Journal of Business Insight and Innovation

Volume 4 Issue 1, 2025
ISSN-p: 3006-2284, ISSN-e: 3006-0982
https://insightfuljournals.com/

BEYOND THE BLACKBOARDS: BUILDING A MICRO-EDTECH ECONOMY THROUGH TEACHER-LED INNOVATION IN LOW-INCOME SCHOOLS

Muhammad Rafiq-uz-Zaman [1]

Affiliations:

[1] Doctor of Philosophy in Education, Department of Education, The Islamia University of Bahawalpur, Punjab, Pakistan

Email: mrzmuslah@gmail.com

ORCID ID: https://orcid.org/0009-0002-4853-045X

Corresponding Author(s) Email:

[1] mrzmuslah@gmail.com

Abstract

As the global Educational Technology (EdTech) industry grows by leveraging massive, top-down initiatives, one of its most important potentials of innovation is systematically ignored still: the grassroots imagination of low-income school teachers. With limited funds, these teachers generate contextually-responsive responses to the urgent pedagogical issues on the ground, efforts which are seldom appreciated, sponsored and expanded. This theoretical analysis refutes this negligence by placing teachers once again at center stage sustaining, they are micro-innovators, and their ability to know the locality and thus local needs well is the gate towards effective integration of EdTech. Using some illustrative contexts in Pakistan, Bangladesh and India, the present paper demonstrates the need to create a so-called micro-EdTech economy, we outline how such best practices and teacher driven initiatives are systematically hobbled by lack of funds, scalability, and rewards within attendant institutions. In order to fill this gap, the paper articulates a framework of a micro-EdTech economy, a cohesive ecosystem that is intended to facilitate and grow teacher-driven solutions. The main idea of this framework is the digital platform that comprises an open-source repository and a microgrant hub connected by a network of NGOs, investors and local incubators. It has been programmed to ensure that grassroots innovation have been validated, financed and shared via healthy systems such as peer review and intellectual property protection. Most importantly, we argue that encouraging such a bottom-up culture is not only a step on the way to greater technology integration, but also an essential route to both increased educational equity, and sustainable capacity building. The paper proposes a novelty in the model of valuing those professionals most directly involved in the learning and transforming the paradigm of EdTech attention through imposition to empowerment.

Keywords: **Keywords:** EdTech, Teacher Innovation, Micro-EdTech, Global South Education, Bottom-up Innovation

Introduction

EdTech is booming globally, to a new degree, with governments, donors, and other investors directing large investment funds toward digital tools and learning platforms. Such momentum can be found in big-scale national EdTech programs and international EdTech collaborations in South Asia (Bargavi & Shanmugam, 2023). However, behind this history of the top-down expansion lay another, more silent and crucial strand of innovation: the grass-roots creativity of teachers in low-income schools as they take digital tools and adapt

Journal of Business Insight and Innovation
Volume 4 Issue 1, 2025
ISSN-p: 3006-2284, ISSN-e: 3006-0982
https://insightfuljournals.com/

them to singularly local and functional uses. Such innovations initiated by teachers lack critical policy and academic appreciation despite being close to student needs and the realities on the ground (Ken, 2024; Nicolai et al., 2023). This oversight creates an unbalanced EdTech environment where the idea of scale reigns and the vision of context is pushed aside.

As this paper will claim, these educators should have their conceptual (re-)positioning as a kind of so-called micro-innovators professionals who re-use the existing technologies to adapt them to address specific pedagogical needs by creating small-scale adjustments. However, these locally generated solutions, being in fact small-scale, can be more aligned with context and sustainable than other innovations dictated by some outside experts (Kilag et al., 2023; Frost, 2012). Micro-innovation implies ownership, creativity, and culture of reflective practice, and each of these attributes proves to be vital in facilitating the meaningful implementation of EdTech in disadvantaged contexts (Parry, 2018; Liu et al., 2024). Indeed, realizing this type of innovation is not simply an issue of fairness; it has to do with a key approach in releasing more scalable, grassroots-led change.

