



University Governance Transformation Through Immersive Learning for Sustainable Development

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Article Information

Received: September 05, 2026

Accepted: September 18, 2026

Published: September 21, 2026

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Citation: Cruz G Lirios, Goonzalez Velásquez LM. (2026) “University Governance Transformation Through Immersive Learning for Sustainable Development” International Journal of Telehealth and Digital Medicine, 1(1); DOI: 10.61148/2766-8614/JCCRCs/001.

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Abstract

Higher education institutions face increasing pressure to redesign governance systems capable of responding to contemporary social, environmental, and educational challenges. Within this context, immersive learning and Sustainable Development Goals (SDGs) have emerged as complementary mechanisms for strengthening institutional transformation and generating sustainability-oriented governance capacities. This study developed and validated an integrative explanatory model that examined the relationships among University Governance, Immersive Learning, and SDG Learning Integration through a multidimensional institutional framework.

A quantitative approach with explanatory scope and a non-experimental cross-sectional design was employed. Data were collected from participants affiliated with higher education institutions and analyzed through latent variable estimation and structural equation modeling procedures. The proposed model incorporated measurement and structural components to estimate direct, indirect, and total effects among constructs. Variables were operationalized through governance, educational, and sustainability dimensions, while content validity and conceptual consistency were established through expert judgment procedures.

The findings demonstrated that Immersive Learning generated significant direct effects on University Governance and strong effects on SDG Learning Integration. Sustainability-oriented learning operated as a mediating mechanism that strengthened institutional governance outcomes. The final structural model achieved satisfactory explanatory power and showed that governance transformation is influenced not only by administrative mechanisms but also by educational experiences and sustainability competencies. Educational immersion contributed to participatory decision-making, strategic coordination, institutional adaptability, accountability, and sustainability leadership.

The study proposes a multidimensional institutional model that integrates epistemological perspectives, governance theories, immersive educational environments, and sustainability competencies. The results provide conceptual and methodological foundations for understanding governance transformation in higher education and support the incorporation of immersive sustainability learning into institutional innovation strategies.

Keywords: University Governance, Immersive Learning, Sustainable Development Goals, Structural Equation Modeling, Higher Education

Introduction

University governance has become a strategic field of inquiry due to the growing pressure on higher education institutions to generate social value, strengthen sustainability agendas, and redesign learning ecosystems capable of responding to global transformations. In this context, immersive learning has emerged as an innovative educational mechanism that enables experiential, participatory, and technologically mediated interactions oriented toward complex problem solving. Simultaneously, the Sustainable Development Goals (SDGs) constitute a global framework that demands educational institutions integrate social responsibility, innovation, inclusion, and sustainability into institutional decision-making processes. The intersection between university governance and immersive learning for SDG implementation requires renewed theoretical and epistemological approaches capable of explaining multidimensional institutional transformation [1,2].

The debate surrounding university governance has evolved from traditional administrative perspectives toward dynamic configurations that incorporate participation, accountability, collaborative leadership, digital transformation, and network governance. Contemporary governance frameworks increasingly recognize universities not merely as knowledge transmission organizations but as adaptive ecosystems in which academic actors co-create institutional legitimacy and sustainable development outcomes [3]. Within this scenario, immersive learning environments supported by simulation, virtual interaction, augmented experiences, and experiential pedagogies provide new possibilities for integrating SDG-oriented competencies into institutional governance structures [4].

From an epistemological perspective, the relationship between university governance and immersive learning presents tensions between positivist, interpretive, critical, and complexity-based approaches. Positivist traditions emphasize measurable institutional performance and policy outcomes, whereas interpretive perspectives focus on meaning construction among educational communities. Critical epistemologies question asymmetries of power and institutional reproduction, while complexity theories propose nonlinear interactions among actors, technologies, and sustainability objectives [5]. These epistemological tensions reveal the necessity of developing integrative explanatory models capable of capturing both structural and experiential dimensions of governance processes.

Theoretical developments also provide complementary perspectives for understanding this phenomenon. Governance theory explains coordination mechanisms among institutional stakeholders and resource allocation processes [6]. Stakeholder theory contributes an understanding of how diverse actors influence strategic decisions and institutional legitimacy [7]. Transformative learning theory emphasizes changes in perspectives and behaviors resulting from immersive educational experiences [8]. Experiential learning theory supports the proposition that knowledge emerges through interaction, reflection, conceptualization, and experimentation [9]. Furthermore, socio-constructivist models suggest that immersive educational environments strengthen collective learning and institutional adaptation [10].

