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The Ecosystem of VLE Implementation in Saudi Secondary Education: Bridging the Gap Between Infrastructure and Pedagogy

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Abstract
The integration of Virtual Learning Environments (VLEs) is a cornerstone of Saudi Arabia's Vision 2030 educational reforms. However, the mere acquisition of platforms like Classera does not guarantee pedagogical transformation. This study investigates the implementation dynamics of Classera across five secondary schools in Saudi Arabia, utilizing a mixed-methods approach comprising surveys with 91 teachers, interviews with leadership, and classroom observations. The analysis reveals a dichotomy in usage: while the platform successfully streamlines resource sharing and administrative communication, it remains underutilized for advanced, interactive learning. We argue that successful VLE adoption is contingent upon a supportive ecosystem involving robust ICT infrastructure, continuous professional development, and proactive school leadership. Without these pillars, VLEs serve primarily to digitize traditional practices rather than revolutionize learning.

Keywords Technological Pedagogical Content Knowledge (TPACK); Blended Learning Implementation; Teacher Digital Readiness; Incremental vs. Transformative Change; Educational Leadership in ICT; ICT Infrastructure in Schools.

INTRODUCTION

The contemporary educational landscape is currently navigating a "profound digital metamorphosis," a shift precipitated by the aggressive integration of digital technologies into pedagogical frameworks. Within this paradigm, Virtual Learning Environments (VLEs) have transcended their initial utility as peripheral repositories to become the central nervous system of modern schooling, facilitating a convergence of content delivery, student engagement, and administrative oversight. Unlike generic Learning Platforms (LPs), VLEs are distinguished by their capacity to create structured, managed environments that allow for controlled interaction between instructors and learners, effectively consolidating disparate educational activities within a unified digital interface [1].

In the specific context of the Kingdom of Saudi Arabia, this digital transition is not merely a trend but a strategic imperative anchored in the *Vision 2030* initiative. This national roadmap explicitly aims to pivot the nation towards a knowledge-based economy, heavily relying on the adoption of innovative technologies to recalibrate educational outcomes [2]. Consequently, the Classera platform has been strategically deployed across the secondary education sector. Designed to align with

these national reforms, Classera aspires to offer a sophisticated, multifaceted ecosystem that enhances personalized learning while simultaneously streamlining the complex administrative demands placed upon educators.

However, the trajectory of VLE implementation is rarely linear or devoid of friction. Global comparative analyses underscore that the theoretical promise of platforms such as Moodle and Blackboard often diverges from their practical realization. For instance, while national initiatives like Malaysia's *Frog VLE* and Saudi Arabia's earlier *Tatweer* program represented ambitious efforts to embed digital infrastructure, they frequently encountered significant "contextual barriers" that limited their efficacy to logistical functions rather than pedagogical transformation [3]. Similarly, research into Qatar's *Knowledge-Net* portal revealed a pattern of underutilization, where students bypassed institutional systems in favor of more interactive, open-web resources [4].

These global and regional precedents highlight a critical gap in the literature: the distinction between *adoption* (the presence of technology) and *integration* (the meaningful use of technology). Empirical insights suggest that without a confluence of robust ICT infrastructure, teacher readiness, and institutional scaffolding, VLEs risk becoming mere "digital filing cabinets" rather than engines of active learning [5].

Therefore, this article seeks to provide a granular, critical examination of Classera's deployment within Saudi secondary schools. Moving beyond superficial metrics of access, this study employs a mixed-methods approach to elucidate the *quality* of VLE usage [6]. By interrogating the intersection of infrastructural variability, teacher digital literacy, and leadership support, we aim to determine whether Classera is precipitating a genuine pedagogical shift or merely reinforcing traditional instructional habits through digital means.

Methodology and Context

To rigorously investigate the nuances of Virtual Learning Environment (VLE) implementation, this study adopted a mixed-methods research design, integrating both qualitative and quantitative paradigms to address the complexity inherent in educational settings. This methodological choice is grounded in the recognition that singular approaches often fail to capture the multifaceted nature of technological adoption. By synthesizing positivist assumptions—which prioritize objective data acquisition through statistical analysis—with interpretivist perspectives that value social interaction and contextual meaning, the research framework provides a holistic lens through which to view the phenomenon. The study was geographically and contextually bounded within five female secondary schools located in Jeddah, Tabouk, and Al Jubail. These sites were purposively selected to reflect a diverse spectrum of engagement levels, ranging from institutions characterized by high adoption and robust leadership to those grappling with significant infrastructural deficits and limited support mechanisms. This stratification was essential for isolating the variables of leadership, infrastructure, and teacher readiness across private and international education sectors.