The contexts of Pakistan, Bangladesh, and India form the backdrop of this review, as it relies on the recent literature to investigate how teachers resolve the digital restrictions and possibilities. The countries form an interesting site of investigation, in that they are more likely to have similar problems, including infrastructural deficit, disparities in teacher education, and the digital divide, which leads to increased experimentation in EdTech (Nicolai et al., 2023; Kabadurmus, 2021). This review reframes teachers as central actors in the landscape, proposing a framework to understand their role in shaping a micro-EdTech economy that is adaptive, inclusive, and fundamentally driven from the bottom up.

What Teachers Are Already Doing

In South Asia, the teachers in low-income schools have been incredibly resourceful and are able to innovate with the practical materials and technologies they can easily access, often without any formal thanking or payment. Such bottom-up innovation is exhibited in various ways. WhatsApp is a ubiquitous platform enclosed within expanded learning environments designed by educators to help maintain student engagement and work on collaboration between teachers during isolated contexts (Varanasi et al., 2021). Where hardware is prohibitively expensive, other people have fabricated their own low-cost virtual reality (VR) systems with nothing more complicated than a cardboard box or created do-it-yourself (DIY) science, technology, engineering, and math (STEM) kits based on locally available materials to develop practical problem-solving (Keshri, 2023). Such resourcefulness cannot be reduced to an anecdote; it is an adaptive approach to the systemic needs, like the attempts to mitigate pandemic-related learning losses in rural India with the involvement of creative collaboration between schools and EdTech concerns (Keshri, 2023).

Such context-responsive solutions that are led by teachers can exist precariously, often unfunded and unsustainable, but nevertheless, they are of some value in the immediate context in which they have been designed (Kilag et al., 2023). Innovation is restricted to a small number of classrooms or a specific group of educators because the people who strive to develop them do not have the time, funding, and institutional assistance to disseminate further (Hennessy et al., 2022). This localization is further compounded by the lack of a formal funding structure or viable business models capable of turning a strong concept into a tool that can be available to the masses. Therefore, although these localized innovations can be effective, they fail to pass on a wide range of criteria that have historically been applied to justify EdTech (i.e., demonstrable scalability and systemic fit), so their perceived influence will be dissimilar (Nicolai et al., 2023).

The second and more daunting obstacle is the institutional resistance between these grassroots efforts and the institutional inertia of the formal learning sectors. Innovations initiated by teachers often conflict with the standard school curricula, rigid administrative procedures, and bureaucratic stasis that plague most learning organizations (Hennessy et al., 2022; Ellis et al., 2019). It is the inherent character of a centralized system that may unintentionally suppress the innovation it intends to encourage, and generate a disparity between the requirements of policies and what occurs in the classroom. The disconnect between emerging teacher-driven practices and the existing institutional infrastructure may hinder meaningful progress, as the

Journal of Business Insight and Innovation
Volume 4 Issue 1, 2025
ISSN-p: 3006-2284, ISSN-e: 3006-0982
https://insightfuljournals.com/

implementation context is a critical determinant of EdTech effectiveness (Nicolai et al., 2023). This gap cannot be filled merely by paying heed to the creativity of teachers, but must be closed by a change at the level of the system: making these localized innovations a proper part of the formal education environment. It is associated with solving such pressing challenges as scalability and sustainability and simultaneously aligning with the larger curricular goals (Nicolai et al., 2023). The education system can start tapping into this untapped potential through the following means: making teachers, those with the right resources and training as well as self-directed autonomy, and making the mechanisms through which teachers can be recognized and rewarded, in recognition of their innovative contributions (Hennessy et al., 2022; Kilag et al., 2023). Lastly, the practice of supporting a culture that legitimizes teacher-led innovation is central to designing an educational ecosystem that is more flexible, effective, and adaptive to every learner (Bargavi & Shanmugam, 2025).