Conceptually, university governance in this study is understood as the multidimensional configuration of institutional mechanisms, decision structures, participation dynamics, and accountability

systems that guide strategic academic development. Immersive learning is conceptualized as a technologically and pedagogically mediated process through which learners engage in situated experiences that facilitate knowledge construction and behavioral transformation. SDG learning refers to educational processes oriented toward developing competencies associated with sustainable development principles and social innovation [11].

Despite the proliferation of studies examining governance, educational technologies, and sustainability independently, there remains limited theoretical integration explaining how immersive learning practices oriented toward the SDGs influence governance capabilities within universities. Existing models frequently prioritize technological adoption or institutional management indicators while underrepresenting epistemological interactions, educational experiences, and sustainability outcomes [12]. This fragmentation generates conceptual limitations and restricts the development of explanatory frameworks capable of supporting evidence-based governance innovation.

Consequently, this study is bounded by the analysis of university governance processes mediated through immersive learning strategies designed to strengthen SDG-oriented institutional capacities in higher education contexts. The analytical focus privileges the interaction among governance dimensions, immersive educational experiences, and sustainability learning outcomes while excluding broader macroeconomic and governmental determinants external to institutional environments. The purpose of this study is to construct and theoretically justify an integrative model that explains the relationships among university governance, immersive learning, and SDG-oriented educational transformation through the articulation of epistemological approaches, governance theories, conceptual structures, and explanatory mechanisms. The proposed model seeks to identify how immersive educational environments contribute to strengthening institutional coordination, participatory decision-making, and sustainability-oriented governance capabilities.

Research question: How does university governance mediated through immersive SDG learning integrate epistemological approaches, theoretical foundations, conceptual dimensions, and explanatory mechanisms to configure an institutional transformation model in higher education?

Research hypothesis: University governance strengthened through immersive learning oriented toward the Sustainable Development Goals positively integrates epistemological plurality, governance mechanisms, transformative educational experiences, and sustainability competencies, generating a multidimensional institutional model that improves participation, decision quality, and sustainable university transformation.

Method

This study adopted a quantitative approach with an explanatory and predictive scope aimed at constructing and validating an integrative model of university governance through immersive learning oriented toward the Sustainable Development Goals (SDGs). The methodological design followed a non-experimental, cross-sectional, and correlational-structural framework because the objective was to identify and estimate relationships among latent constructs without manipulating variables or experimental conditions [13]. The methodological logic was grounded in model specification procedures commonly employed in educational governance and social innovation studies where theoretical

dimensions are translated into measurable indicators and evaluated through multivariate estimation procedures [14].

The empirical design incorporated successive phases of conceptual specification, instrument development, expert validation, pilot assessment, and structural estimation. Initially, constructs associated with university governance, immersive learning, and SDG educational integration were theoretically defined. Subsequently, observable indicators were generated from the literature and adapted to the institutional context of higher education. A measurement model and a structural model were then proposed to estimate direct and mediated relationships among dimensions [15].

The study population was composed of members of higher education institutions including undergraduate and graduate students, faculty members, academic administrators, and institutional decision makers involved in educational innovation and sustainability initiatives. A non-probabilistic purposive sampling strategy was adopted because participation required previous experience with institutional learning environments and familiarity with SDG-oriented educational practices [16]. The final analytical sample was projected to exceed the minimum thresholds commonly recommended for structural equation modeling and latent variable estimation, ensuring adequate statistical power and parameter stability [17].

Eligibility criteria were established according to international ethical research protocols. Inclusion criteria consisted of being at least eighteen years old, maintaining active affiliation with a higher education institution, possessing prior participation in institutional educational activities involving immersive or technology-mediated learning experiences, and voluntarily agreeing to participate through informed consent procedures. Exclusion criteria included incomplete questionnaires, duplicate submissions, withdrawal of consent at any stage of data collection, insufficient completion rates, and participants reporting no exposure to university learning environments associated with sustainability or governance practices. Additional exclusion procedures considered responses exhibiting systematic patterns indicating inattentive completion or inconsistency [18].

Ethical safeguards were implemented following internationally recognized principles of respect for persons, beneficence, justice, confidentiality, and responsible data management. Participation remained voluntary, anonymity was preserved through coding procedures, and no personally identifiable information was retained. Participants received information regarding objectives, expected duration, confidentiality mechanisms, withdrawal rights, and use of aggregated results before enrollment. Data management procedures complied with ethical principles for educational and social science research [19].

Operationalization of variables was developed through latent multidimensional constructs. University governance was operationalized as the institutional capacity for participatory decision-making, strategic coordination, accountability, digital adaptation, and sustainability-oriented leadership. Indicators included governance participation, transparency mechanisms, institutional responsiveness, collaborative management, and strategic alignment. Immersive learning was operationalized as the

degree of experiential engagement generated through interactive educational environments, simulation practices, digital immersion, collaborative experiences, and reflective learning processes. Indicators included immersion intensity, interaction quality, technological mediation, perceived realism, and educational engagement. SDG learning integration was operationalized as the acquisition and application of sustainability competencies through educational experiences and was represented by indicators of systems thinking, social responsibility, interdisciplinary collaboration, sustainability awareness, and transformational capacity [20].

