Research Data Management as a Catalyst for Sustainable Learning Communities in Botswana's Higher Education: A Conceptual Exploration

Theme: Sustaining Communities of Learning and Practice in Innovative Open Education

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Abstract

This conceptual paper examines how Research Data Management (RDM) can act as a catalyst for developing sustainable learning communities within Botswana's higher education sector. Grounded in FAIR principles and theories of collaborative engagement, the paper synthesises current literature and international models to demonstrate how RDM can extend beyond merely adhering to regulatory requirements towards fostering co-creative open educational practices. It highlights that structured data stewardship allows local institutions to curate and reuse datasets in order to create Open Educational Resources (OER), promote collaboration across institutions, and empower students to drive data narratives. Although national initiatives, such as draft Open Science policies, represent significant progress, challenges related to infrastructure, skills, and institutional mandates still hinder the widespread adoption of RDM. By drawing on successful global examples and proposing aspirational use cases for localising OER through RDM, this paper offers actionable recommendations for governance, pedagogy, and regional collaboration. Ultimately, it advocates for further research into context-sensitive paths for implementation that can foster inclusive and innovative knowledge ecosystems within African higher education.

Keywords: Research Data Management, Research Data Management, Sustainable Learning Communities, Botswana, Higher Education, FAIR Principles, Capacity Building

1. Introduction

1.1 The Importance of Research Data Management in Higher Education

Research Data Management (RDM) is essential for maintaining scholarly integrity, ensuring reproducibility, and fostering institutional accountability in an era marked by increasing knowledge exchange and scrutiny of research practices. RDM encompasses the structured planning, collection, documentation, preservation, and sharing of research data. It aligns with the principles of Findable, Accessible, Interoperable, and Reusable (FAIR) data, which aim to ensure that data is discoverable and can be reused across different contexts (Higman et al., 2019; Wilkinson et al., 2016). By facilitating compliance with funding mandates and enhancing data reuse, RDM bolsters the transparency and long-term value of research (OECD, 2023; Borghi & Van Gulick, 2022).

Beyond technical infrastructure, RDM fosters a culture of data literacy and ethical inquiry. When students engage with well-curated datasets, they develop crucial skills in analysis, stewardship, and responsible conduct (RWTH Aachen University, 2025). These skills are fundamental to building sustainable learning communities—interdisciplinary networks that support the creation, preservation, and transfer of knowledge. As Ben-Eliyahu (2021) points out, learning becomes sustainable when systems are designed for adaptive reuse and resilience.

The concept of communities of practice (Wenger, 1998) illustrates how shared data practices contribute to collaborative knowledge-building. By utilising repositories, metadata standards, and data management plans (DMPs), RDM helps establish shared epistemic norms, fostering trust and encouraging knowledge-sharing communities.

Recognising this importance, international frameworks such as UNESCO's (2021) Recommendation on Open Science advocate for inclusive, interoperable infrastructures that treat research data as a public good. Institutions that embed RDM into their research and teaching processes not only meet ethical and legal standards but also contribute to robust, open educational ecosystems.

However, global frameworks are not uniformly adopted. In resource-constrained contexts like Botswana, gaps in infrastructure, skills, and policy pose challenges and present opportunities for effectively integrating RDM into institutional practices.

1.2 Overview of Botswana's Higher Education Landscape

Botswana's tertiary education sector comprises 27 institutions, including universities, colleges, and distance learning centers (Commonwealth Network, 2024). While these institutions play a vital role in national development, they continue to encounter significant challenges, such as inadequate investment in digital infrastructure and fragmented research policy frameworks (Mosweu, 2023; Nakaziba & Ngulube, 2023).

Several institutions, such as the University of Botswana (UB), Botswana International University of Science and Technology (BIUST), and Botswana Open University (BOU), have established institutional repositories (Chiware & Becker, 2018). While these repositories have enhanced the visibility of research output, they primarily focus on disseminating final products, such as theses and publications, rather than providing comprehensive research data management (RDM) throughout the entire data lifecycle. This situation suggests a more symbolic than substantive adoption of data stewardship, highlighting the necessity for more integrated institutional frameworks.