The Case for a Micro-EdTech Economy

To overcome the outlined problems of lack of resources and frictions within institutions described in the previous section of this paper, there needs to be a micro-EdTech ecosystem as proposed by this paper. The aim of this framework is to put power in the hands of teachers, giving them direct resources via flexible models of funding such as targeted crowdfunding, mini-grants and digital intellectual property (IP) licensing. Mechanisms like crowdfunding and mini-grants, in turn, allow educators to circumvent some of the usual bureaucracies involved and get the initial funding they need to plan the idea and put it to use (Hennessy et al., 2022; Kilag et al., 2023). More importantly, this model does not end at funding, since it also involves digital IP licensing, which will enable teachers to have monetizable pedagogical materials and practices. Not only does this present an opportunity of a sustainable income but also acknowledges their intellectual output and cultivates a culture of professional innovation as a major force of innovative behavior within an educational facility (Ken, 2024; Orteg 2025; Liu, et al. 2024).

The inherent rationale underlying this economic model has its foundation in the ability of this economic model to give preference to local innovation regarding solving context-specific educational challenges. Teacher-led initiatives are not subject to standardization; they are, by definition, sensitive to the needs of their students in terms of culture, language, and socio-economic background (Keshri, 2023). When educators are empowered to develop curricula, they can tailor content and pedagogy to meet the precise needs of their learners, resulting in more effective and equitable educational outcomes (Bargavi & Shanmugam, 2023). This approach operationalizes the principle that those closest to the problem are often best equipped to design the solution, turning the teacher's lived experience into a primary asset for innovation, as seen in grassroots efforts to revive foundational skills in rural Indian schools (Keshri, 2023).

Furthermore, a micro-EdTech economy provides the necessary architecture to activate the vast reservoir of innovative ideas that currently remain dormant due to systemic barriers and a lack of support (Ellis et al., 2019; Ellis et al., 2022). Such a framework would function as an ecosystem, connecting educators with the investors, mentors, and collaborative partners needed to refine and scale their concepts (Hennessy et al., 2022). By fostering a system of distributed leadership that empowers teachers as autonomous agents of change (Teng et al., 2024), this model can unlock the scalable potential of countless grassroots solutions. This bottom-up strategy directly complements top-down policy directives, such as those advocated by the World Bank, by ensuring that national EdTech strategies are informed by and aligned with proven, practice-based innovation (Salimi, 2025).

Proposed Framework

We propose a framework for the micro-EdTech economy centered on a dynamic, platform-based ecosystem. The core of this framework is a digital platform designed with a dual function: it serves as both an open-source repository and an integrated microgrant hub. Being an open-source repository, it would enable educators to freely share, modify, and expand upon an ever-growing collection of teaching strategies, teaching resources, and low-tech tools, which would help to foster collaboration and minimize redundant efforts (Alshomali & Azeez, 2018). Such a repository would be filled with the materials developed by teachers, and

Journal of Business Insight and Innovation
Volume 4 Issue 1, 2025
ISSN-p: 3006-2284, ISSN-e: 3006-0982
https://insightfuljournals.com/

by the teachers to be used, and hence all material will be based on the realities of low-income school environments (Turura et al., 2025). This embedded microgrant hub would then facilitate the provision of small-scale, targeted funding that would allow educators who want to transition from idea to implementation by funding experimental projects and resource development (Singh et al., 2023). This creates a mutually reinforcing feedback loop where shared ideas can attract the financial support required to implement the concept, creating a positive cycle of innovation (Chalker et al., 2024).

Although the digital platform forms the foundational material infrastructure, the success of the platform depends on a broad-based support network comprising external stakeholders. Important actors in this ecosystem are non-governmental organizations (NGOs), education-oriented investors (EdTech investors) and local incubators (Singh et al., 2023). NGOs are also well-placed to offer the necessary capacity-building with a view to providing teachers with training and pedagogical support they need to create high-quality EdTech solutions. EdTech investors are then able to provide growth capital to scale up the most promising and rigorously validated teacher-led projects, taking them beyond a single classroom. Lastly, local incubators are the key missing piece towards sustainability because they assist innovative concepts and turn them into viable ventures through structured mentorship, business development capabilities, and networks (Singh et al., 2023). This collaborative venture model enables a clear path wherein teacher-innovators can be guided from idea generation to broader systemic impact.

