The Rise and Fall of Conversations: Tracing Discussion Engagement across MOOCs with Latent Growth Modeling

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INTRODUCTION

MOOCs provide broad access to education, but discussion engagement declines over time. While prior studies focus on single-course engagement patterns, longitudinal trends across structured MOOC sequences remain underexplored. This study tracks posting, replying, and voting behaviors across a six-course MOOC professional certification program. Using Latent Growth Modeling (LGM), we examine how engagement evolves over time.

📌 **Self-Determination Theory**
- **Autonomy** (freedom in participation)
- **Competence** (confidence in contributions)
- **Relatedness** (sense of belonging)

📌 **Key Research Questions:**
1. How does engagement (posts, replies, votes) evolve?
2. How do learner characteristics (gender, race, age, education) influence engagement?
3. How do MOOC design factors (instructor presence, workload, pacing) shape participation?

METHODOLOGY

📌 **Study Context:**
- 6-MOOC Social Work professional certification offered through Coursera (8,808 learners)

📌 **Engagement Metrics:**
- Posting → New contributions
- Replying → Responses to others
- Voting → Peer endorsements

📌 **Predictor Variables:**
- Learner Characteristics: Gender, race, age, education
- MOOC Engagement Factors: Enrollment reason, prior MOOC experience, instructor presence, workload, course pacing

