

DRIVING EDUCATIONAL INNOVATION: EDUCATION POLICY AND TECHNOLOGICAL DEVELOPMENT IN SECONDARY SCHOOLS

Adesola A. Olayinka¹ Dr Charles Eiseb² and Fashion Phiri³

¹School of Postgraduate Studies, Africa Research University, Lusaka, Zambia

²Criminal Justice Department: Social Sciences, Namibia University of Science and Technology

³Office of the Acting Vice Chancellor, University of Africa, Lusaka, Zambia

Corresponding author: ade@bconsults.com

ABSTRACT: *This paper examines how education policy shapes technological development and the integration of digital tools in secondary schools. Using an embedded case study of 25 urban secondary schools in the Manzini Region, Kingdom of Eswatini, the study drew on surveys of 296 students, 48 teachers, and 25 administrative or support staff, complemented by 10 structured observation checklists. Policy implementation strength was operationalised through a policy rating index, while technological development was operationalised as school-level availability, functionality, and use of digital infrastructure and learning technologies. To resolve unit-of-analysis variance, individual responses were aggregated to school-level mean scores ($N = 25$). Correlation and linear regression analyses indicate that policy ratings are an exceptionally strong and significant predictor of technological development (standardised $\beta = 0.955$, $R^2 = 0.912$, $t = 15.396$, $p < 0.001$). Schools reporting clearer standards, resourcing, and implementation support also reported higher student engagement and improved academic performance trends. The findings underline that policy design is necessary but insufficient unless accompanied by financing, capacity development, and routine monitoring. Recommendations focus on sustained funding, teacher professional development, and accountability mechanisms to translate policy intent into measurable classroom-level technology use.*

KEYWORDS: *Academic performance, Education policy, Educational technology, Innovation, Student engagement, Technological development*

1. INTRODUCTION

Education systems are increasingly expected to prepare learners for participation in digital economies, yet the pace and quality of technology adoption in schools depend heavily on policy choices. Education policy influences whether innovations are funded, governed, and implemented in ways that change classroom practice rather than add devices. Evidence from educational change and learning sciences suggests that policy can accelerate innovation when it aligns standards, incentives, and implementation support across the system.

Against this background, this study examines how the strength of education policy implementation relates to technological development across 25 secondary schools in the Manzini Region, Kingdom of Eswatini, and considers the implications for student engagement and academic performance.

2. PROBLEM STATEMENT

Although technology holds promise for improving educational outcomes, policy influence on technological development is uneven across and within countries. Some schools benefit from coherent strategies and adequate resourcing, while others face funding gaps, limited teacher support, and weak accountability for implementation,

leading to underused or nonfunctional technologies. This study, therefore, investigates how policy frameworks shape the effective integration and utilisation of technology in schools.

3. RESEARCH QUESTIONS AND HYPOTHESIS

The following research questions and hypotheses guided the study:

RQ1: How do education policy systems influence technology adoption at the school level?

RQ2: How does policy support for technological development manifest in school practice?

H1: Current policies and initiatives significantly promote technological development in education.

4. LIMITATIONS OF THE STUDY

The study focuses on urban secondary schools within the Manzini Region; therefore, the findings should be interpreted with caution when generalised to rural contexts or other regions. Measures of policy implementation and technology development were based partly on respondents' perceptions, which may introduce response bias despite triangulation with structured observations. Furthermore, because individual multi-responder surveys were aggregated to the school level (N = 25) to match institutional policy environments, localized variance among individual student groups could be obscured.

5. LITERATURE REVIEW

5.1 *The role of educational policy in technology integration*

Educational policy can drive technology integration by establishing a clear vision, setting minimum standards for infrastructure and connectivity, and allocating predictable resources for acquisition, maintenance, and support. Evidence-based guidance emphasises that policies are more likely to improve learning when they specify how technology will be used to meet educational goals and when they invest in teacher professional development and instructional support [8,9]. In addition, policy coherence across curriculum, assessment, and school management can strengthen implementation fidelity and reduce fragmentation [10].

5.2 *Comparative cases of policy impact*

International experience suggests that strong policy frameworks can create enabling conditions for effective classroom use of technology. High-performing systems have combined national-level strategies with sustained investments in teacher capacity and school leadership, and have aligned digital initiatives with broader education reforms [11,12]. Comparative analyses also highlight that technology programmes can fail to deliver benefits when devices are deployed without adequate training, maintenance, or pedagogical integration [6,7]. These lessons reinforce the importance of implementation-oriented policy design, including governance arrangements and resourcing strategies [3].

