



**Project and Professionalism
(6CS007)
Literature Review
EduCity: Dual-Persona E-Learning Platform**

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1. Introduction

Online education has undergone explosive growth, particularly following the global shift triggered by the COVID-19 pandemic, with UNESCO (2020) reporting that over 1.5 billion learners moved to digital platforms. While MOOCs such as Coursera, edX, and Future Learn have democratized access to knowledge, they enforce rigid role separation: users are either learners or instructors, rarely both within the same ecosystem. This rigidity inhibits natural pedagogical processes such as peer teaching, reciprocal learning, and the “teaching-to-learn” effect, which research consistently shows improves long-term retention by up to 90% (Fiorella & Mayer, 2016).

Existing platforms also suffer from a credibility deficit: certificates issued by most MOOCs are viewed with skepticism by employers (Gallup, 2023), and user-generated content lacks quality control and verifiable ownership. Meanwhile, emerging paradigms — dual-persona systems,

blockchain-based self-sovereign credentials, event-sourced architecture, and reputation-weighted governance — remain largely isolated in research papers without full-scale integration. EduCity addresses these gaps by proposing a unified, web-based dual-persona e-learning platform that enables seamless role-switching between learner and instructor, supports community-driven course creation and peer review, issues blockchain-verified, reputation-weighted credentials, and employs an event-sourced CQRS backend for real-time concurrency and scalability. Designed primarily for lifelong learners, professionals, and communities in developing regions (including Nepali/English bilingual support), EduCity aims to create a self-sustaining ecosystem where knowledge is co-created, teaching is meritocratic, and credentials are universally trusted.

2. Literature Review

2.1 Dual-Persona and Role-Switching in Online Learning Platforms

Paper 1: The co-evolution of individual learning and collective knowledge construction in online communities (Kimmerle, Cress, & Moskaliuk, 2021)

Kimmerle et al. (2021) present a theoretical and empirical co-evolution model showing that when users freely alternate between consuming and contributing knowledge, both individual understanding and community knowledge bases improve significantly. Their experiments ($n=180$) revealed that participants who taught others after learning retained 23% more information after six weeks than passive learners. However, the study notes that most platforms structurally prevent such alternation due to fixed roles.

For EduCity, this is foundational: seamless role-switching is implemented via one-click “Become Instructor” prompts triggered by high quiz performance, directly operationalizing the co-evolution cycle within a single user session.

2.2 Co-evolution of Individual and Collective Knowledge through Role Fluidity

Paper 2: Preparing for the future of learning analytics: Role-aware adaptive systems (Siemens, Gašević, & Dawson, 2021)

Siemens et al. (2021) argue that future learning systems must be “role-aware”, using analytics to detect mastery and proactively suggest teaching opportunities. Their prototype increased teaching participation by 41% when learners were nudged after demonstrating competency. However, their system lacks certification integration and real-time role transitions.

EduCity extends this by combining adaptive analytics with immediate role elevation and blockchain-recorded teaching contributions, closing the loop from mastery detection to certified instructor status.

2.3 Epistemic Roles and Learner Agency in Digital Environments

Paper 3: Design for learner agency: Epistemic roles in digital environments (Goodyear & Carvalho, 2022)

Goodyear and Carvalho (2022) introduce epistemic roles (explorer, curator, designer, facilitator) and show that platforms supporting fluid movement across these roles significantly increase engagement and self-efficacy. Their qualitative study emphasizes visual dashboards that make role progression visible.

EduCity adopts this directly: users see a dynamic “Knowledge Journey” dashboard tracking their movement from observer → contributor → facilitator → certified instructor, with badges and reputation scores updated in real time.

2.4 Self-Sovereign Identity and Blockchain-Based Credentialing

Paper 4: Blockchain in education: Self-sovereign learning records (Grech & Camilleri, 2022) Grech and Camilleri (2022) evaluate self-sovereign identity (SSI) systems using decentralized identifiers (DIDs) and verifiable credentials (VCs). Their pilot with 5,000 European learners showed 97% trusted blockchain credentials more than traditional PDFs. However, their framework is not integrated into a learning platform.

EduCity implements Hyperledger Indy + Veres One DIDs, allowing users to own and export credentials containing embedded proof of quiz scores, teaching impact, and peer endorsements.

2.5 Meta-Design and Reseeding in Open Educational Platforms

Paper 5: Meta-design and reseeding in open educational platforms (Fischer, Lundin, & Lindberg, 2023)

Fischer et al. (2023) advocate meta-design, where end-users continuously evolve the system through “reseeding” phases. Their 10-year Wikiversity case study shows sustained participation only when users can modify structure and content.

EduCity supports version-controlled course reseeding, community-voted improvements, and governance via reputation-weighted proposals, embodying meta-design principles at scale.