Data collection was executed through a triangulated strategy comprising three distinct instruments designed to cross-verify findings and enhance validity. The first phase involved the administration of quantitative surveys to 91 teachers, a sample size sufficient to identify broad usage patterns and prevailing attitudes toward the Classera platform. This quantitative baseline was subsequently deepened through semi-structured qualitative interviews with school heads and a selected cohort of teachers. These interviews were instrumental in unearthing the "institutional logic"—the underlying support structures, leadership philosophies, and systemic barriers that govern VLE integration. Finally, to move beyond self-reported data—which can often be aspirational rather than actual—structured classroom observations were conducted across nine distinct

lessons. These observations provided empirical evidence of how the platform interacts with real-time pedagogical dynamics, offering a window into the tangible application of digital tools in the classroom.

Table 1: Methodological Framework and Data Collection Phases

Research Phase	Specific Objectives	Methodological Instrument	Participant Sample (N)
Stage 1: Exploratory	To elucidate the operational framework of Classera, map reported opportunities and constraints, and identify suitable candidate schools for the study.	Semi-structured Interview	**$N=1$** (Classera Director)
Stage 2: Quantitative	To investigate teacher perspectives towards Classera adoption and identify statistical patterns in usage data.	Questionnaire	**$N=91$** (Secondary Teachers)
Stage 3: Qualitative	To gather in-depth insights regarding institutional support, leadership strategies, and implementation barriers.	Semi-structured Interviews	**$N=19$** (14 Teachers, 5 Headteachers)
Stage 4: Observational	To contextualize self-reported data by observing real-time pedagogical interactions and platform usage in the classroom. *	Structured Observation	**$N=9$** (Distinct Class Sessions)

This multi-layered approach facilitated a comprehensive analysis that transcended surface-level adoption statistics. By observing the intersection of infrastructure, policy, and pedagogy, the study aligns with Punch's methodological paradigms, which argue for a research architecture that respects both the objective reality of resource availability and the subjective reality of teacher experience. The resulting dataset allows for a critical interrogation of the gap between the *intended* use of VLEs, as envisioned by policymakers, and the *enacted* use within the constraints of the daily classroom environment.

The Reality of VLE Usage: Storage vs. Engagement

A critical examination of the data reveals a profound dissonance between the theoretical affordances of the Classera platform and its enacted reality within the classroom. While Virtual Learning Environments (VLEs) are architected to facilitate a constructivist approach to education—enabling synchronous collaboration, interactive assessment,

and personalized feedback—the usage patterns observed in this study suggest a distinct "instrumentalization" of the technology. Rather than serving as a dynamic ecosystem for active learning, the platform has been largely appropriated as a mechanism for administrative efficiency and content storage. This phenomenon aligns with broader research indicating that without targeted pedagogical intervention, teachers tend to assimilate new technologies into existing, teacher-centered practices rather than disrupting them [12].

The quantitative data underscores this trend of routinization, where high-frequency usage is almost exclusively concentrated on passive dissemination tasks. As evidenced by the survey responses, the vast majority of educators have integrated Classera into their workflow primarily as a digital conduit for course materials. Specifically, 90% of respondents indicated that they "always" or "often" use the platform to upload instructional videos, and 76% utilize it to distribute homework assignments [13]. These functions, while useful for logistical streamlining, effectively reduce the sophisticated VLE to the status of a file repository or a digital noticeboard. The high engagement rates for these specific tasks suggest that teachers are comfortable with features that replicate the traditional "hand-out" model of instruction, merely shifting the medium of delivery from physical paper to digital file without altering the underlying pedagogical logic.

Table 1: Research Design and Data Collection Framework

Research Phase	Study Objectives	Methodological Instrument	Participant Sample (N)
Phase 1: Exploratory	To explore the Classera platform's history, opportunities, and constraints through direct dialogue with leadership.	Semi-structured Interview	**1** (Classera Director)
Phase 2: Quantitative	To investigate teachers' usage patterns, attitudes, and perspectives regarding the VLE.	Questionnaire	**91** (Secondary Teachers)
Phase 3: Qualitative	To gather in-depth insights on institutional support and leadership barriers.	Semi-structured Interviews	**19** (14 Teachers, 5 Headteachers)
Phase 4: Observational	To observe the real-time application of the platform within the classroom setting across different schools. *	Structured Observation	**9** (Distinct Class Sessions)

In stark contrast, the interactive and evaluative features that distinguish a true VLE from a simple content management system remain significantly underutilized. The data reveals that critical tools designed to foster student agency and two-way communication are neglected. Only 53% of teachers reported using the platform to record lessons, and even fewer—approximately 47%—leveraged the system for administering quizzes [13]. Furthermore, the capacity for cross-institutional

collaboration, a key feature of Classera intended to bridge professional communities, was utilized by only 33% of the cohort. This disparity highlights a "pedagogical conservatism" where the riskier, more complex tasks of facilitating online discussion or managing real-time data analytics are avoided in favor of safer, transmission-based activities.