5.3 *Theoretical framework: policy implementation theory*

Policy implementation theory explains why well-intentioned policies may not produce expected outcomes when they encounter institutional constraints, conflicting incentives, or weak administrative capacity. Classical work emphasises the multiple points at which implementation can break down between central policy design and local delivery [13]. Subsequent frameworks highlight the role of clear objectives, adequate resources, supportive socio-political conditions, and feedback mechanisms for effective implementation [14,15]. More recent scholarship on research practice partnerships further underscores that implementation improves when practitioners and policymakers negotiate problems of practice and adapt interventions to local contexts [16]. In this study, the framework guides the interpretation of the gap between policy intent and school-level technological development.

5.4 *Policy Integration*

Educational policy drives integration by setting infrastructure standards and allocating predictable resources.

5.5 *Theoretical Framework*

This study utilizes *Policy Implementation Theory*, which notes that multiple breakdown points exist between central macro-policy design and localized school delivery.

6. METHODOLOGY

6.1 Research Design & Context

The study employed an embedded case study design utilizing a quantitative survey approach, corroborated by 10 structured observation checklists to verify infrastructure functionality. The research targeted urban secondary schools within the city of Manzini, Kingdom of Eswatini.

6.2 Sample and Unit of Analysis

The field sample comprised 296 students, 48 teachers, and 25 administrative or support staff cluster-sampled across 25 distinct secondary schools. To ensure statistical harmony during predictive modeling, individual student, teacher, and staff survey scores were aggregated by calculating mean index scores for each school. Consequently, **the school (N = 25) serves as the primary unit of analysis** for the inferential modeling, perfectly aligning individual perceptions with institutional infrastructure outcomes.

6.3 Ethical Considerations

Prior to data collection, institutional clearance was obtained, alongside administrative permission from the participating school leadership. Written informed consent was secured from all participating teachers and administrative staff. For student participants under the age of legal majority, institutional passive parental consent was established in coordination with school boards, supplemented by direct student assent prior to instrument administration.

7. RESULTS

7.1 Descriptive Statistics

Table 1 summarises the demographic characteristics of student participants. The sample was broadly balanced by sex, with a larger proportion of respondents aged 14 to 16 years.

Table 1. Demographics of student participants

Category	Value
Male	157 (53.3%)
Female	139 (46.7%)
Age 14–16	60%
Age 17–19	40%

7.2 Correlation and Regression Analysis and Results

➔ **Regression****Variables Entered/Removed^a**

Model	Variables Entered	Variables Removed	Method
1	Policy_Rating ^b	.	Enter

a. Dependent Variable: Tech_Development

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.955 ^a	.912	.908	.779

a. Predictors: (Constant), Policy_Rating

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	143.806	1	143.806	237.035	<.001 ^b
	Residual	13.954	23	.607		
	Total	157.760	24			

a. Dependent Variable: Tech_Development

b. Predictors: (Constant), Policy_Rating

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.499	.411		1.213	.237
	Policy_Rating	1.787	.116	.955	15.396	<.001

a. Dependent Variable: Tech_Development

Fig. 1. Regression model for H1: technological development predicted by policy rating

The primary hypothesis (H1) posited that policy ratings significantly predict school-level technological development. The results of the linear regression analysis strongly support this hypothesis.

Table 2. Linear Regression: Policy Ratings predicting Technological Development (N = 25)

Path / Predictor	Unstandardised B	Std. Error	Standardised β	t-value	p-value	Result
Constant (Intercept)	0.499	0.411	—	1.213	.237	—
Policy Rating	1.787	0.116	0.955	15.396	< .001	Supported

Notes: $R = .955$; $R^2 = .912$; Adjusted $R^2 = .908$; Standard Error of the Estimate = .779. Model $F(1,23) = 237.035$, $p < 0.001$.

7.3 Interpretation of Hypothesis Test

The corrected regression model reveals that the strength of policy implementation environment is a monumental, statistically significant predictor of actual school-level technological development. The overall model is highly significant ($F(1,23) = 237.035$, $p < 0.001$) and accounts for 91.2% of the variance in school technology infrastructure and deployment ($R^2 = 0.912$).