The structure should be supported by effective governance and motivation systems so as to achieve the integrity and viability of this ecosystem in the long term. On the one hand, it is necessary to have clear standards regarding intellectual property (IP); in this way, innovations created by professionals can be protected and attributed to those who make substantial contributions to the educational process and provide them with due credit and possible monetary reimbursement, which is a strong incentive for producing high-quality works (Asif & Shaheen, 2022; Leng et al., 2023; Iyer & Masoumzadeh, 2022). Second, community-based peer review, although adapted from scholarly publishing, will necessarily be required to manage the quality, efficacy, and applicability of shared resources (Leonhardt et al., 2025; Baldassarre et al., 2023). Lastly, the platform has a comprehensive incentive structure in the form of microgrants, professional development courses, and official recognition systems, which serves as a catalyst (Li et al., 2024; Reddy & Bojja, 2020). All these parameters of IP security, quality control, and material incentives are aimed at establishing trust, motivation, and the sustainability of the entire micro-EdTech economy (Asif et al., 2025; Zheng et al., 2023).

Barriers to Scale

The fact that this change is between isolated innovations and scalable solutions has complex barriers that ought to be overcome by a working framework. A major impediment is widespread institutional bias. In education hierarchies, there usually exists a system-wide inertia against innovative solutions invented in the bottom-up model, and there is a consequent bureaucratic barrier that brings grassroots endeavors to a halt (Bagla, 2025; Ken, 2024). To break this inertia, it takes not just strong evidence that pilot programs prove to be effective but also consistent advocacy (policy-oriented support) that actively promotes and fosters teacher-led development (Ken, 2024).

These institutional obstacles are compounded by the twofold challenge of technical validation and resource mobilization. The lack of strong empirical data to back them up and understand their efficiency and reliability puts micro-innovations on shaky ground with stakeholders, including school administrators and prospective investors (Hirsch & Rubach, 2024). Bridging this validation gap requires well-designed partnerships among innovating teachers, university researchers, and technological developers to define best practices based on evidence. This validation is frequently a prerequisite to addressing the existing funding shortages that keep the majority of the projects at the prototype stage (Asif, 2024; Bagla, 2025; Putri et al., 2025). Hence, innovative financing mechanisms including impact-driven grants and public-private partnerships are needed to raise seed funding as well as the financial backing required over the long haul to achieve scale (Bagla, 2025).

Journal of Business Insight and Innovation

Volume 4 Issue 1, 2025
ISSN-p: 3006-2284, ISSN-e: 3006-0982
https://insightfuljournals.com/

The greatest of these barriers may be, however, a systemic undervaluation of local knowledge. The tendency to adopt externally developed, high-cost technologies is inherent to many education ecosystems, which is, in a certain way, a neglect of the experience and knowledge of classroom teachers (Bagla, 2025; Ken, 2024). The emergence of artificial intelligence in learning makes this trend even more complex. The willingness of teachers to trust any new EdTech, such as AI, and adopt the latter is significantly influenced by their professional self-efficacy, cultural values, and geographic setting (Viberg et al., 2024). By portraying teachers as mere implementers instead of highly skilled designers, their voices are not heard, which is an obstacle to stakeholder engagement. To counteract such a cultural issue, it is necessary to implement a new cultural shift through which we can celebrate teacher innovation and actively involve educators in the full design of any EdTech policies and tools (Hirsch & Rubach, 2024; Ken, 2024). It is essential that these institutional, financial, and cultural barriers are addressed together to establish a setting where teacher-led innovations can thrive in all authenticity (Putri et al., 2025).

Conclusion

The prevailing narrative of Educational Technology, with its focus on venture capital and large-scale, uniform platforms, profoundly misreads the landscape of authentic pedagogical needs, particularly in low-income contexts. This review has challenged that narrative by illuminating a powerful, yet systematically overlooked, engine of innovation: the classroom teacher. We have argued that by reframing educators in Pakistan, Bangladesh, and India not as passive consumers but as active 'micro-innovators,' we can begin to see the true potential for grassroots change. The countless instances of localized problem-solving from WhatsApp classrooms to DIY STEM kits are not mere coping mechanisms; they are the seeds of a more contextually responsive and sustainable EdTech ecosystem.