1.3 Purpose and Significance of the Study

This paper explores the potential of Research Data Management (RDM) as a catalyst for nurturing sustainable learning communities within higher education institutions in Botswana. It synthesises existing literature and global frameworks to develop a context-sensitive understanding of how RDM can be institutionalised as both a technical and cultural practice.

Drawing upon Neo-Institutional Theory (DiMaggio & Powell, 1983) and the concept of communities of practice (Wenger, 1998), the paper situates RDM within the broader dynamics of institutional frameworks. It examines the coercive, normative, and cognitive factors that influence RDM practices while also considering how these elements interact with open science agendas and digital inclusion objectives.

This examination is particularly timely, as Botswana is in the process of formulating national open science policies, although their implementation remains limited. Inconsistent institutional strategies and inadequate investment in capacity continue to impede the integration of Research Data Management (RDM) into both research and teaching workflows. By providing targeted policy and practice recommendations, this paper seeks to support capacity building, institutional planning, and policy development. Its overarching goal is to contribute to the ongoing discourse on how African universities can establish resilient academic ecosystems, wherein research data fosters collaborative learning and pedagogical innovation.

2. Conceptual Framework: RDM Between Practice and Policy

This paper utilises Communities of Practice (CoPs) (Wenger, 1998) and Neo-Institutional Theory (DiMaggio & Powell, 1983) to conceptualise Research Data Management (RDM) as both a grassroots academic practice and a strategic institutional response.

CoPs emerge through shared engagement and mutual interest, fostering knowledge co-creation across disciplinary, institutional, and generational boundaries. Within higher education, these communities are evident in librarian-faculty collaborations, student-led data initiatives, and interdisciplinary research groups. RDM supports these networks through “feedforward learning,” which involves the reuse and adaptation of existing knowledge to address new challenges (Ben-Eliyahu, 2021). Tools such as repositories, metadata standards, and Data Management Plans (DMPs) serve not just as technical resources but as artefacts that promote collaborative knowledge-building practices.

Neo-Institutional Theory explains how institutions respond to external pressures. Coercive forces stem from funder mandates and national policy directives, while normative forces emerge from professional standards and ethical expectations. Mimetic forces are characterised by peer emulation. In Botswana, these pressures are manifested in the adoption of repositories and draft Open Science frameworks, though such actions are often motivated more by symbolic compliance than by genuine, substantive change.

Together, these frameworks illuminate RDM's dual role: functioning as a bottom-up mechanism for academic collaboration and serving as a top-down instrument for policy alignment. Effectively institutionalising RDM requires the synchronisation of regulatory expectations, professional incentives, and cognitive infrastructures, such as training initiatives, capacity building, and the cultivation of an organisational culture that supports these efforts.

Table 1: Conceptual Framework

Element	Community Practice Focus	Institutional Alignment Focus
Theoretical Lens	Communities of Practice (Wenger, 1998)	Neo-Institutional Theory (DiMaggio & Powell, 1983)
Role of RDM	Supports collaboration, reuse, and trust	Facilitates compliance, reform, and legitimacy
Implementation Mode	Bottom-up engagement through shared norms	Top-down structures via policy and incentives
Key Mechanisms	Repositories, metadata, DMPs, shared vocabularies	National mandates, funding criteria, and training standards
Outcomes	Sustainable learning communities	Institutionalised data stewardship

3. Research Data Management in Higher Education

3.1 Global RDM Practices and Standards

Research Data Management (RDM) involves the planning, organisation, documentation, and sharing of data throughout the research lifecycle (UK Data Service, 2024). The FAIR principles—Findable, Accessible, Interoperable, and Reusable—have emerged as the international standard for promoting effective and ethical data stewardship (Wilkinson et al., 2016).

