

Working Paper Series

No. 11-2026

Author Voices in the Classroom: A Podcast-Integrated Approach to Inclusive Pedagogy in Postgraduate Economics Education *

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This paper evaluates a podcast-integrated teaching intervention designed to improve student engagement with empirical research articles in a postgraduate economics course. Recognizing that journal articles, particularly in technical modules such as econometrics, can present affective and epistemic barriers, the intervention paired assigned readings with an integrated sequence of student-generated interview questions, short-form podcast interviews with the original authors, and online discussions with those authors. The podcast interviews, shaped by student-submitted questions, explored research motivations, methodological trade-offs, and fieldwork challenges. Using a difference-in-differences design that exploits within-student variation across seminar weeks, the study finds that the intervention significantly improved students' reading motivation, perceived comprehension, emotional connection to research, and behavioral engagement, including greater participation in seminar discussions. Qualitative evidence further suggests that the intervention reframed econometrics as a human-centered, narrative-rich practice, positioning students as co-inquirers rather than passive recipients. The findings demonstrate that thoughtfully integrated podcast-based pedagogy can enhance student engagement while creating reusable teaching resources that support more inclusive economics education.

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Conflict of Interest: None

^{*}I am grateful to Chowdhury Rashaad Shabab, Gabriella Cagliesi, Barry Reilly, Sambit Bhattacharyya, Marco De Los Reyes, and participants at the Sussex Education Festival in 2024 and 2026 for helpful conversations and feedback on the project. The project was supported by the University of Sussex Engagement Facilitation Fund (EFF), which funded podcast production. Special thanks to the authors of the selected journal articles for generously contributing their time to this project. Finally, I thank Steven Proud, Associate Editor of The Journal of Economic Education, and two anonymous referees for constructive comments that improved the manuscript.

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1 Introduction

Engaging students with complex academic literature remains a persistent challenge in postgraduate economics education, where journal articles serve as both epistemic gatekeepers and disciplinary touchstones. For students from diverse disciplinary, cultural, and professional backgrounds, such texts can feel abstract, opaque, or alienating (Ashwin, 2015; McCune, 2019; Quinn, 2012; Nieminen and Ketonen, 2024). These affective and epistemic barriers not only hinder comprehension but also suppress motivation, confidence, and identity alignment, all of which are critical for sustained engagement in technical courses such as econometrics (Becker, 2004; Shabab, 2024).

This paper presents and evaluates a bespoke podcast-integrated teaching intervention designed to promote more inclusive engagement with empirical journal articles in a postgraduate econometrics module. Five assigned papers were integrated into a three-stage learning sequence comprising student-generated interview questions, pre-recorded podcast interviews with the original authors, and online discussions with those authors. The interviews explored research motivations, fieldwork dilemmas, and methodological decisions. This multimodal, dialogic format aimed not to replace technical content but to humanize it by situating empirical methods within the motivations, decisions, and experiences that shape the research process. Unlike generic educational media, these episodes were informed by student-submitted questions and modeled reciprocal teaching through direct engagement with the original authors. Although the intervention required substantial upfront coordination with participating researchers, the resulting podcast episodes constitute reusable pedagogical resources because much of the discussion centers on enduring aspects of the research process, including research motivation, methodological decisions, and fieldwork experiences.

The intervention was grounded in three interconnected design principles: affective scaffolding, narrative framing, and dialogic participation. Drawing on inclusive and postdigital pedagogies (Fawns, 2019; Asarta, 2024; Birdi et al., 2023; Freire, 1970), the podcasts were designed to make research emotionally resonant and socially situated. They positioned students not as passive consumers of econometric knowledge but as co-inquirers capable of interrogating and contributing to the research process. Student-submitted questions functioned as an “annotative framework”¹ (Porter, 2022), transforming reading from an extractive activity into a dialogic, participatory encounter.

The effectiveness of this design was evaluated using a mixed-methods approach combining within- and between-cohort comparisons. Quantitative evidence from difference-in-differences models exploiting within-student variation across seminar weeks showed statistically significant improvements in reading motivation, perceived comprehension, emotional connection to research, and discussion participation. Spillover effects were also observed, with higher engagement persisting during non-intervention weeks. These findings were supported by qualitative evidence from student reflections and pre-seminar question submissions, which revealed a shift in how students positioned themselves

¹Annotative frameworks refer to pedagogical designs that prompt students to actively comment on, question, or reframe academic texts or media, often functioning as a form of collaborative interpretation and engagement. Annotation has been used to transform reading from passive to dialogic engagement (Porter, 2022).

in relation to research: from technical decoding toward narrative, critical, and motivational engagement. Rather than asking only about identification strategies or robustness, students increasingly posed questions about author motivation, ethics, and scholarly identity.

