

Designing an AI-Enabled, Project-Based Curriculum for Undergraduate FinTech Education: A Competency-Oriented Teaching Reform Framework

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Abstract: FinTech programs must integrate finance, computing, regulation, and ethical judgment while responding to rapid technological change. This conceptual study proposes a competency-oriented reform framework for undergraduate FinTech education by synthesizing research on constructive alignment, project-based learning, digital competence, and responsible artificial intelligence. The framework organizes learning around five competency domains: financial reasoning, data and AI practice, digital system design, regulatory and ethical judgment, and professional communication. It connects these domains to a four-layer curriculum, an authentic project cycle, portfolio-based assessment, and an explicit protocol for generative-AI use. A staged implementation and evaluation plan is provided, using performance tasks, analytic rubrics, learning portfolios, student feedback, and external review. The proposed reform shifts FinTech education from disconnected course coverage toward evidence-based capability development. It also offers a practical way to preserve academic integrity while treating AI as an object of critical inquiry and a supervised learning tool.

Keywords: FinTech education; Curriculum reform; Project-based learning; Competency-based education; Responsible artificial intelligence

Online publication: September 30, 2026

1. Introduction

Financial technology has developed from a narrow label for back-office digitization into a broad field involving platform finance, digital payments, algorithmic credit, blockchain, robo-advice, and data-driven regulation ^[1-3]. Its growth is changing the organization of financial intermediation and the skills expected of graduates ^[4,5]. Undergraduate programs therefore face a difficult design problem: they must retain rigorous

financial reasoning while adding programming, data analysis, systems thinking, and regulatory judgment.

Many programs respond by adding isolated technical courses. This increases content coverage but does not necessarily produce integrated capability. Students may learn valuation without reproducible data workflows, code without understanding model risk, or regulation without examining how rules affect product design. At the same time, generative AI can accelerate coding and explanation while also enabling opaque, unverifiable, or academically dishonest work^[6,7]. The central reform question is thus not simply what additional content should be taught, but how learning outcomes, teaching activities, assessment evidence, and responsible AI use should be aligned.

This paper develops a practical framework for an undergraduate FinTech major. It is a design-oriented study rather than a report of completed experimental results. Drawing on constructive alignment, active and project-based learning, digital competence, and AI literacy, it specifies competency domains, curriculum architecture, teaching processes, assessment methods, and an evaluation plan. The contribution is a coherent model that can be adapted to local course structures without claiming a universal syllabus.

2. Reform challenges in undergraduate FinTech education

2.1. Fragmented interdisciplinary knowledge

FinTech sits at the intersection of finance, information systems, data science, and law. The field is therefore vulnerable to curricular fragmentation: disciplinary courses are often sequenced administratively rather than through shared problems. Yet professional tasks—such as designing a credit model or evaluating a digital-payment product—require simultaneous attention to business value, data quality, system constraints, consumer protection, and explainability. Constructive alignment suggests that intended outcomes, learning activities, and assessment must reinforce the same integrated performance^[8].

2.2. Rapid technological change and the theory–practice gap

Tool-specific instruction ages quickly. A curriculum centered on one platform or programming package may create short-term fluency but weak transfer. Active learning and problem-based learning are more durable because students repeatedly apply principles to unfamiliar situations, receive feedback, and revise their reasoning^[9–11]. Project work also makes tacit integration visible through artifacts such as data dictionaries, model cards, prototypes, and audit reports^[12,13].

2.3. Assessment validity and responsible AI

Traditional examinations remain useful for foundational knowledge, but they cannot fully demonstrate whether a student can build, validate, explain, and govern a FinTech solution. Generative AI further weakens the evidential value of unsupervised take-home products. Banning AI is neither realistic nor educationally sufficient. Students need AI literacy: the capacity to understand capabilities and limits, evaluate outputs, recognize ethical consequences, and document human responsibility^[14,15]. Assessment must therefore combine process evidence, reproducibility, oral defense, and disclosure.

3. A competency-oriented reform framework

3.1. Five competency domains

The framework defines competence as the ability to mobilize knowledge, skills, and judgment in an authentic

context. Five mutually reinforcing domains are proposed. Financial reasoning covers markets, institutions, risk, valuation, and the economic logic of products. Data and AI practice covers data acquisition, cleaning, modeling, validation, and reproducibility. Digital system design covers architecture, interfaces, cybersecurity, and operational feasibility. Regulatory and ethical judgment covers privacy, fairness, explainability, compliance, and consumer protection. Professional communication covers teamwork, documentation, visualization, and decision-oriented presentation. This structure is consistent with broader digital-competence and future-skills frameworks while retaining finance as the organizing domain ^[16–18]. See **Table 1**.