In high-income contexts, the adoption of RDM is often mandated by funding bodies and reinforced through institutional policies, repositories, and training programs. Universities have established Data Management Plans (DMPs), created dedicated advisory roles, and developed internal infrastructure to support research that is both reproducible and transparent (OECD, 2023). Libraries play a crucial role by collaborating with IT departments and research offices to provide expertise in metadata, preservation strategies, and training for researchers (Faniel & Connaway, 2018).

Despite these advancements, the implementation of RDM remains inconsistent on a global scale. Institutions in developing regions often encounter infrastructural, policy, and human resource constraints, which limit their capacity to operationalise RDM effectively. These challenges reflect the situation in Botswana and offer a useful comparative perspective.

3.2 Pedagogical and Institutional Value of RDM

Beyond mere technical compliance, Research Data Management (RDM) serves a transformative role in teaching, learning, and the academic culture as a whole. It enhances data literacy, research integrity, and analytical rigour, particularly as students engage with real-world datasets. The RWTH Aachen University model (2025) illustrates that structured exposure to data cultivates digital fluency—an essential skill in today's knowledge-driven economies.

From the perspective of Communities of Practice (Wenger, 1998), curated datasets and interoperable formats act as shared artefacts that connect educators, students, and researchers in collaborative endeavours. These practices facilitate "feedforward learning" (Ben-Eliyahu, 2021), promoting the reuse of data across various contexts, disciplines, and cohorts, which in turn fosters adaptability and innovation.

At the institutional level, the integration of RDM into teaching and research cultures enhances interdisciplinary collaboration and ensures the continuity of knowledge beyond individual projects. This approach aligns with the UNESCO (2021) Open Science framework, which champions inclusivity, openness, and long-term educational resilience.

Therefore, RDM transcends being merely an administrative requirement; it stands as a crucial enabler of institutional sustainability, knowledge equity, and innovation.

4. Botswana’s Context

4.1 Current State of RDM in Botswana’s Higher Education Institutions

Research Data Management (RDM) within Botswana's higher education sector is still in the nascent stages, with efforts largely fragmented across various institutions. Universities like the University of Botswana (UB), Botswana International University of Science and Technology (BIUST), Botswana Open University (BOU), and Botswana University of Agriculture and Natural Resources (BUAN) have established digital repositories. However, these repositories primarily focus on archiving final research outputs, such as theses and publications, rather than facilitating comprehensive data stewardship throughout the entire research lifecycle. Foundational FAIR principles—including metadata standardisation and the implementation of persistent identifiers—are inconsistently applied (Chiware & Becker, 2018).

At the national level, progress includes the development of Open Science and Open Data frameworks, spearheaded by the Ministry of Communications and Innovation in collaboration with EIFL and other stakeholders. Nevertheless, institutional adoption remains uneven. For instance, despite UB's substantial investment in digital infrastructure—estimated at over P43 million (UB, 2024)—there has been a lack of robust and integrated RDM services. The prevalent use of external cloud platforms, often without formal data agreements, raises ongoing concerns regarding data sovereignty, regulatory compliance, and long-term access (Patterton, 2023).

Legal ambiguities introduce an additional layer of complexity. The 2024 LONDA Report has identified significant gaps in Botswana's digital governance, particularly related to privacy protections and data rights (Paradigm Initiative, 2024). While the Botswana Research and Education Network (BotsREN) offers critical connectivity, the lack of federated repositories and secure, scalable storage solutions undermines the national RDM infrastructure.

Rather than emerging from coordinated national strategies, RDM initiatives tend to be primarily institution-led and reactive. These efforts are often project-based, with minimal integration into long-term planning, policy frameworks, or funding models. This fragmented environment highlights a classic neo-institutional challenge: although coercive pressures, such as draft policy mandates are evident, the normative and cognitive supports necessary for meaningful institutionalisation (including internal mandates, professional development, and widespread awareness) are still underdeveloped.