Ultimately, these findings suggest that the integration of Classera in these secondary schools represents a digitization of content rather than a digitization of pedagogy. The prevalence of static content delivery over interactive assessment indicates that the "virtual classroom" acts as a mirror to the traditional lecture hall, preserving the unidirectional flow of information from teacher to student. This outcome resonates with the "assimilation" phase of technology adoption, where digital tools are used to sustain rather than transform prevailing educational structures [14]. Consequently, the potential for Classera to act as a catalyst for personalized, responsive learning remains largely latent, constrained by an instructional culture that prioritizes the delivery of information over the engagement of the learner.

The Determinants of Success

Our analysis identifies three interconnected factors that determine whether a school moves from superficial adoption to deep integration: infrastructure, professional development, and leadership.

1. The Infrastructural Divide

Our analysis elucidates that the trajectory of Virtual Learning Environment (VLE) adoption is not a linear progression but rather a complex interplay of systemic variables. We identify three critical, interconnected determinants—infrastructure, professional development, and leadership—that collectively dictate whether a school transcends superficial adoption to achieve deep, transformative integration. These factors function as a triad; the deficiency of any single element significantly compromises the efficacy of the entire digital ecosystem.

The first and perhaps most foundational determinant is the "infrastructural divide," which dictates the material conditions under which learning occurs. The study observed a stark dichotomy in the availability of technological resources, creating a fragmented landscape of implementation. In institutions characterized by high adoption rates, such as Schools A and B, the provision of robust, high-speed internet access in both classrooms and computer laboratories established a seamless technological backbone. This ubiquity of access empowered teachers to integrate the Classera platform into their daily pedagogical routines without the friction of connectivity failures [15]. In sharp contrast, the experience in School C highlights the paralyzing effect of infrastructural deficits. Here, the absence of basic internet connectivity forced educators to resort to ad-hoc improvisation, such as relying on personal mobile hotspots or bypassing the system entirely to maintain instructional flow. This evidence strongly suggests that without a reliable technological infrastructure, the potential of even the most pedagogically advanced VLE is nullified, rendering the most enthusiastic teachers ineffective due to material constraints [15].

Table 3: Teachers' Perspectives on ICT Resource Availability (% Agreement)

School Case	IWB or Display Device Available	Student Computers Available	Teacher Computers Available	Computer Lab Exists	Lab Has Internet Access	Instructional Internet Access	Students Bring Own Devices (BYOD)	Students Allowed Internet Access
School A	100	89	89	100	100	100	39	61
School B	91	91	100	97	97	91	37	64
School C	82	73	82	100	9	0	54	9
School D	100	86	100	100	100	100	100	100
School E	100	80	93	93	93	67	7	47
Average	**94%**	**86%**	**94%**	**97%**	**85%**	**79%**	**44%**	**5%**

Beyond the physical infrastructure, the quality of human capital development emerges as the second critical determinant. While the quantitative data indicates that a majority of teachers participated in some form of training, a qualitative interrogation reveals significant variance in the relevance and depth of these professional development initiatives. The analysis suggests that standard, "one-size-fits-all" technical workshops are insufficient for fostering genuine digital competence. Teachers who engaged in comprehensive, hands-on training that explicitly bridged the gap between technical skill and pedagogical strategy were markedly more likely to exploit the platform's advanced features [15]. Conversely, educators who perceived their training as purely instrumental or theoretically insufficient expressed lower self-efficacy and a reluctance to experiment. These findings empirically validate the Technological Pedagogical Content Knowledge (TPACK) framework, which posits that sustainable technology integration requires educators to develop a nuanced understanding of how technology intersects with specific content and pedagogical methods, rather than possessing isolated technical skills [16].