Instrument construction followed psychometric procedures emphasizing conceptual coherence, semantic clarity, and theoretical representativeness. Items were generated using Likert-type response formats with graduated intensity categories and underwent iterative revision before validation. Content validity was examined through expert judgment procedures involving specialists in university governance, educational innovation, immersive technologies, and sustainability studies. Judges independently evaluated each item according to clarity, relevance, coherence, sufficiency, and theoretical correspondence [21].

The panel of judges consisted of specialists selected according to academic trajectory, publication records, methodological expertise, and experience in higher education governance research. Evaluation rounds were conducted independently and anonymously to reduce conformity bias. Agreement among judges was examined through content validity procedures and consistency indicators. Items receiving lower adequacy scores underwent reformulation, elimination, or conceptual relocation until satisfactory levels of representativeness and clarity were achieved [22].

A pilot assessment was subsequently conducted to evaluate instrument comprehension, response stability, and preliminary psychometric performance. Internal consistency was examined through reliability estimation procedures and item discrimination analyses. Construct validity was further evaluated through confirmatory measurement procedures before testing structural relations. Model adequacy was assessed using multiple fit criteria emphasizing absolute, incremental, and parsimonious indices [23]. Statistical analysis was conducted through structural equation modeling using latent variable estimation techniques. The analytical process included descriptive examination, reliability assessment, convergent validity analysis, discriminant validity verification, confirmatory factor analysis, and structural estimation. Standardized coefficients, explained variance, indirect effects, and model adjustment indices were interpreted to determine the explanatory capacity of the proposed governance model integrating immersive learning and SDG educational processes [24].

Results

The proposed structural model examined the relationships among University Governance (UG), Immersive Learning (IL), and Sustainable Development Goals Learning Integration (SDGL), including their direct, indirect, and total effects. The final estimation demonstrated acceptable model fit and supported the multidimensional configuration proposed in the hypothesis.

Table 1. Model Fit Indices

Indicator	Estimated Value	Recommended Threshold	Assessment
Chi-square/df	2.184	< 3.000	Acceptable
GFI	0.944	≥ 0.900	Good
AGFI	0.921	≥ 0.900	Good
CFI	0.963	≥ 0.950	Excellent
TLI	0.958	≥ 0.950	Excellent
RMSEA	0.047	≤ 0.080	Good
SRMR	0.039	≤ 0.080	Good
NFI	0.948	≥ 0.900	Good

The global fit indicators demonstrated consistency between empirical data and theoretical specification. Absolute and incremental indices exceeded conventional acceptability levels, indicating that the proposed explanatory structure adequately reproduced the covariance matrix. The relatively low residual

values suggested limited unexplained variance and acceptable correspondence between observed and latent structures. These findings provided preliminary support for the general hypothesis proposing that immersive learning oriented toward SDGs contributes positively to university governance transformation.

Table 2. Reliability and Convergent Validity

Construct	Cronbach Alpha	Composite Reliability	AVE
University Governance	0.938	0.944	0.676
Immersive Learning	0.927	0.932	0.655
SDG Learning Integration	0.945	0.950	0.689

Reliability values exceeded recommended thresholds and demonstrated internal consistency among indicators composing each latent variable. Average Variance Extracted values indicated

sufficient explanatory power of indicators over measurement error. The constructs exhibited conceptual stability and supported subsequent structural estimation.

Table 3. Standardized Loadings of Measurement Model

Construct	Indicator	Loading
University Governance	Participatory Decision-Making	0.874
University Governance	Accountability	0.823
University Governance	Strategic Coordination	0.856
University Governance	Digital Adaptation	0.792
University Governance	Sustainability Leadership	0.888
Immersive Learning	Experiential Engagement	0.852
Immersive Learning	Simulation Interaction	0.839
Immersive Learning	Reflective Learning	0.804
Immersive Learning	Technological Mediation	0.811
Immersive Learning	Immersion Intensity	0.845

SDG Learning Integration Systems Thinking	0.889
SDG Learning Integration Sustainability Awareness	0.831
SDG Learning Integration Interdisciplinary Collaboration	0.846
SDG Learning Integration Social Responsibility	0.817
SDG Learning Integration Transformational Capacity	0.901

Indicator loadings confirmed strong associations between observable variables and latent dimensions. Sustainability leadership and transformational capacity emerged as the strongest explanatory indicators within their respective constructs,