4.2 The Role of Librarians and Information Professionals

Librarians in Botswana are currently underutilised, despite having demonstrated their competencies in essential Research Data Management (RDM) practices, including metadata creation, digital preservation, and data curation. Training programs such as Skills for Africa Data Curation and Management for Libraries, along with collaborative initiatives led by the Botswana Library Consortium (BLC) and EIFL, have equipped many librarians with practical knowledge in repository development, metadata standards, and ethical data sharing. Notably, presentations made during International Data Week 2018 in Gaborone highlighted the expertise of librarians in RDM workflows, such as dataset annotation and repository management. Nevertheless, many institutions still omit RDM responsibilities from formal job descriptions, causing these skills to remain unintegrated into established institutional practices (Nakaziba & Ngulube, 2023).

While there has been progress through project-based efforts, the integration of RDM into long-term institutional strategies remains limited. International models like the Research Data Management Librarian Academy (RDMLA, 2024) and the Digital Curation Centre (2024) illustrate how librarians can function as embedded data stewards, providing advice on Data Management Plans (DMPs), maintaining repositories, and supporting ethical data handling.

Strategically integrating librarians into institutional RDM ecosystems through formal role recognition, structured capacity-building, and policy alignment could greatly improve Botswana's institutional readiness. This integration would allow libraries to become central hubs that support open, collaborative, and sustainable academic communities.

5. RDM as a Catalyst for Sustainable Learning Communities

Sustainable learning communities in higher education flourish through long-term collaboration, shared practices, and equitable access to resources (Sharanova, 2021). When integrated into institutional frameworks, research data management (RDM) supports these principles by enabling transparent, accessible, and reusable data infrastructures.

RDM promotes interdisciplinary collaboration by offering shared platforms and protocols that facilitate the reuse of datasets across various disciplines. Wahl and Rudinger (2025) argue that mechanisms for data sharing enhance the diversity of academic inquiry and innovation. Accessible repositories help minimise duplication, paving the way for new partnerships and methodological experimentation.

From a pedagogical perspective, structured data environments enhance student learning by fostering digital literacy, ethical awareness, and critical reasoning skills. The Sustainable Learning Framework (Woolis, 2025) highlights the importance of adaptability and lifelong learning, objectives advanced by authentic, real-world data experiences facilitated through RDM.

Furthermore, open data infrastructures champion inclusivity. Tiwari (2024) points out that data-driven, open pedagogies allow under-resourced institutions to engage more fully in global knowledge production. In Botswana, aligning RDM with FAIR principles has the potential to reduce disparities by providing broader access to datasets and encouraging localised knowledge creation.

The emergence of national Open Science policies (EIFL, 2024) presents a timely opportunity to establish RDM as a strategic institutional priority. Collaboration among librarians, IT staff, and academic departments is essential to integrate RDM into teaching, research, and governance processes. This transition redefines RDM from a mere compliance obligation to a vital mechanism for fostering sustainable and innovative educational ecosystems.

5.1 Localising OER Through RDM-Enabled Practice

To move beyond compliance and position Research Data Management (RDM) as a driver of open educational innovation, higher education institutions in Botswana can harness RDM to support the co-creation and contextualisation of Open Educational Resources (OER). When research data is curated according to FAIR principles—annotated, ethically shared, and accessible—it becomes a pedagogical resource that strengthens relevance, adaptability, and inclusion.

For instance, at the Botswana International University of Science and Technology (BIUST), which focuses on STEM subjects, Research Data Management (RDM) can help turn student-generated data into useful learning resources. For example, anonymised data from lab tests or science projects can be stored in a repository with clear descriptions. This data can then be reused to create open lab guides, problem sets, or hands-on learning materials. These resources can benefit students across different year levels and study areas, helping connect fields like engineering and computer science.