📌 **Analysis Approach:** Latent Growth Modeling to track individual engagement trajectories.
- Identify initial engagement levels (intercepts) and changes over time (slopes).
- Account for within-subject variability in engagement behaviors.
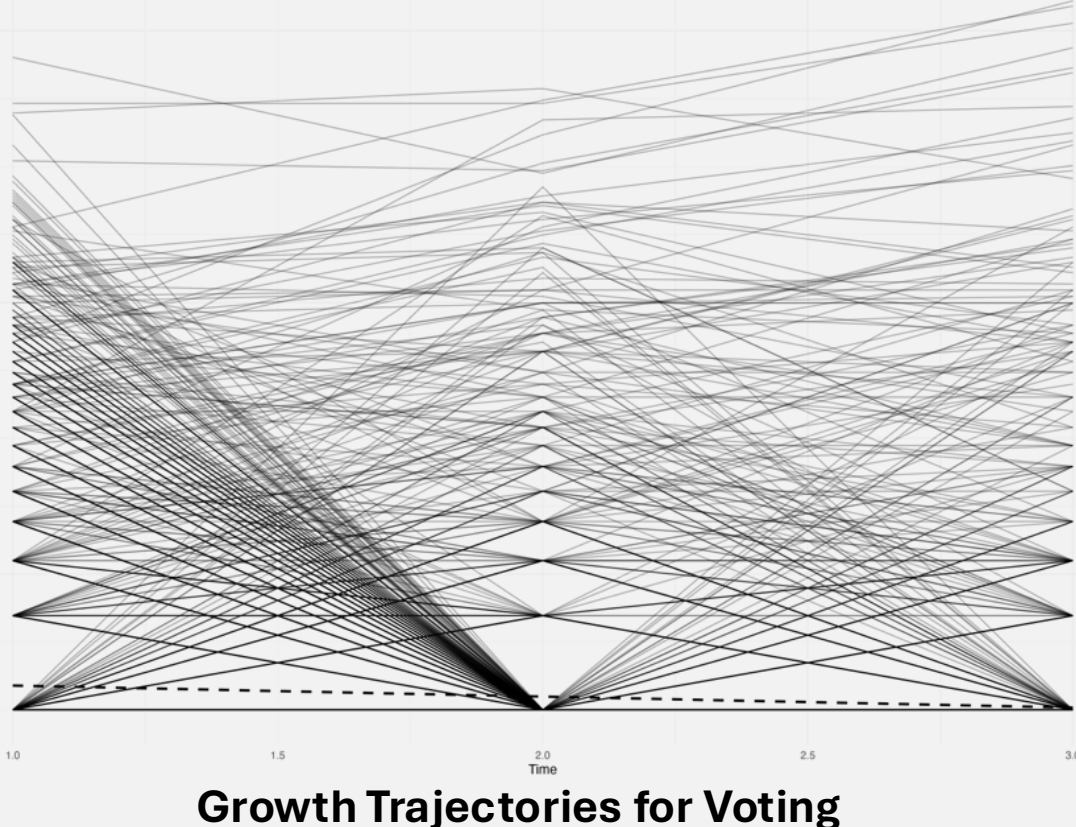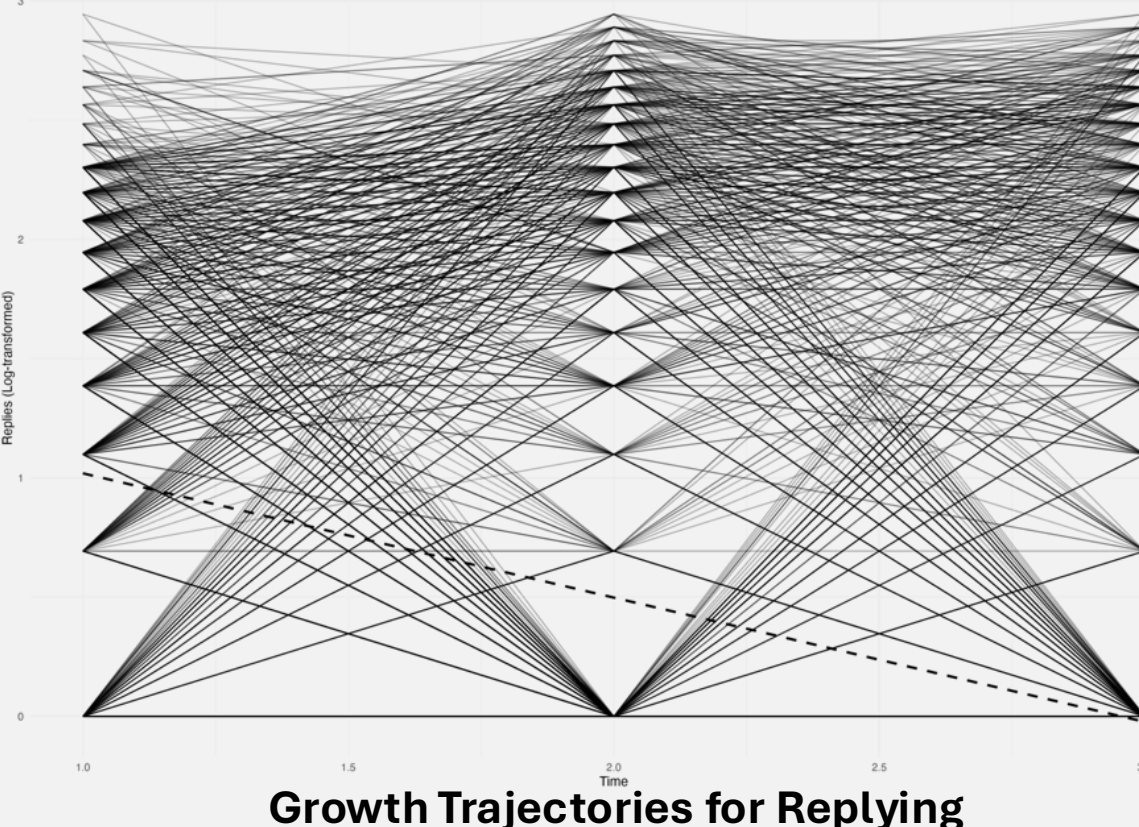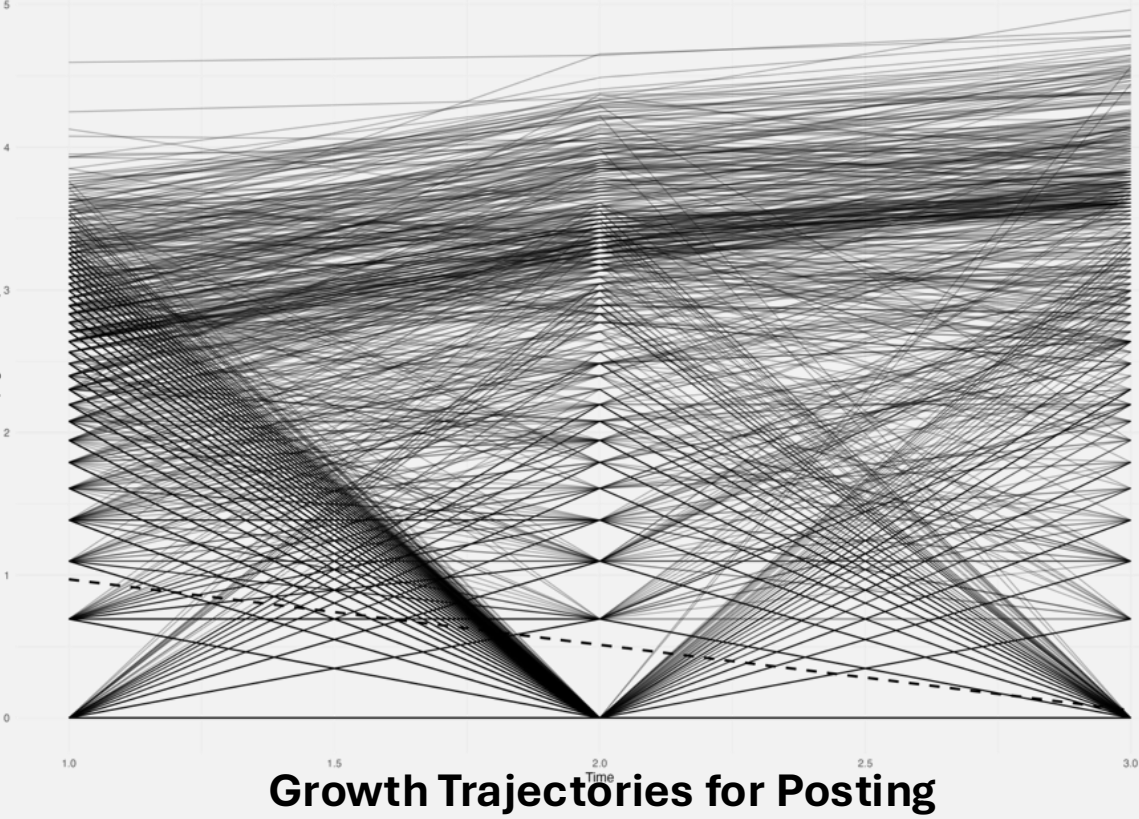- Explore predictor variables that explain variation in discussion participation patterns.