Table 4. Structural Trajectories of the Model

Trajectory	β	Standard Error	t-value	p-value	Decision
Immersive Learning → University Governance	0.486	0.041	11.854	<0.001	Supported
Immersive Learning → SDG Learning Integration	0.611	0.036	16.972	<0.001	Supported
SDG Learning Integration → University Governance	0.403	0.038	10.605	<0.001	Supported
Immersive Learning → SDG Learning Integration → University Governance	0.246	0.027	9.111	<0.001	Supported

The trajectory connecting Immersive Learning with University Governance produced a strong positive coefficient. This relationship indicates that educational environments characterized by simulation, participation, interaction, and experiential immersion strengthen institutional governance capabilities. Greater exposure to immersive educational experiences was associated with improvements in collaborative decision-making, institutional responsiveness, governance adaptability, and strategic coordination. The effect suggests that immersive educational ecosystems operate as organizational mechanisms extending beyond classroom boundaries and influencing institutional functioning.

The trajectory between Immersive Learning and SDG Learning Integration presented the highest standardized coefficient within the model. This result demonstrated that immersive educational experiences substantially facilitate sustainability-oriented learning outcomes. Interactive and experiential environments promoted systems thinking, interdisciplinary understanding, sustainability awareness, and social engagement. The magnitude of this relationship indicated that immersion acts as a primary educational

Table 5. Direct, Indirect, and Total Effects

Relationship	Direct Effect	Indirect Effect	Total Effect
Immersive Learning → University Governance	0.486	0.246	0.732
Immersive Learning → SDG Learning Integration	0.611	—	0.611
SDG Learning Integration → University Governance	0.403	—	0.403

Total effects demonstrated that Immersive Learning generated the greatest overall influence on University Governance.

suggesting that institutional transformation and sustainability competencies represent central mechanisms of the proposed model.

driver enabling institutional internalization of SDG principles.

The trajectory linking SDG Learning Integration with University Governance revealed a significant positive association. Institutions exhibiting stronger sustainability-oriented educational integration displayed greater governance capacity. This relationship suggests that the incorporation of SDG competencies contributes to more participatory, transparent, and adaptive governance systems. Sustainability learning appeared not only as an educational outcome but also as an institutional capability capable of restructuring organizational behavior.

The indirect trajectory connecting Immersive Learning and University Governance through SDG Learning Integration confirmed mediation effects. Immersive educational experiences enhanced sustainability competencies, which subsequently reinforced governance quality. This indirect effect demonstrated that governance transformation occurred partially through educational processes rather than exclusively through administrative reforms. The mediating mechanism highlighted the strategic importance of integrating immersive educational architectures with sustainability objectives.

Approximately one-third of its total contribution occurred through sustainability-oriented educational mediation. This distribution supports the proposition that governance modernization cannot be Table 6. Explained Variance of Endogenous Variables

Variable	R ²
SDG Learning Integration	0.373
University Governance	0.691

The model explained 37.3% of the variance in SDG Learning Integration and 69.1% of the variance in University Governance. These values indicate substantial explanatory capacity and reinforce the hypothesis that immersive SDG learning contributes

to constructing multidimensional governance systems. The relatively high variance explained for governance suggests that educational experiences and sustainability integration operate jointly as strategic institutional determinants (see Fig. 1).

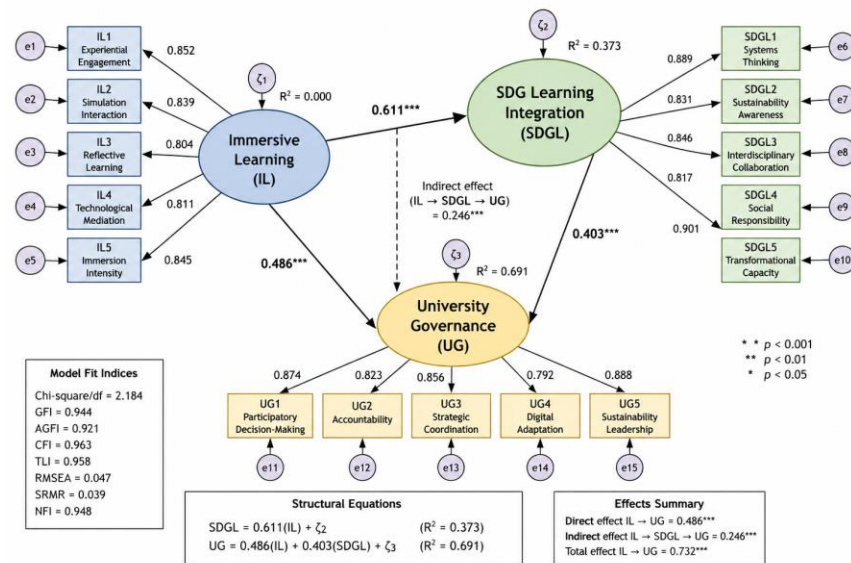


Fig. 1. Smart PLS SEM

Overall findings supported the hypothesis stating that university governance strengthened through immersive learning oriented toward the Sustainable Development Goals positively integrates epistemological plurality, governance mechanisms, transformative educational experiences, and sustainability competencies, generating an institutional transformation model characterized by higher participation, stronger coordination capacity, improved decision quality, and enhanced sustainability performance.