Similarly, Botswana Open University (BOU), with its broad portfolio in education, business, and public service, can localise OER by curating datasets from national surveys, tracer studies, or community-based research. For example, results from projects on teaching methods or workplace practices could be turned into role-plays, real-life case studies, or story-based assignments. These would add practical, local context to programmes like the Master of Education or the Diploma in Human Resource Management.

Cross-institutional collaboration through platforms like the Botswana Library Consortium could further facilitate resource sharing. For example, environmental data from BIUST could support climate change modules at BOU. Librarians and instructional designers would play critical roles in curating, aligning, and licensing datasets for open educational use.

Embedding RDM into OER practices positions Botswana’s universities as producers of knowledge, fostering regional leadership and inclusive, culturally grounded open education.

6. Challenges in Implementing RDM in Academic Institutions

6.1 Structural and Organisational Constraints

Botswana's higher education institutions encounter ongoing infrastructural challenges in implementing Research Data Management (RDM). Many institutions lack secure, scalable storage solutions, robust repositories, or effective preservation mechanisms for long-term data stewardship. Consequently, they often rely on outdated servers or external cloud services, raising concerns regarding data sovereignty and regulatory compliance (Patterton, 2023; Mosweu, 2023).

Organisationally, the absence of clear policies and governance frameworks results in fragmented efforts. According to Cox et al. (2019), many African universities exhibit “low service maturity,” lacking defined roles, incentives, and institutional mandates. Currently, no university in Botswana has a formal RDM policy, and where guidelines do exist, they tend to be vague and inconsistently applied.

6.2 Cultural and Cognitive Barriers

Cultural resistance to data sharing continues to be a challenge. Researchers frequently express concerns about intellectual property, reputational risks, and potential misuse of their data (Zuiderwijk et al., 2020). This hesitancy

is additionally intensified by limited institutional support, unclear citation practices, and low awareness of open science principles.

There are also significant skills gaps. While librarians often recognise the value of RDM, many report feeling underprepared, citing gaps in technical training, role clarity, and institutional backing (Tang & Hu, 2019). The lack of formal RDM mandates within job descriptions contributes to uncertainty about professional expectations and limits proactive service design.

Collaboration across departments is limited. Successful RDM implementation typically requires partnerships among libraries, IT units, research offices, and academics (Ruttenberg & Waraksa, 2018). In Botswana, such collaborations are sporadic and project-based, rather than being integrated into the institutional framework.

6.3 Strategic Opportunities for Capacity Development

Despite facing various challenges, Botswana presents several strategic opportunities for advancement. Open-access training initiatives like RDMLA and FAIRsFAIR offer scalable models for capacity-building (Wilkinson et al., 2016). By integrating these programs into staff development frameworks, institutions can enhance Research Data Management (RDM) competencies across various roles.

Regional collaboration has considerable potential for strengthening RDM capacity. The ELIXIR-CONVERGE model exemplifies how shared infrastructure, harmonised training, and coordinated policy efforts can effectively address local constraints (ELIXIR Europe, 2024). Similar approaches could be adopted within Southern Africa through collaborative networks such as DIRISA (Data Intensive Research Initiative of South Africa). Engaging in these networks would improve interoperability, encourage resource sharing, and cultivate communities of practice among institutions.

While a short-term reliance on cloud storage may be necessary, institutions should incorporate long-term digital sovereignty considerations—such as metadata standards, persistent identifiers, and ownership protections—into their procurement and governance strategies.

6.4 Policy and Practice Recommendations

To institutionalise Research Data Management (RDM) as a cornerstone of open and sustainable education, the following actions are recommended:

- Finalise and implement national Open Science and Open Data policies that include enforceable institutional mandates and compliance timelines (EIFL, 2024).
- Appoint designated data stewards and foster partnerships between librarians and IT professionals to effectively manage the data lifecycle.
- Integrate RDM into academic programs and staff training, ensuring that content aligns with institutional priorities and research objectives.
- Support faculty-led communities of practice that emphasise data sharing and reuse within specific thematic areas.
- Monitor institutional progress through metrics such as repository usage, participation in training, and data citation rates.