DISCUSSION

📌 **Key Takeaways:**
- Sustained posting behavior suggests that motivated learners continue contributing, while interaction declines.
- MOOC design is more influential than demographics, as instructor presence and workload shape participation patterns more than age, gender, or race.
- Declining replies and votes highlight the need for enhanced peer engagement mechanisms.
- LGM confirms that interventions at early and mid-course stages are critical for preventing disengagement.

📌 **Practical MOOC Design Strategies:**
- Introduce structured discussion prompts to sustain replying rates.
- Use adaptive workload strategies to maintain early engagement and avoid cognitive overload.
- Incorporate peer interaction incentives such as gamified voting and reputation-based rewards.
- Adopt a scaffolded instructor presence—frequently in early stages, reducing as learners gain autonomy.

RESULTS

📌 **RQ1. How Engagement Evolves over Time**
- **Posting intercepts are relatively high**, but the slope is nearly flat, suggesting that some learners sustain contributions while others decline.
- **Replying shows a negative slope**, indicating a steady decline across time.
- **Voting has the steepest decline**, suggesting it is the least sustainable engagement behavior.

Growth Trajectories for Posting

Growth Trajectories for Replying

Growth Trajectories for Voting

📌 **RQ2. Role of Learner Characteristics**
- **Intercept Effects:** White and older learners start with higher engagement levels, but engagement trajectories do not differ significantly across demographics.
- **Slope Effects:** Education level has a minor but positive influence on engagement retention, particularly in posting behaviors.
- **Gender Differences:** No significant impact on initial engagement or engagement changes over time.

Measure	Unconditional Model	Conditional Model	Extended Model
χ^2	9515.728	9252.219	9543.094
Degree of freedom	18	27	42
p-value	0.000	0.000	0.000
CFI	0.872	0.877	0.874
TLI	0.744	0.671	0.648
RMSEA	0.245	0.197	0.160
SRMR	0.151	0.103	0.078
AIC	80584.664	79825.037	79742.451
BIC	80775.916	80207.541	80337.458

Model Fit for Unconditional, Conditional, Extended LGMs

📌 **RQ3. Impact of MOOC Engagement Factors**
- **Instructor Presence & Workload lower initial engagement** (posts & votes) → Cognitive overload risk in structured discussions.
- **MOOC Experience** does not affect initial engagement but predicts sustained participation (posts & replies).
- **Instructor Presence** & **Workload** boost long-term engagement, despite their early negative impact.
- **Course Pacing** & **Enrollment Reason** have no significant effect on initial or long-term engagement.

Predictor	Posts (Intercept)	Replies (Intercept)	Votes (Intercept)
MOOC Experience	NS	NS	NS
Instructor Presence	↓ -0.280 (p = .012)	NS	↓ -0.129 (p = .028)
Workload	↓ -0.344 (p = .005)	NS	NS

Predictor	Posts (Slope)	Replies (Slope)	Votes (Slope)
MOOC Experience	↑ 0.052 (p < .001)	↑ 0.040 (p < .001)	NS
Instructor Presence	↑ 0.220 (p < .001)	NS	↑ 0.079 (p = .004)
Workload	↑ 0.205 (p < .001)	⛔ 0.091 (p = .059)	↑ 0.066 (p = .031)

Note: ↑ = Positive effect (increase engagement) vs. ↓ = Negative effect

CONCLUSION

📌 **MOOC discussion engagement declines over time, but LGM reveals actionable strategies to sustain participation:** Posting remains relatively stable; while replying and voting require targeted interventions.

📌 **Course design has a stronger influence than learner demographics, highlighting the need for intentional instructional strategies:** Structured instructor presence and adaptive workload can mitigate disengagement trends.

📌 **Future Research Directions:**
- Investigate **discussion quality and sentiment analysis** to uncover deeper interaction patterns beyond participation metrics.
- Develop **engagement models integrating gamification, peer incentives, and AI-driven adaptive feedback** to promote sustained interaction.
- Analyze **self-paced and competency-based MOOCs** to assess how flexible learning structures affect long-term discussion engagement.
- Explore **the role of AI tutors and chatbot-facilitated discussions** in sustaining engagement across diverse learning cohorts.

ACKNOWLEDGEMENT & REFERENCES

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