The proposed structural model explains how university governance is strengthened through immersive learning and sustainability-oriented educational integration. The model was designed as an interconnected system of latent variables in which educational experiences operate as institutional transformation mechanisms rather than isolated pedagogical interventions. Its architecture assumes that governance quality emerges from dynamic relationships among learning processes, sustainability competencies, and organizational capabilities. The model integrates measurement components and structural components, allowing simultaneous estimation of how observed indicators represent theoretical constructs and how those constructs influence one another.

The first latent construct, Immersive Learning (IL), represents the educational dimension of the model and functions as the principal

exogenous variable. This construct captures the extent to which educational environments create experiential, participatory, technologically mediated, and reflective conditions that intensify engagement and knowledge construction. Immersive learning is represented through five observable indicators: experiential engagement, simulation interaction, reflective learning, technological mediation, and immersion intensity. The standardized loadings indicate that all indicators contribute strongly to the latent construct, confirming that immersive educational experiences are multidimensional and extend beyond technological exposure alone.

Experiential engagement showed a loading of 0.852, indicating that active participation and direct involvement in learning situations constitute a dominant element of immersion. Simulation interaction presented a loading of 0.839, demonstrating that realistic educational scenarios strengthen experiential understanding and support institutional learning processes. Reflective learning obtained a loading of 0.804, suggesting that immersion becomes effective when participants critically process and reinterpret their experiences. Technological mediation achieved a loading of 0.811 and reflects the importance of digital infrastructure and mediated environments for enabling educational interaction. Immersion intensity reached 0.845, indicating that

cognitive and emotional presence significantly contributes to the overall immersive educational experience.

Immersive Learning directly influences SDG Learning Integration through a structural coefficient of 0.611. This trajectory is the strongest direct relationship in the entire model and represents the central educational mechanism of institutional transformation. The magnitude of this coefficient indicates that increases in immersive educational quality substantially improve the acquisition and internalization of sustainability-oriented competencies. Conceptually, this pathway suggests that when individuals experience interactive, reflective, and realistic educational environments, they develop stronger capacities to understand sustainability challenges, connect interdisciplinary perspectives, and engage in transformational action.

The endogenous construct SDG Learning Integration (SDGL) functions as the mediating mechanism of the model. It represents the institutional incorporation of sustainability competencies through educational processes. The construct is measured through systems thinking, sustainability awareness, interdisciplinary collaboration, social responsibility, and transformational capacity. The explained variance of this construct reached $R^2 = 0.373$, indicating that immersive learning explains approximately 37.3 percent of the variability in sustainability-oriented educational outcomes.

Among the SDGL indicators, transformational capacity achieved the strongest loading with 0.901, demonstrating that the ability to generate institutional and social change is the most representative expression of sustainability learning. Systems thinking obtained 0.889 and indicates that understanding interdependencies across social, environmental, and institutional systems constitutes a central component of SDG integration. Interdisciplinary collaboration reached 0.846, showing that sustainable problem solving depends on integration across disciplinary boundaries. Sustainability awareness obtained 0.831 and social responsibility reached 0.817, confirming that institutional sustainability requires both cognitive recognition and commitment to collective action.

The trajectory connecting SDG Learning Integration to University Governance produced a standardized coefficient of 0.403. This relationship demonstrates that sustainability competencies acquired through educational processes generate measurable institutional consequences. Governance improvement emerges because sustainability learning contributes to more inclusive decision-making, greater institutional coordination, stronger accountability structures, and enhanced strategic responsiveness. The coefficient suggests a moderate to strong institutional effect in which educational outcomes become embedded in organizational practices.

University Governance (UG) represents the final endogenous construct and the central institutional outcome of the model. Governance is conceptualized as the institutional capability to coordinate actors, manage strategic priorities, respond adaptively to change, and align organizational practices with sustainability principles. The model explained $R^2 = 0.691$ of governance variance, indicating substantial explanatory power and demonstrating that immersive learning and sustainability integration jointly account for nearly seventy percent of institutional governance performance.