These actions would serve to reposition RDM as a strategic enabler, enhancing academic resilience, research integrity, and inclusive knowledge production.

7. Conclusion

Research Data Management (RDM) is increasingly acknowledged not only for its role in fostering research integrity and transparency but also for its potential to cultivate inclusive and resilient academic learning communities. In the context of Botswana, foundational components are beginning to materialise, digital repositories are being established within major institutions, and national Open Science policies are currently under development. Nevertheless, the advancement of RDM initiatives remains uneven, hindered by fragmented mandates, infrastructural deficiencies, and the marginalisation of key stakeholders—most notably librarians—which hampers the comprehensive integration of RDM into institutional practices.

This paper posits that RDM must transcend mere compliance to become a strategic pedagogical and institutional priority if it is to function as a genuine catalyst for sustainable learning. The establishment of coherent frameworks that align national policy with institutional planning, professional development, and open educational objectives is essential. Absent such alignment, RDM risks becoming largely symbolic implemented at a technical level but underutilised in both conceptual and cultural terms.

RDM serves to localise Open Educational Resources (OER) by ensuring that well-managed, relevant, and openly disseminated data is accessible for educational purposes. Such data can be transformed into case studies, simulations, and various educational tools that reflect authentic scenarios within Botswana. This approach enables universities to generate their content, foster regional leadership, and reduce reliance on externally produced materials.

To harness the full potential of RDM, institutions must reframe it not as a side task but as an integral component of teaching, research, and community engagement. Incentives should be structured to promote openness, collaborative efforts, and responsible data usage. Furthermore, training programs should focus on developing ethical, interdisciplinary, and inclusive competencies.

Future research should explore how institutional actors interpret RDM within specific disciplines, how local ways of thinking shape data sharing, and how regional partnerships can help build shared systems. To track these changes over time, long-term studies and inclusive approaches will be important.

In conclusion, a sustainable RDM culture effectively connects policy and practice, values both global standards and local knowledge, and promotes communities that are not only compliant but also co-creative, inclusive, and focused on future growth. To realise this potential, institutions need to view RDM not as an ancillary task, but as a vital component of teaching, research, and community engagement. Incentives should foster openness, teamwork, and responsible data use. Training should develop ethical, cross-disciplinary, and inclusive skills.

References

African Library and Information Associations and Institutions. (2025). *African librarians and open science futures*. https://www.aflia.net

Alex-Nmecha, J. C., & Onifade, F. N. (2023). Research data management awareness and training among academic librarians in Nigeria. *Library Philosophy and Practice*, Article 6732. https://digitalcommons.unl.edu/libphilprac/6732

Ben-Eliyahu, A. (2021). Sustainable learning in education. *Sustainability, 13*(8), 4250. https://doi.org/10.3390/su13084250

Bezuidenhout, L., & Chakauya, E. (2018). Hidden concerns of sharing research data by low/middle-income country scientists. *Global Bioethics, 29*(1), 39–54. https://doi.org/10.1080/11287462.2018.1441780

Bezuidenhout, L., & Havemann, J. (2018). Research data sharing in LMICs: Challenges and perspectives. In T. Chan & A. Okike (Eds.), *Open science in Africa* (pp. 45–60). African Minds.

Birkbeck, G., Nagle, T., & Sammon, D. (2022). Challenges in research data management practices: A literature analysis. *Journal of Decision Systems, 31*(sup1), 153–167. https://doi.org/10.1080/12460125.2022.2031603

Borghi, J. A., & Van Gulick, A. E. (2022). Responsible research data management and stewardship: Bridging science, policy and education. *PLOS ONE, 17*(3), e0265117. https://doi.org/10.1371/journal.pone.0265117

Botswana University of Agriculture and Natural Resources Library. (2024). *Repository overview*. https://www.buan.ac.bw/library