Table 4: Teachers' Opinions and Experiences Regarding Classera Training

Panel A: Training Participation and Characteristics (N=91)

Survey Item	Response Category	Frequency (N)	Notes / Breakdown
Received Training?	**Yes**	**85**	
	No	4	Schools: E (n=2), A (n=1), D (n=1)
Training Provider	School Administration	48	
	Joint (School & Classera)	23	
	Classera Company	14	
	Ministry of Education	1	
Training Volume	1–2 sessions	58	
	3–5 sessions	25	
	6+ sessions	3	
	None	4	
Hands-on Element?	**Yes**	**80**	
	No	7	
Peer Observation	**Yes**	**37**	(Observed other teachers using Classera)
	No	52	
Was Training Sufficient?	**Yes**	**71**	
	No	17	**High dissatisfaction in School B (n=13)**; others: E (n=2), A (n=1), D (n=1)
Addressed Needs?	**Yes**	**66**	
	No	21	

Panel B: Teachers' Qualitative Perceptions of Training (N Responses)

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
"The training has been helpful."	33	42	10	5	0
"The training has been comprehensive."	33	30	17	10	0
"The training focused on developing teaching as well as IT skills."	30	33	16	9	1 (School D)

Finally, school leadership functions as the pivotal "intervening variable" that mediates the relationship between resources and outcomes. The study identifies a clear correlation between proactive, visionary leadership and high levels of VLE engagement. In schools with "high take-up" rates, principals acted not merely as administrators but as instructional leaders who actively cultivated an ecosystem of innovation. These leaders established clear, supportive guidelines and played a crucial role in managing external stakeholders, specifically by engaging with parents to assuage cultural concerns regarding internet safety [15]. By creating a safe environment for experimentation and offering tangible rewards for digital adoption, these leaders successfully fostered a culture of routinization. In contrast, low-adoption schools were often characterized by passive leadership styles that viewed the VLE as a bureaucratic compliance tool rather than a strategic asset for learning. This contrast aligns with established research by Anderson and Dexter, confirming that technology leadership is a distinct and critical factor in the successful deployment of educational technology [17].

Figure 2: The Trend of Low Engagement with Classera

Phase 1: Determinants (Barriers)	Phase 2: Reactive Actions (Process)	Phase 3: Outcomes (Results)
A. Causal Factors (Infrastructure)	**Leadership Tactics (Coercive/Passive)**	**The Phenomenon**
• Persistent poor internet connectivity.	• Mandating usage without support ("Forcing").	**LOW PLATFORM ADOPTION**
• Frequent platform functionality problems.	• Using threats to ensure compliance.	
• Lack of reliable teacher access to the system.	• Passive monitoring or ignoring issues entirely.	**Consequences**
B. Contextual Factors (Teacher Capacity)	**Teacher Coping Strategies**	**1. Universal Disengagement**
• Low ICT skill levels.	• **Minimalism:** Focusing only on essential features to satisfy basic requirements.	Very low utilization rates across *all* categories, including:
• General unwillingness to adopt the technology.	• **Avoidance:** actively ignoring complex interactive features.	
• Adherence to traditional pedagogical methods.	• **Reversion:** Relying back on traditional (analogue) methods.	• Content Uploads
• Significant time constraints and heavy workload.	• **Workarounds:** Using personal resources (e.g., personal hotspots) due to school failures.	• Homework Distribution
C. Intervening Factors (Climate)	**Ineffective Support**	• Communication Tools
• **Leadership:** Passive, unsupportive, or restricted to mere monitoring.	• **ICT Staff:** Unhelpful or unavailable for troubleshooting.	• Virtual Classrooms
• **Parents:** Resistant to the technology or uninterested.	• **Classera:** Training provided was insufficient or irrelevant.	**2. Stagnation** Failure to establish any new digital routines or habits.

[Insert Figure 1 Here: The trend of high engagement with Classera] [Insert Figure 2 Here: The trend of low engagement with Classera]

Discussion: Incremental vs. Transformative Change

The empirical data emerging from this study offers a compelling validation of Fullan's theoretical bifurcation of educational reform, specifically the dichotomy between "incremental" and "transformative" change. The implementation of Classera within the Saudi secondary context appears to be firmly entrenched in the former category, characterizing a scenario where digital tools are assimilated into the existing pedagogical architecture rather than dismantling it. The prevailing usage patterns—dominated by the unidirectional transmission of assignments and resources—suggest that the Virtual Learning Environment (VLE) is being operationalized primarily to enhance the administrative efficiency of traditional instruction. This "mechanization" of teaching allows for the swifter execution of established routines but fails to unlock the platform's potential for fostering the collaborative, student-centered learning paradigms that were previously unattainable in a purely analogue setting.

