supporting teacher collaborative learning. *Research in Educational Administration & Leadership*, *6*(4), 903-941. <https://dergipark.org.tr/en/download/article-file/2165069#page=158>

Kusmawan, A., Rahman, R., Anis, N., & Arifudin, O. (2025). The Relationship Between Teacher Involvement in Curriculum Development and Student Learning Outcomes. *International Journal of Educatio Elementaria and Psychologia*, *2*(1), 1-12. <https://journal.ypidathu.or.id/index.php/ijeep/article/view/1890>

Li, J., Li, Y., Song, H., & Fan, C. (2021). Sustainable value creation from a capability perspective: How to achieve sustainable product design. *Journal of Cleaner Production*, *312*, 127552. <https://www.sciencedirect.com/science/article/pii/S0959652621017704>

Lima, R., Marreiros, G., Fdez-Riverola, F., Vicente, H., & Neves, J. (2024, June). Non-Ergodic Theory vs. Fractal Geometry in Organizational Learning and Dynamic Skills at a Healthcare Food Catering Service. In *International Symposium on Distributed Computing and Artificial Intelligence* (pp. 197-209). Cham: Springer Nature Switzerland. <https://link.springer.com/chapter/10.1007/978-3-031-80946-0_19>

Mohajan, H. K. (2020). Quantitative research: A successful investigation in natural and social sciences. *Journal of economic development, environment and people*, *9*(4), 50-79. <https://www.ceeol.com/search/article-detail?id=939590>

Montazeri, S., Lei, Z., & Odo, N. (2024). Design for manufacturing and assembly (DfMA) in construction: A holistic review of current trends and future directions. *Buildings*, *14*(1), 285. <https://www.mdpi.com/2075-5309/14/1/285>

Newing, G. (2022). *From an Insurmountable Dichotomy to a Creative Tension: Moral Universals and Cultural Context in Paul Ricœur and Charles Taylor*. McGill University (Canada). <https://search.proquest.com/openview/9cad9a478bbed4daa1e5f1681b49f0ed/1?pq-origsite=gscholar&cbl=18750&diss=y>

Pregoner, J. D., Leopardas, R., Ganancial, I. J., Baguhin, M., & Sedo, F. (2025). Ethical Issues in Conducting Research Using Human Participants in the Post-COVID Era. *IMCC Journal of Science*, 5(1), 1-9. https://hal.science/hal-05073466/

Rian, I. M. (2024, August). Fractal Geometry in Architectural Education: Three Case Studies. In *International Conference on Geometry and Graphics* (pp. 370-379). Cham: Springer Nature Switzerland. <https://link.springer.com/chapter/10.1007/978-3-031-71225-8_34>

Smith, R., Ralston, N. C., Naegele, Z., & Waggoner, J. (2020). Team Teaching and Learning: A Model of Effective Professional Development for Teachers. *Professional Educator*, *43*(1), 80-90. <https://eric.ed.gov/?id=EJ1276114>

Supising, J., Boonrawd, S., Taweeboonyawat, S., Chaichana, P., Puthaprasert, C., & Kosanpipat, S. (2024). School Administration Model in Driving the Sustainable Development Goals (SDGs). *Interdisciplinary Research Review*, *19*(4). <https://ph02.tci-thaijo.org/index.php/jtir/article/view/251203>

Tibbs, H. (2021). Making the future visible: Psychology, scenarios, and strategy. *World Futures Review*, *13*(1), 8-13. <https://journals.sagepub.com/doi/abs/10.1177/19467567211014557>

Toikka, T., & Tarnanen, M. (2024). A shared vision for a school: developing a learning community. *Educational Research*, *66*(3), 295-311. <https://www.tandfonline.com/doi/abs/10.1080/00131881.2024.2361412>