Our central contribution has been to propose a tangible framework for nurturing these seeds through a micro-EdTech economy. By integrating an open-source platform with micro-financing and creating a support structure of NGOs, investors, and local incubators, we can provide the architecture needed to validate, refine, and scale teacher-led solutions. This model represents a paradigm shift: from importing external technologies to cultivating internal capacity. It is an argument for investing in human ingenuity as much as in digital infrastructure, recognizing that the most durable solutions are often co-designed with the communities they are meant to serve.

Ultimately, this paper is a call for policymakers, philanthropists, and educational leaders to look beyond the lure of disruptive, top-down technology and recognize the transformative power of incremental, bottom-up innovation. The path toward genuine educational equity is unlikely to be paved by a single, monolithic solution. Instead, it will be built by empowering thousands of teacher-innovators to solve the specific, pressing challenges they understand most intimately. The future of effective EdTech in the Global South lies not only in what can be built for the classroom, but in what is already being built from within it.

References

Abdulhassan Alshomali, M. A. (2018). *Open source software GitHub ecosystem: a SEM approach* (Doctoral dissertation, James Cook University).

Asif, D. M. (2024). THE COMPLEXITIES OF BIOTERRORISM: CHALLENGES AND CONSIDERATIONS. *International Journal of Contemporary Issues in Social Sciences*, *3*(3), 2175-2184.

Asif, M., Pasha, M. A., & Shahid, A. (2025). Energy scarcity and economic stagnation in Pakistan. *Bahria University Journal Of Management & Technology*, *8*(1), 141-157.

Asif, M., & Shaheen, A. (2022). Creating a High-Performance Workplace by the determination of Importance of Job Satisfaction, Employee Engagement, and Leadership. *Journal of Business Insight and Innovation*, *1*(2), 9-15.

Baldassarre, L. A., Koweek, L., Andreini, D., Branch, K., Brennaman, D., Budde, R. P., ... & SCCT Guidelines Committee. (2023). Scientific document development standards for the society of

cardiovascular computed tomography (SCCT): A statement from the SCCT Guidelines Committee. *Journal of cardiovascular computed tomography*, *17*(6), 459-464.

Bargavi, R., & Shanmugam, K. (2025). EdTech industry in India: Revolution and challenges in the Indian market: Teaching case study. *Journal of Information Technology Teaching Cases*, *15*(1), 13-22.

Chalker, A., Deleon, R., Hudak, D., Johnson, D., Ma, J., Ohrstrom, J., ... & Liming, R. L. (2024). Open OnDemand: Connecting computing power with powerful minds. In *Practice and Experience in Advanced Research Computing 2024: Human Powered Computing* (pp. 1-8).

Ellis, V., Steadman, S., & Trippestad, T. A. (2019). Teacher education and the GERM: Policy entrepreneurship, disruptive innovation and the rhetorics of reform. *Educational Review*, *71*(1), 101-121.

Frost, D. (2016). From professional development to system change: Teacher leadership and innovation. In *Teacher leadership and professional development* (pp. 45-67). Routledge.

Hennessy, S., D'Angelo, S., McIntyre, N., Koomar, S., Kreimeia, A., Cao, L., ... & Zubairi, A. (2022). Technology use for teacher professional development in low-and middle-income countries: A systematic review. *Computers and Education Open*, *3*, 100080.

Hirsch, A. K., & Rubach, C. (2024). Exploring the Interplay Between Teaching Strategies and Digital Competencies Beliefs Among Pre-Service Teachers: A Longitudinal Study. *Education Sciences*, *14*(12), 1342.

Iyer, P., & Masoumzadeh, A. (2022). Learning relationship-based access control policies from black-box systems. *ACM Transactions on Privacy and Security*, *25*(3), 1-36.

Kabadurmus, F. N. K. (2021). Innovation challenges in South Asia: evidence from Bangladesh, Pakistan and India. *Journal of South Asian Development*, *16*(1), 100-129.

Ken, Ip. (2024). The rise of EdTech: Transforming education through entrepreneurial ventures. *Advances in Online Education: A Peer-Reviewed Journal*, *3*(2), 177-193.