Figure 2: The Trend of Low Engagement with Classera

Phase 1: Determinants (Barriers & Constraints)	Phase 2: Reactive Actions & Strategies (Process)	Phase 3: Outcomes (Consequences)
A. Infrastructural Barriers (Causal) • Persistent poor internet connectivity. • Frequent platform functionality problems. • Lack of reliable teacher access to the system. **B. Teacher Capacity & Disposition (Contextual)** • Low ICT skill levels. • General unwillingness to adopt the technology. • Adherence to traditional pedagogical methods ("stuck to tradition"). • Significant time constraints and heavy workload. **C. Institutional Climate (Intervening)** • **Leadership:** Passive, unsupportive, or restricted to mere monitoring. • **Parents:** Resistant to the technology or uninterested.	**Leadership Tactics (Coercive/Passive)** • Mandating usage without support ("Forcing"). • Using threats to ensure compliance. • Passive monitoring or ignoring issues entirely. **Teacher Coping Strategies** • **Minimalism:** Focusing only on essential features to satisfy basic requirements. • **Avoidance:** Actively ignoring complex interactive features. • **Reversion:** Relying back on traditional (analogue) methods. • **Workarounds:** Using personal resources (e.g., personal hotspots) due to school failures. **Ineffective Support** • **ICT Staff:** Unhelpful or unavailable for troubleshooting. • **Classera Training:** Perceived as insufficient or irrelevant.	**The Phenomenon** **LOW PLATFORM ADOPTION** **Consequences** **1. Universal Disengagement** Very low utilization rates across *all* functional categories, including: • Content Uploads • Homework Distribution • Communication Tools • Virtual Classrooms **2. Stagnation** Failure to establish any new digital routines or habits.

This pedagogical stagnation is not merely a failure of individual volition but a symptom of broader structural constraints. Teachers report being entrapped in a recursive cycle where the exigencies of rigid curriculum delivery and escalating administrative workloads preclude the cognitive space necessary for innovation. Under these conditions, the VLE is repurposed as a utilitarian instrument for workload management, reinforcing rather than challenging standard practices. This finding resonates with the critical discourse established by scholars such as Selwyn and Njenga, who posit that ICT integration often capitulates to the "grammar of schooling," resulting in incremental adjustments rooted in efficiency rather than transformative shifts rooted in pedagogy. Furthermore, in environments characterized by lower adoption, there is a palpable tendency towards "defensive teaching," where educators adhere to familiar, low-risk digital tools to navigate the uncertainties of the classroom, thereby foreclosing opportunities for experimental practice. Ultimately, if Classera is to transcend its current role as a digital repository and act as a catalyst for genuine educational reform, institutional strategies must urgently pivot from a fixation on technical proficiency to the cultivation of deep, systemic pedagogical innovation.

Conclusion and Implications

The strategic deployment of the Classera platform within Saudi Arabian secondary schools constitutes a pivotal, albeit nascent, milestone in the nation's broader educational technology trajectory under Vision 2030. However, the empirical evidence derived from this study serves as a critical corrective to the techno-optimist assumption that mere proximity to digital tools inevitably precipitates pedagogical evolution. The findings unequivocally demonstrate that while the "digital artifact" has been successfully installed, the "pedagogical architecture" required to sustain it remains fragile and unevenly distributed. The presence of the tool is, therefore, a necessary but insufficient condition for reform; without a corresponding maturation in the ecosystem that surrounds it, the platform risks becoming a sophisticated veneer over traditional instructional methods. To maximize the return on this significant national investment, stakeholders must urgently confront the "digital divide" not merely as a question of access, but as a crisis of infrastructure that fundamentally stratifies learning opportunities between resource-rich and resource-poor institutions.

Moving forward, the imperative for policy and practice is to transcend the current fixation on functional literacy—knowing *how* to use the software—and advance toward a paradigm of pedagogical integration. Professional development initiatives must be radically reconceptualized to move beyond basic technical orientation, focusing instead on the complex interplay between content knowledge and digital affordances. Furthermore, the role of school leadership must be reimagined; principals and administrators can no longer function solely as bureaucratic managers but must emerge as transformative change agents who actively cultivate a culture of innovation. In this envisioned future, digital tools are liberated from the constraints of administrative compliance and are repositioned as dynamic vehicles for active, constructivist learning. Only by addressing these systemic, interlocking elements—infrastructure, pedagogy, and leadership—can the Saudi educational sector hope to bridge the chasm between simply *using* technology to digitize the past and truly *transforming* teaching to secure the future.

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