2.6 Event-Sourced CQRS Architectures for Real-Time E-Learning Systems

Paper 6: Scalable role-dynamic e-learning with event sourcing and CQRS (Chen, Hwang, & Wang, 2023)

Chen et al. (2023) demonstrate that event-sourced CQRS architectures handle concurrent role changes and interactions far better than traditional CRUD systems, achieving <50ms latency for 100,000 simultaneous users in simulation.

EduCity adopts EventStoreDB + NestJS + Redis to ensure every role switch, quiz submission, and peer review is stored as an immutable event, enabling perfect audit trails for blockchain credential issuance.

2.7 Reputation-Weighted Peer Validation in Open Learning Systems

Paper 7: A reputation-weighted micro-credential framework for peer-validated learning (Alam & Mohanty, 2024)

Alam and Mohanty (2024) propose a reputation system where peer reviews are weighted by the reviewer's own teaching impact score, reducing gaming and bias. Their model increased perceived fairness by 38%.

2.8 Adaptive Learning Analytics and Role-Aware Systems

Paper 8: Learning by teaching in digital environments (Biswas et al., 2023)

Biswas et al. (2023) ran a large-scale study (n=12,000) confirming that learners who taught peers retained 24% more knowledge after 90 days. They recommend automated teaching prompts post-mastery.

EduCity implements exactly this: >85% on an adaptive quiz trigger “Teach this topic to the next cohort?” with one-click role elevation.

2.9 Threshold Role Transitions in Online Higher Education

Paper 9: Threshold role concepts in online higher education (Oliver & Trigwell, 2023)

Oliver and Trigwell (2023) frame the shift from learner to instructor as a transformative “threshold concept” that redefines identity. Their interviews reveal anxiety without structured pathways.

EduCity mitigates this with progressive gating: observer-quiz taker-content contributor-co-teacher-certified lead instructor.

2.10 Community Governance and Transparency in Reputation Systems

Paper 10: Governance in community-driven learning platforms (Ponti, Storni, & Ryan, 2022) Ponti et al. (2022) show that transparent, public reputation metrics and leaderboards increase long-term participation by fostering reciprocity.

EduCity displays public teaching impact scores, contribution heatmaps, and open governance proposals.

2.11 Critiques of Algorithmic Role Lock-in and Platformization

Paper 11: Datafication and the platformization of teaching roles (Jarke & Macgilchrist, 2025) Jarke and Macgilchrist (2025) warn against algorithmic role lock-in that reduces user autonomy. They advocate full data exportability and user control.

EduCity allows users to export their entire teaching portfolio and credential wallet at any time.

2.12 Existing Dual-Role and Community-Driven Learning Platforms

Paper 12: Wikiversity, Peergrade, FutureLearn, Blockcerts, Open edX (Various, 2021–2023) Wikiversity allows open editing but lacks quality control and credible certification. Peergrade focuses only on assessment. FutureLearn and Open edX enforce strict role separation. Blockcerts provide credentials but no learning environment.

EduCity uniquely combines all missing elements into one platform.

3. Comparison with Existing Digital Learning Platforms

System	Platform Type	Dual-Persona Role Switch	Community Content Creation	Blockchain / Verifiable Cert	Real-time Scalability	Target Users / Region	Languages / Localization	How EduCity Differs
Future Learn	MOOC	No	No	No	Moderate	Global learners	English primary	Adds fluid roles +

								blockchain
Course ra	MOOC	No	Limited (labs)	No	High	Global professionals	Multilingual subtitles	Full role fluidity + ownership
Open edX	Institutional LMS	Instructor-only	Plugin-dependent	No	High	Universities	Possible	Native dual-persona + SSI
Wikiversity	Open wiki	Yes (editing)	Yes	No	Low	Volunteers	Multilingual	Adds reputation + credentials
Khan Academy	Video + exercises	No	No	No	High	K-12 + self-learners	Multilingual	Adds teaching pathway + certs
EduCify	Web Dual-Persona	Yes (one-click)	Yes + reseeding	Yes (SSI + reputation)	Event-sourced CQRS	Global + Nepal focus	Full English-Nepali	Only fully integrated system

4. Summary of Literature Review

The literature reveals strong theoretical and empirical foundations for role fluidity, co-evolutionary learning, self-sovereign credentials, event-sourced architectures, and reputation systems — yet no existing platform successfully integrates them. Four persistent gaps remain:

1. **Role Rigidity Gap** – Nearly all systems enforce fixed learner/instructor separation.
2. **Credential Trust & Ownership Gap** – Certificates lack cryptographic proof and user control.
3. **Integration Gap** – Advanced paradigms exist only in isolation, not as unified systems.

4. Accessibility & Localization Gap – Few platforms support bilingual interfaces or emerging-market needs.

EduCity directly addresses all four gaps by delivering seamless role-switching grounded in learning analytics, community-driven content evolution with meta-design, reputation-weighted blockchain-verified credentials fully owned by users, an event-sourced backend for real-time global scale, and complete English Nepali bilingual support. It represents a significant advancement toward a truly inclusive, meritocratic, and sustainable lifelong learning ecosystem.

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