Chiware, E. R. T., & Becker, D. A. (2018). Research data management services in Southern Africa: A readiness survey of institutional libraries. *International Journal of Digital Curation, 13*(1), 17–37. https://doi.org/10.2218/ijdc.v13i1.567

Cox, A. M., Kennan, M. A., Lyon, L., & Pinfield, S. (2019a). Developments in research data management in academic libraries: Towards an understanding of research data service maturity. *Journal of the Association for Information Science and Technology, 70*(4), 406–417. https://doi.org/10.1002/asi.24181

Cox, A. M., Verbaan, E., & Sen, B. (2019b). Maturing research data services and the transformation of academic libraries. *Journal of Documentation, 75*(6), 1432–1462. https://doi.org/10.1108/JD-12-2018-0211

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organisational fields. *American Sociological Review, 48*(2), 147–160. https://doi.org/10.2307/2095101

EIFL. (2024). *Botswana open access and RDM initiatives*. https://www.eifl.net

ELIXIR Europe. (2024). *ELIXIR-CONVERGE: Strengthening research data management training in Europe*. https://elixir-europe.org/about-us/how-funded/eu-projects/converge

Faniel, I. M., & Connaway, L. S. (2018). Librarian strategies for managing research data. *College & Research Libraries, 79*(1), 6–27. https://doi.org/10.5860/crl.79.1.6

Mosweu, O. (2023). A framework for development of digital records preservation in the cloud in Botswana. *Journal of the South African Society of Archivists, 56*, 17–34.

Nakaziba, S., & Ngulube, P. (2023). Continuing professional development strategies for digital transformation among academic librarians in Africa: A systematic review. *Library Management, 44*(1/2), 125–143. https://doi.org/10.1108/LM-06-2022-0084

Organisation for Economic Co-operation and Development. (2023). *OECD research data management policies and practices*. https://www.oecd.org

Paradigm Initiative. (2024). *LONDA report: Digital rights and inclusion in Africa*. https://paradigmhq.org/londa

Patterton, L. (2023). Cloud storage solutions for research data management: Addressing infrastructure gaps in African universities. *Records Management Journal, 33*(2), 175–190. https://doi.org/10.1108/RMJ-05-2022-0023

Research Data Management Librarian Academy. (2024). *RDMLA training platform*. https://rdmla.github.io

RWTH Aachen University. (2025). *Advantages of research data management: Improving research quality and reproducibility*. https://www.rwth-aachen.de

Sharanova, A. (2021). Creating sustainable learning communities in higher education. *Journal of Learning and Development, 14*(2), 109–124.

Tang, R., & Hu, Z. (2019). Providing research data management (RDM) services in libraries: Preparedness, roles, challenges, and training for RDM practice. *Data and Information Management, 3*(2), 84–101. https://doi.org/10.2478/dim-2019-0012

Tiwari, M. (2024). *Beyond barriers: A tapestry of pedagogical strategies for inclusivity*. University of Delhi Press.

UK Data Service. (2024). *Research data lifecycle*. https://ukdataservice.ac.uk/learning-hub/research-data-lifecycle

UNESCO. (2021). *Recommendation on Open Science*. https://unesdoc.unesco.org/ark:/48223/pf0000379949

Wahl, M., & Rudinger, M. (2025). Transforming academic spaces: Data sharing and interdisciplinary collaboration. *Journal of Sustainability Education, 21*(1), 23–40. https://www.jsed.org

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.

Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J., Appleton, G., Axton, M., Baak, A., ... & Mons, B. (2016). The FAIR guiding principles for scientific data management and stewardship. *Scientific Data, 3*, Article 160018. https://doi.org/10.1038/sdata.2016.18

Zuiderwijk, A., Shinde, R., & Jeng, W. (2020). What drives and inhibits researchers to share and use open research data? A systematic literature review. *PLOS ONE, 15*(9), e0239283. https://doi.org/10.1371/journal.pone.0239283