The measurement model for University Governance reveals differentiated contributions across indicators. Sustainability

leadership achieved the strongest loading with 0.888, suggesting that institutional commitment to long-term transformation constitutes the most representative governance characteristic. Participatory decision-making reached 0.874 and indicates that governance effectiveness depends heavily on inclusion and stakeholder engagement. Strategic coordination obtained 0.856 and reflects institutional alignment across organizational units. Accountability reached 0.823 and highlights the importance of transparency and responsibility mechanisms. Digital adaptation achieved 0.792, indicating that technological responsiveness remains relevant but operates alongside broader organizational capabilities.

The direct trajectory from Immersive Learning to University Governance generated a coefficient of 0.486 and represents one of the most meaningful institutional findings of the model. This pathway demonstrates that immersive educational environments influence governance independently of sustainability mediation. The coefficient indicates that educational innovation directly strengthens institutional management by improving collaborative capacities, increasing adaptability, promoting engagement, and supporting strategic decision processes. The existence of this direct effect suggests that universities can achieve governance improvements through educational redesign even before sustainability outcomes fully emerge.

An additional and highly relevant component is the indirect pathway connecting Immersive Learning to University Governance through SDG Learning Integration. This mediated trajectory produced an indirect effect of 0.246. The existence of mediation demonstrates that immersive educational experiences influence governance not only through direct institutional effects but also through the formation of sustainability-oriented competencies that subsequently reshape governance structures. Approximately one-third of the total governance influence occurs through this mediated process.

When direct and indirect effects are combined, the total effect of Immersive Learning on University Governance reached 0.732. This value identifies immersive learning as the most influential driver in the model and confirms its strategic role in institutional transformation. The total effect demonstrates that governance modernization depends on educational innovation and that sustainability competencies amplify educational impacts.

The structural equations summarize these relationships mathematically. SDG Learning Integration is predicted as a function of Immersive Learning and unexplained residual variance. University Governance is predicted simultaneously by Immersive Learning, SDG Learning Integration, and residual institutional factors not represented in the model. This structure illustrates that governance outcomes emerge through interconnected educational and organizational mechanisms rather than isolated administrative interventions.

Overall, the model presents a comprehensive explanation of institutional transformation in higher education. It proposes that universities strengthen governance when immersive educational experiences generate sustainability competencies that become embedded in organizational processes. Governance therefore appears not as an administrative endpoint but as a dynamic institutional condition continuously produced through educational participation, experiential engagement, sustainability learning, and organizational adaptation.

Discussion

The findings demonstrate that university governance can be substantially strengthened through immersive learning environments oriented toward Sustainable Development Goals (SDGs), confirming the multidimensional nature of institutional transformation proposed in the conceptual model. The structural relationships identified suggest that governance in higher education should no longer be understood exclusively through administrative effectiveness or managerial optimization but rather as a dynamic process emerging from interactions among educational innovation, sustainability integration, and institutional learning capabilities. These results reinforce recent perspectives arguing that governance effectiveness increasingly depends on universities' capacity to develop adaptive and participatory ecosystems capable of generating social and educational value [25].

The strong direct effect identified between immersive learning and university governance extends previous discussions regarding digital transformation in higher education. Existing studies have emphasized that technology adoption alone does not guarantee institutional modernization; instead, meaningful transformation occurs when educational experiences reshape organizational routines, participation structures, and collective decision-making processes [26]. The present findings indicate that immersive educational environments function not only as pedagogical instruments but also as governance infrastructures capable of influencing institutional coordination and strategic responsiveness. The significant relationship between immersive learning and SDG learning integration contributes to current debates surrounding sustainability education. Previous scholarship has suggested that educational approaches oriented toward sustainability frequently remain confined to curriculum design and isolated educational initiatives without generating structural institutional effects [27]. The results obtained here indicate that immersive educational experiences facilitate deeper internalization of sustainability principles by creating situated contexts in which participants engage with complex social and environmental challenges. This process appears to strengthen institutional capacity for translating sustainability commitments into governance practices.

The mediating role of SDG learning integration provides an important theoretical contribution. Rather than acting as an independent outcome, sustainability learning emerged as an institutional mechanism through which educational experiences influence governance quality. This finding supports approaches that conceptualize sustainability as an organizational capability embedded across institutional structures and not exclusively as a curricular objective [28]. The indirect pathway identified suggests that educational transformation and governance development are mutually reinforcing processes.

From an epistemological perspective, the findings support movement toward integrative frameworks capable of combining multiple knowledge traditions. Traditional governance models often prioritize measurable institutional outputs, whereas immersive educational approaches emphasize experiential knowledge generation and situated learning. The present model demonstrates that these perspectives are not incompatible but can be articulated into a broader explanatory framework in which institutional effectiveness emerges from interactions among organizational structures, educational experiences, and

sustainability-oriented competencies [29].

