The Stayers, Stragglers, and Slippers: Tracking Student Journeys in a MOOC Certification Program

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INTRODUCTION

📌 **Background:** MOOCs provide flexible, low-cost education, but learner engagement varies, with some persisting while others disengage.

📌 **Gap:** Prior research focuses on single-course MOOCs, missing how engagement evolves in structured, multi-course programs.

📌 **Goal:** This study analyzes a **six-MOOC certification program**, identifying engagement trajectories, key success factors, and predictive patterns to enhance learner retention.

📌 **Research Questions**

1. How do engagement patterns evolve across courses?
2. What factors influence sustained engagement and achievement?
3. Which engagement patterns predict successful completion?

METHODOLOGY

📌 **Dataset**: 1,539 learners from a 6-course Coursera certification program (2020–2023).

📌 **Engagement Metrics**: Each activity—Readings, Lectures, Quizzes, Discussions, and Peer-Reviewed Assignments—was classified as Not Started (NS) if there was no interaction, Incomplete (IC) if partially completed, and Complete (CP) if fully completed.

📌 **Analytical Methods**

RQ	Method	Why?
RQ1	Transition Matrices & Longitudinal Cluster Analysis	Track engagement shifts & learner clusters over time.
RQ2	Logistic Regression	Identify which engagement factors predict achievement with interpretable coefficients.
RQ3	Random Forest & XGBoost	Improve predictive accuracy by handling complex interactions.
	Sequential Pattern Mining	Uncover behavioral pathways most associated with success.

DISCUSSION

📌 **Engagement Must Be Sustained, Not Just Sparked:** Use **milestone incentives and nudges** to keep learners active.
📌 **Personalized Learning Pathways Enhance Retention:** Adaptive content delivery, self-paced options, and AI-driven recommendations can optimize engagement.
📌 **Flexibility Without Fragmentation:** Structured checkpoints, catch-up weeks, and gradual workload adjustments balance autonomy with accountability.
📌 **Peer Interaction is a Long-Term Investment:** Gamification, scaffolded debates, and peer accountability mechanisms can sustain meaningful participation.
📌 **Predictive Analytics as an Early Warning System**: Targeted interventions, automated reminders, and adaptive feedback loops can prevent disengagement before it escalates.
📌 **Re-engagement Strategies Are Critical at Course Transitions:** Many learners drop off between courses, requiring personalized outreach, recommitment prompts, and structured re-entry pathways to sustain participation.

RESULTS

📌 RQ1. How Do Learner Engagement Patterns Evolve?

💡 **3 Key Learner Clusters:**

- Consistently High Engagers (50.1%) – Maintain strong engagement across all courses.
- Persistent Low Engagers (26.2%) – Limited interaction throughout.
- Initial High Engagers with Later Decline (23.7%) – Start strong but disengage over time.

Activity	NS >> IC	NS >> CP	IC >> NS	CP >> NS
Reading	72.3%	12.4%	100.0%	100.0%
Lecture	57.3%	19.4%	87.0%	100.0%
Quiz	23.2%	36.3%	69.2%	100.0%
Discussion	52.1%	16.0%	100.0%	100.0%
Peer-reviewed Assignment	0%	47.9%	0%	56.1%

✓ Delayed Engagement: Many learners started late but didn't always complete activities (e.g., 72.3% of NS → IC in Reading, 57.3% in Lectures). Quizzes had the highest direct NS → CP transition (36.3%), indicating a stronger focus on assessments.
✓ High Regression to Inactivity: 100% of CP → NS transitions in Readings, Lectures, Discussions, and Quizzes suggest dropout risk between courses. Peer-reviewed assignments had lower disengagement (56.1%), implying stronger retention.