Table 1. Alignment of competencies, authentic tasks, and assessment evidence

Competency domain	Observable learning outcome	Authentic task	Assessment evidence
Financial reasoning	Explain value creation, pricing, and risk	Evaluate a digital-credit or payment product	Decision memo; sensitivity analysis
Data and AI practice	Build and validate a reproducible model	Develop a credit-risk or fraud-detection pipeline	Code repository; model card; validation report
Digital system design	Translate requirements into a feasible solution	Prototype a secure customer journey and API logic	Architecture diagram; prototype; test log
Regulatory and ethical judgment	Identify compliance, fairness, and privacy risks	Conduct an algorithmic and consumer-protection audit	Risk register; audit report; mitigation plan
Professional communication	Defend choices for technical and nontechnical audiences	Present to a simulated investment-and-risk committee	Team presentation; oral defense; peer review

3.2. Four-layer curriculum architecture

The curriculum is organized in four layers. The foundation layer develops accounting, economics, statistics, financial markets, and programming. The integration layer connects these foundations through courses such as financial databases, machine learning for finance, digital-payment systems, and financial regulation. The application layer uses studios and laboratories organized around lending, wealth management, payments, insurance, and RegTech. The capstone layer requires teams to solve an open-ended problem for a realistic stakeholder and to submit both a functioning artifact and a governance dossier. Technology is treated as pedagogical content knowledge: teachers must decide not only which tools are available, but how each tool supports disciplinary understanding ^[19].

3.3. The authentic project cycle

Each major project follows six stages: diagnose, acquire, model, prototype, audit, and communicate. Students first define the financial problem and stakeholder criteria; they then document data provenance and quality. Next, they construct and compare models, translate the selected approach into a prototype, audit technical and social risks, and defend the final recommendation. Short lectures and guided exercises are delivered when they are needed within this cycle. This sequencing preserves explicit instruction while giving it an immediate application context.

4. Teaching, assessment, and responsible AI

4.1. Studio-based teaching and feedback

A typical module combines a concise concept briefing, a worked example, team studio time, a checkpoint critique, and individual reflection. Projects should increase in ambiguity across the program: early tasks

use curated data and defined metrics; later tasks require students to justify data, objectives, and trade-offs. Feedback is most effective when it helps learners compare current performance with explicit standards and plan the next revision ^[20]. Industry participation should focus on problem framing, critique, and external review rather than replacing academic responsibility.

4.2. An assessment system based on multiple evidence

Assessment should balance knowledge, product quality, process quality, and individual accountability. A recommended capstone structure allocates 20% to an individual concept test, 25% to the technical artifact, 20% to financial and regulatory analysis, 15% to reproducibility and documentation, 10% to the oral defense, and 10% to individual reflection and peer-calibrated contribution. Analytic rubrics make standards visible across courses. Portfolios preserve longitudinal evidence and support assessment for long-term learning rather than one-time performance ^[21].

4.3. A responsible-AI protocol

Students may use generative AI under a four-part protocol. First, permitted and prohibited uses are stated for every task. Second, students append an AI-use statement identifying tools, purposes, and materially adopted outputs. Third, factual claims, citations, code, and calculations must be independently verified; fabricated sources or undisclosed substitution of AI work for student reasoning are academic misconduct. Fourth, every submission must be reproducible and defensible orally. The protocol reframes AI from an invisible shortcut into a visible object of evaluation and critical inquiry ^[7,22].

5. Implementation and evaluation plan

Implementation can proceed over three academic years. In Year 1, the program maps existing courses to the five competency domains, identifies gaps and duplication, develops shared rubrics, and pilots one integrated project. In Year 2, projects are vertically sequenced across core courses, faculty development is provided for data, assessment, and AI governance, and an external advisory panel reviews capstone briefs. In Year 3, the program refines workload, strengthens cross-course data and tool standards, and institutionalizes portfolio review.

Evaluation should test whether the reform improves observable capability rather than merely student satisfaction. A baseline and end-of-program performance task can be scored blindly with the same rubric. Additional evidence should include portfolio progression, course completion, rubric reliability, student perceptions of workload and feedback, faculty implementation logs, and structured reviews by finance, technology, and compliance practitioners. Cohort comparisons may be informative, but causal claims should be made only when design and sample quality support them. Mixed evidence also helps identify whether weaker outcomes arise from curriculum design, teaching fidelity, resource constraints, or assessment inconsistency.

6. Discussion

The framework offers three advantages. First, it gives interdisciplinary content a common organizing logic: every course contributes evidence toward shared competencies. Second, authentic projects reduce the distance between conceptual learning and professional judgment without reducing education to tool training. Third, the responsible-AI protocol protects evidential validity while allowing students to learn

how AI changes financial work. These advantages depend on institutional capacity. Project teaching requires manageable team sizes, stable computing environments, shared datasets, faculty coordination, and moderation of scoring. External partners must not control assessment or expose students to confidential data.

The proposal also has limitations. It is a literature-informed design and requires local validation. Competency priorities will differ by regulation, labor market, student preparation, and institutional mission. Moreover, technology and AI policy will continue to change. The framework should therefore be treated as an adaptable governance structure, reviewed annually through evidence from student work and stakeholder feedback.

7. Conclusion

Effective FinTech education requires more than adding coding or AI to a finance degree. It requires aligned outcomes, authentic tasks, credible evidence, and explicit responsibility. The proposed five-domain, four-layer framework integrates financial reasoning, technical practice, system design, governance, and communication through a staged project cycle. Its implementation and evaluation plan provides a feasible route from fragmented course coverage to demonstrable graduate capability. By making AI use transparent, verifiable, and defensible, the reform can prepare students to innovate without separating technical performance from financial and social judgment.

Acknowledgements

The authors would like to express their sincere gratitude to Professor Li for valuable guidance, thoughtful suggestions, and continued support throughout the development of this study.

Disclosure statement

The authors declare no conflict of interest.

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