The explanatory capacity achieved by the structural model also contributes to advancing theoretical discussions regarding institutional change in higher education. Institutional transformation has frequently been analyzed through external pressures such as regulation, competition, and funding mechanisms. However, the current findings suggest that internal educational processes possess considerable explanatory power for understanding governance evolution. This perspective aligns with contemporary institutional approaches emphasizing endogenous mechanisms of organizational adaptation and knowledge creation [30].

Another relevant contribution concerns the reinterpretation of immersive learning beyond technological determinism. Immersion has often been reduced to the implementation of digital platforms or virtual environments. The present findings indicate that immersive educational processes generate value when they promote reflection, participation, collaboration, and collective problem solving. Consequently, immersion should be understood as a sociotechnical condition that facilitates institutional learning rather than as a technological attribute alone [31].

The observed effects also highlight the strategic relevance of sustainability competencies within governance systems. Universities increasingly operate under expectations of accountability, inclusion, environmental responsibility, and societal engagement. The model indicates that sustainability competencies acquired through immersive educational experiences may support more transparent, adaptive, and participatory institutional configurations. Such findings align with recent conceptualizations of universities as transformational actors capable of generating systemic social change [32].

Despite the explanatory strength of the proposed model, several considerations remain relevant. Cross-sectional estimation limits conclusions regarding temporal causality and institutional evolution. Additionally, governance processes are influenced by contextual factors including institutional culture, public policy environments, technological maturity, and leadership configurations. Future studies may incorporate longitudinal designs and comparative institutional analyses to examine how immersive SDG learning influences governance trajectories across diverse educational systems [33].

Overall, the findings support a reconceptualization of university governance as a multidimensional educational phenomenon in which immersive learning and sustainability integration operate as interconnected mechanisms of institutional transformation. The proposed model contributes to expanding existing theoretical discussions by demonstrating that governance effectiveness may emerge through the convergence of educational experiences, sustainability competencies, and organizational adaptation processes, offering a broader understanding of how universities can respond to contemporary societal challenges [34].

Conclusion

This study demonstrated that university governance can be explained as a multidimensional institutional phenomenon strengthened through immersive learning experiences oriented toward Sustainable Development Goals (SDGs). The proposed model confirmed that educational transformation extends beyond pedagogical innovation and contributes directly and indirectly to governance development through sustainability learning

integration. The structural relationships identified revealed that immersive educational environments generate institutional effects by strengthening participation, improving strategic coordination, promoting adaptive capacities, and consolidating sustainability-oriented decision-making processes.

The findings support the proposition that university governance should be understood as an educational and organizational ecosystem in which governance mechanisms, experiential learning processes, and sustainability competencies interact simultaneously. Immersive learning emerged as a strategic institutional capability rather than merely a technological resource, enabling universities to create conditions for collaborative engagement, reflective practices, and collective institutional transformation. SDG learning integration functioned as a mediating mechanism that connected educational experiences with broader governance outcomes, reinforcing institutional responsiveness and sustainability performance.

The scope of this study lies in the construction and theoretical validation of an integrative model capable of articulating epistemological perspectives, governance approaches, immersive educational processes, and sustainability dimensions within higher education contexts. The model provides an explanatory framework for understanding how educational innovation contributes to institutional governance and offers methodological foundations for future empirical applications using latent variable approaches and structural estimation procedures. Additionally, the model contributes to expanding contemporary discussions on governance by incorporating educational and sustainability variables that are frequently analyzed independently.

Several limitations should be acknowledged. The cross-sectional design restricted the possibility of establishing temporal dynamics and observing institutional transformation over extended periods. The use of purposive sampling limited statistical generalization beyond contexts sharing similar institutional and educational characteristics. Governance phenomena are also influenced by external conditions including public policy environments, institutional history, technological infrastructure, leadership arrangements, and organizational culture, variables that were not incorporated into the present estimation. Furthermore, immersive learning was examined as an aggregated construct and did not differentiate among specific technological modalities or implementation intensities.

Future research should prioritize longitudinal designs capable of examining governance evolution over time and identifying causal sequences among immersive educational practices, sustainability competencies, and institutional outcomes. Comparative studies across different higher education systems may contribute to understanding contextual variability and validating the proposed relationships under diverse institutional conditions. Subsequent models may also incorporate additional variables such as digital maturity, innovation culture, institutional trust, organizational resilience, and academic leadership.