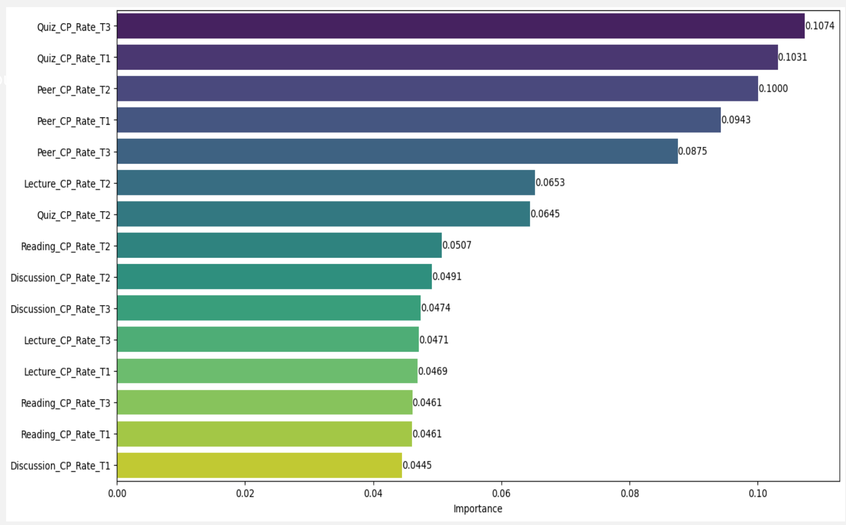
💡 **Key Takeaways:**

- Completion does not guarantee continued engagement—many learners disengage between courses.
- Assessments drive engagement, while passive activities like readings see higher dropouts.
- Intervention at course transitions is essential to retain learners and sustain momentum.

📌 RQ2. What Factors Predict Engagement & Achievement?

💡 **Key Predictors of Success (Logistic Regression)**

- Active participation drives success. Lecture, quiz, and peer-reviewed assignment completion are the strongest predictors.
- Quizzes become more critical over time, suggesting assessments help sustain engagement in later courses.
- Discussions & peer interactions matter. Learners engaging in collaborative activities have higher success rates.
- Reading completion is not a strong predictor, indicating that passive content consumption does not directly lead to achievement.

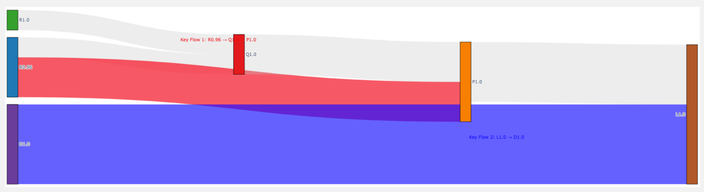


Random Forest (79.4%) & XGBoost (78.5%) confirm **late-stage quiz completion is the most influential feature,** reinforcing the need for assessment-driven engagement strategies.

📌 RQ3. Impact of MOOC Engagement Factors

💡 **Common Engagement Sequences**

- Complete Engagement Maintenance – Sustained lecture, quiz, and peer-reviewed assignment completion (469 students).
- Interactive & Reflective Learning Path – Heavy reliance on quizzes, discussions, and peer interactions (323 students).
- Content-Driven Learning – Strong engagement in reading and peer assessments (300 students).
- Selective Engagement Pattern – Moderate reading engagement but strong quiz & peer participation (232 students).



• Sankey Diagram confirms that sustained quiz participation and peer interaction are the strongest predictors of success.

💡 **Key Takeaways**

- Engaging with interactive and assessment-based activities (quizzes, discussions, peer reviews) leads to the highest success rates.
- Passive content consumption (reading) alone is insufficient.

IMPLICATION FOR MOOC DESIGN

📌 **Prevent Dropout Between Courses** – Use progress reminders, structured re-engagement prompts, and transition scaffolds to keep learners moving through multi-course programs.
📌 **Make Interaction Core, Not Optional** – Prioritize quizzes, discussions, and peer-reviewed assignments over passive lectures and readings to drive engagement.
📌 **Balance Flexibility with Accountability** – Implement soft deadlines, check-ins, and adaptive progress tracking to prevent disengagement without rigid pacing.
📌 **Use Data to Drive Timely Interventions** – Deploy real-time predictive alerts, automated nudges, and personalized support when disengagement patterns emerge.
📌 **Redefine Completion as Continuous Engagement** – Track learner progress across courses, using dynamic learner profiles, personalized recommendations, and community-driven retention strategies to sustain momentum.

💡 **MOOCs must actively guide learners through structured engagement, adaptive pacing, and real-time interventions to ensure long-term success.**

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📌 **Key References:**

Deng, R., Benckendorff, P., & Gannaway, D. (2019). *Progress and new directions for teaching and learning in MOOCs*. Computers & Education, 129, 48-60. https://doi.org/10.1016/j.compedu.2018.10.019

Gardner, J., & Brooks, C. (2018). *Student success prediction in MOOCs*. User Modeling and User-Adapted Interaction, 28(2), 127-203. https://doi.org/10.1007/s11257-018-9203-z

Hone, K. S., & El Said, G. R. (2016). *Exploring the factors affecting MOOC retention: A survey study.* Computers & Education, 98, 157-168. https://doi.org/10.1016/j.compedu.2016.03.016

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