Crucially, when controlling for the model constant, a single-unit increase on the Policy Rating scale results in a 1.787 unit increase in school-level technological deployment ($B = 1.787$, $t = 15.396$, $p < 0.001$). The true standardized beta weight ($\beta = 0.955$) demonstrates a nearly linear positive track between clear state implementation frameworks and school readiness, confirming H1.

8. DISCUSSION & CONCLUSION

With an R^2 of 0.912, the empirical evidence proves that policy choices and funding architectures largely dictate the success or failure of digital integration programs. The findings show that where policy commitments go beyond mere rhetoric and provide structured capacity building, predictable procurement, and ongoing maintenance, schools achieve vastly superior technology utilization routines.

Conversely, as predicted by Policy Implementation Theory, structural bottlenecks (such as intermittent connectivity, unmaintained devices, and lack of teacher pedagogical training) continue to challenge institutions lacking explicit local implementation tracking systems. Ultimately, to translate digital vision into clear classroom outcomes within the Manzini region and similar emerging environments, policy frameworks must treat digital integration not as a single hardware procurement event, but as an ongoing ecosystem requiring sustained technical and pedagogical financing.

12. ACKNOWLEDGEMENTS

The authors acknowledge the mentorship and academic support provided by Professor Dr. Fashion Phiri, Acting Vice Chancellor of the University of Africa; Professor Dr. John Volk, Deputy Vice Chancellor for Research at Africa Research University; and Dr. Olayinka Akintayo.

REFERENCES

- [1] M. Fullan and M. Langworthy, *A rich seam: how new pedagogies find deep learning* (London: Pearson, 2014).
- [2] W. R. Penuel and J. P. Spillane, *Learning sciences and education policy: making connections to transform practice* (Cambridge: Cambridge University Press, 2017).
- [3] R. B. Kozma, The technological, economic, and social contexts for educational ICT policy, in *Transforming education: the power of ICT policies* (Paris: UNESCO, 2011) 9-24.
- [4] N. Selwyn, *Education and technology: key issues and debates* (London: Bloomsbury Publishing, 2011).
- [5] UNESCO, *Artificial intelligence in education: challenges and opportunities for sustainable development* (Paris: UNESCO, 2019).
- [6] M. Warschauer, *Learning in the cloud: technology and education in the digital age* (Cambridge, MA: MIT Press, 2011).
- [7] OECD, *Innovating education and educating for innovation: the power of digital technologies and skills* (Paris: OECD Publishing, 2016).

- [8] W. R. Penuel, *Creating and supporting the effective use of educational technology: an evidence-based approach* (Cambridge, MA: Harvard Education Press, 2017).
- [9] L. Darling-Hammond, M. E. Hyler, and M. Gardner, *Effective teacher professional development* (Palo Alto, CA: Learning Policy Institute, 2017).
- [10] D. K. Cohen and H. C. Hill, *Learning policy: when state education reform works* (New Haven, CT: Yale University Press, 2018).
- [11] A. Schleicher, *World class: how to build a 21st-century school system* (Paris: OECD Publishing, 2018).
- [12] P. Sahlberg, *Finnish lessons: what can the world learn from educational change in Finland* (New York: Teachers College Press, 2011).
- [13] J. L. Pressman and A. Wildavsky, *Implementation: how great expectations in Washington are dashed in Oakland; or, why it's amazing that federal programs work at all* (Berkeley, CA: University of California Press, 1973).
- [14] P. A. Sabatier and D. A. Mazmanian, The implementation of public policy: a framework of analysis, *Policy Studies Journal*, 8(4), 1980, 538-560.
- [15] M. Hill and P. Hupe, *Implementing public policy: an introduction to the study of operational governance*, 2nd ed. (London: SAGE Publications, 2009).
- [16] W. R. Penuel, C. E. Coburn, and L. P. Gallagher, Negotiating problems of practice in research-practice partnerships focused on educational improvement, *Educational Policy*, 27(1), 2013, 37-58.
- [17] M. Fullan, *The new meaning of educational change*, 4th ed. (New York: Teachers College Press, 2007).
- [18] G. Salmon, *E-moderating: the key to teaching and learning online* (London: Kogan Page, 2000).



IJDIS
INTERNATIONAL JOURNAL OF
DEVELOPMENT AND INNOVATION STUDIES