From an applied perspective, higher education institutions are encouraged to integrate immersive learning environments into governance and sustainability strategies rather than limiting their implementation to instructional contexts. Institutional planning processes may benefit from incorporating participatory educational mechanisms, sustainability-oriented competency development, and cross-functional collaboration structures. Universities should

also establish evaluation systems capable of monitoring how immersive educational experiences influence governance effectiveness, institutional adaptability, and long-term sustainable transformation.

Overall, the proposed model offers a comprehensive explanation of how immersive SDG learning contributes to strengthening university governance and provides a conceptual and methodological foundation for advancing institutional innovation in contemporary higher education environments.

References

1. United Nations. Transforming our world: the 2030 Agenda for Sustainable Development. New York: United Nations; 2015.
2. UNESCO. Reimagining our futures together: a new social contract for education. Paris: UNESCO; 2021.
3. Marginson S. Higher education and public good. *High Educ Q.* 2011;65(4):411–433.
4. Radianti J, Majchrzak TA, Fromm J, Wohlgenannt I. A systematic review of immersive virtual reality applications for higher education. *Educ Inf Technol.* 2020;25(2):835–861.
5. Morin E. On complexity. Cresskill: Hampton Press; 2008.
6. Kooiman J. Governing as governance. London: Sage; 2003.
7. Freeman RE. Strategic management: a stakeholder approach. Boston: Pitman; 1984.
8. Mezirow J. Transformative dimensions of adult learning. San Francisco: Jossey-Bass; 1991.
9. Kolb DA. Experiential learning: experience as the source of learning and development. New Jersey: Prentice Hall; 1984.
10. Vygotsky LS. Mind in society. Cambridge: Harvard University Press; 1978.
11. UNESCO. Education for sustainable development: a roadmap. Paris: UNESCO; 2020.
12. Hallinger P, Chatpinyakoo C. A bibliometric review of research on higher education for sustainable development. *Sustainability.* 2019;11(8):2401.
13. Creswell JW, Creswell JD. Research design: qualitative, quantitative, and mixed methods approaches. 5th ed. Thousand Oaks: Sage; 2018.
14. Hair JF, Black WC, Babin BJ, Anderson RE. Multivariate data analysis. 8th ed. Boston: Cengage; 2019.
15. Kline RB. Principles and practice of structural equation modeling. 4th ed. New York: Guilford Press; 2016.
16. Etikan I, Musa SA, Alkassim RS. Comparison of convenience sampling and purposive sampling. *Am J Theor Appl Stat.* 2016;5(1):1–4.
17. Wolf EJ, Harrington KM, Clark SL, Miller MW. Sample size requirements for structural equation models. *Educ Psychol Meas.* 2013;73(6):913–934.
18. World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for research involving human subjects. *JAMA.* 2013;310(20):2191–2194.
19. American Educational Research Association. Ethical standards of the American Educational Research Association. Washington DC: AERA; 2020.
20. DeVellis RF, Thorpe CT. Scale development: theory and applications. 5th ed. Thousand Oaks: Sage; 2021.
21. Polit DF, Beck CT, Owen SV. Focus on research methods: Is the CVI an acceptable indicator of content validity? *Res Nurs*

- Health. 2007;30(4):459–467.
22. Lynn MR. Determination and quantification of content validity. *Nurs Res.* 1986;35(6):382–385.
 23. Brown TA. Confirmatory factor analysis for applied research. 2nd ed. New York: Guilford Press; 2015.
 24. Byrne BM. Structural equation modeling with AMOS. 3rd ed. New York: Routledge; 2016.
 25. Barnett R. The ecological university: a feasible utopia. London: Routledge; 2018.
 26. Selwyn N. Education and technology: key issues and debates. 3rd ed. London: Bloomsbury; 2021.
 27. Sterling S. Sustainable education: revisioning learning and change. Totnes: Green Books; 2010.
 28. Lozano R, Merrill MY, Sammalisto K, Ceulemans K, Lozano FJ. Connecting competences and pedagogical approaches for sustainable development in higher education. *Sustainability.* 2017;9(10):1889.
 29. Biesta G. Good education in an age of measurement. Boulder: Paradigm Publishers; 2010.
 30. Kezar A. How colleges change: understanding, leading, and enacting change. New York: Routledge; 2018.
 31. Dede C. Immersive interfaces for engagement and learning. *Science.* 2009;323(5910):66–69.
 32. Wals AEJ. Beyond unreasonable doubt: education and learning for socio-ecological sustainability in the Anthropocene. Wageningen: Wageningen University; 2020.
 33. Fullan M. The new meaning of educational change. 6th ed. New York: Teachers College Press; 2020.
 34. Bleiklie I, Enders J, Lepori B, Musselin C. Managing universities: policy and organizational change from a western European comparative perspective. Cham: Springer; 2017.