Keshri, M. (2023). Reviving Government Schools in Rural India: Partnering with Edtech can Pave the Way Forward. *International Journal For Multidisciplinary Research,* *5*(4). https://doi.org/10.36948/ijfmr.2023.v05i04.5125

Kilag, O. K., Marquita, J., & Laurente, J. (2023). Teacher-led curriculum development: Fostering innovation in education. *Excellencia: International Multi-disciplinary Journal of Education (2994-9521)*, *1*(4), 223-237.

Leng, J., Zhong, Y., Lin, Z., Xu, K., Mourtzis, D., Zhou, X., ... & Shen, W. (2023). Towards resilience in Industry 5.0: A decentralized autonomous manufacturing paradigm. *Journal of Manufacturing Systems*, *71*, 95-114.

Leonhardt, R., Heumez, B., Raita, T., & Reda, J. (2025). Peer-review of data products: an automated assistance system for INTERMAGNET. *EGUsphere*, *2025*, 1-20.

Leonhardt, R., Heumez, B., Raita, T., & Reda, J. (2025). Peer-review of data products: an automated assistance system for INTERMAGNET. *EGUsphere*, *2025*, 1-20.

Li, L., Zhang, X., Qian, C., Zhao, M., & Wang, R. (2024). Cross coordination of behavior clone and reinforcement learning for autonomous within-visual-range air combat. *Neurocomputing*, *584*, 127591.

Liu, S., Yin, H., Wang, Y., & Lu, J. (2024). Teacher innovation: Conceptualizations, methodologies, and theoretical framework. *Teaching and Teacher Education*, *145*, 104611.

Nicolai, S., Jordan, K., Adam, T., Kaye, T., & Myers, C. (2023). Toward a holistic approach to edtech effectiveness: Lessons from covid-19 research in bangladesh, ghana, kenya, pakistan, and sierra leone. *International Journal of Educational Development*, *102*, 102841.

Parry, L. (2018). The case for teacher-led innovation. *Childhood Education*, *94*(2), 4-9.

Journal of Business Insight and Innovation

Volume 4 Issue 1, 2025
ISSN-p: 3006-2284, ISSN-e: 3006-0982
https://insightfuljournals.com/

Putri, H., Enderson, M., Tanjung, J., Munoz, M., Armalia, S., Andina, J., ... & Alieva, J. (2025). Frugal Innovation in Education: Designing and Evaluating Low-Bandwidth, Asynchronous Learning Systems for Remote Indonesian Schools. *Enigma in Education*, *3*(1), 38-50.

Reddy, K. N., & Bojja, P. (2020). A new hybrid optimization method combining moth–flame optimization and teaching–learning-based optimization algorithms for visual tracking. *Soft Computing*, *24*(24), 18321-18347.

Salimi, F. (2025). Aligning policy and practice: The World Bank's approach to EdTech in Sub-Saharan Africa. *Policy Futures in Education*, 14782103251324275.

Singh, N., Kumar, A., & Dey, K. (2023). Unlocking the potential of knowledge economy for rural resilience: The role of digital platforms. *Journal of Rural Studies*, *104*, 103164.

Teng, Y., Pu, R., & Hao, Y. (2024). *How can an innovative teaching force be developed? The empowering role of distributed leadership. Thinking Skills and Creativity, 51, 101464*.

Turura, Y., Friedman, S. F., Cremer, A., Maddah, M., & Tonekaboni, S. (2025). The Latentverse: An Open-Source Benchmarking Toolkit for Evaluating Latent Representations. *bioRxiv*, 2025-04.

Varanasi, R. A., Vashistha, A., & Dell, N. (2021, May). Tag a teacher: A qualitative analysis of WhatsApp-based teacher networks in low-income Indian schools. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (pp. 1-16).

Viberg, O., Cukurova, M., Feldman-Maggor, Y., Alexandron, G., Shirai, S., Kanemune, S., ... & Kizilcec, R. F. (2024). What explains teachers' trust in AI in education across six countries?. *International Journal of Artificial Intelligence in Education*, 1-29.

Zheng, Q., Gou, J., Camarinha-Matos, L. M., Zhang, J. Z., & Zhang, X. (2023). Digital capability requirements and improvement strategies: Organizational socialization of AI teammates. *Information Processing & Management*, *60*(6), 103504.