Importantly, the intervention did not crowd out reading or dilute rigor (McGarr, 2009). Instead, it increased students' willingness to engage with complex empirical papers by making the research process visible, affective, and dialogic. Students described the readings as "alive," "relatable," or "inspiring," in sharp contrast to feedback from the earlier non-intervention cohort, which characterized them as "dense," "intimidating," or "dry." These findings echo recent work suggesting that multimodal pedagogical scaffolds² can deepen engagement and foster epistemic access without reducing academic challenge (Moryl, 2013; Roach, 2014; Choi et al., 2024; Johnson and Meder, 2024; Sutton-Brady et al., 2009).

Three overlapping literatures inform this study. First, research on affective engagement³ highlights the emotional, motivational, and identity-based dimensions of learning, particularly in technical and quantitative fields (Krathwohl et al., 1964; Asarta, 2024; Nieminen and Ketonen, 2024). Second, scholarship on multimodal pedagogy demonstrates how audio-based tools can scaffold access to abstract material by foregrounding voice, story, and authorial presence (McGarr, 2009; Fernandez et al., 2009; Dragseth, 2020; Souza and Bingham, 2005). Third, economics education research has long grappled with making technical content more inclusive without sacrificing rigor (Becker, 2004; Birdi et al., 2023; Ping, 2003). This paper contributes to these conversations by providing a theoretically grounded and empirically supported model of inclusive pedagogy.

As postgraduate economics programs become increasingly international and interdisciplinary, the diversity of student preparation continues to widen (McDougall et al., 2025). This presents both a challenge and an opportunity for curriculum design in technical modules such as econometrics, where affective entry points and identity alignment are often overlooked. By positioning the podcast-integrated intervention as a relational pedagogical tool that fosters emotional, cognitive, and dialogic engagement, this paper offers a transferable strategy for promoting more inclusive engagement with empirical research in economics and related disciplines.

2 Literature

A growing body of research highlights the persistent gap between assigning academic readings and fostering genuine student engagement, measured not only by comprehension but also by motivation,

²Multimodal scaffolding theory, as discussed by Fawns (2019), emphasizes the use of multiple, coordinated modes of representation, such as text, audio, visuals, and social interaction, to support learning. Rather than viewing learning as the transmission of content, this approach foregrounds the interplay of cognitive, emotional, and social processes, especially in digital or postdigital settings. Multimodal scaffolds can lower affective and epistemic barriers, helping learners engage more meaningfully with complex or abstract material. In this context, podcasts function as such scaffolds by combining narrative, voice, and dialogic elements to make empirical research more accessible and humanized.

³Affective engagement, following Krathwohl et al. (1964), refers to the emotional, motivational, and identity-related dimensions of learning, such as interest, empathy, curiosity, and confidence, that shape how students relate to knowledge and participate in learning environments.

confidence, and epistemic belonging (Bean, 2014; Starcher and Proffitt, 2011; Doolittle et al., 2006; Nieminen and Ketonen, 2024). These challenges are particularly pronounced in quantitative fields such as economics, where empirical journal articles may feel impenetrable because of dense technical notation, limited contextualization, or unfamiliar epistemologies. This review draws on three overlapping strands of scholarship to situate the intervention.

2.1 Barriers to Reading Engagement

Student disengagement from assigned readings is well documented, particularly when texts are technical, convention-laden, or lack appropriate scaffolding. In economics, students frequently describe empirical journal articles as intimidating or difficult to follow, which inhibits not only comprehension but also students' willingness to persist with reading (Starcher and Proffitt, 2011; Khusniyah and Lustyantje, 2017). Common pedagogical responses, such as reciprocal teaching⁴ and annotation frameworks, seek to improve comprehension through structured questioning (Doolittle et al., 2006). However, these strategies often assume that students are already motivated to begin reading and therefore overlook an earlier obstacle: the initiation barrier, in which students never begin reading because they anticipate difficulty, perceive little relevance, or fear failure.

This barrier is especially salient in postgraduate econometrics, where notation-heavy texts and unfamiliar identification strategies create both cognitive and affective friction. As Becker (2004) argues, empirical articles can function less as learning tools than as disciplinary gatekeeping devices. Similarly, Shabab (2024) finds that disengagement in such contexts is not merely cognitive but also behavioral, driven by anxiety, loss aversion, and identity dissonance. Students may be physically present in class yet remain excluded from meaningful disciplinary participation because of low self-efficacy or perceived epistemic illegitimacy (McCune, 2019; O'Shea et al., 2023). Pedagogical interventions should therefore address not only students' comprehension of content but also their willingness and confidence to engage with it. The podcast-integrated intervention evaluated in this paper was designed to reduce these initiation barriers by humanizing research, foregrounding authorial voice, and providing narrative entry points into technical literature.

2.2 Affect, Narrative, and Inclusive Learning

A growing literature in higher education identifies the affective domain, encompassing emotion, identity, and motivation, as central to student learning, particularly in diverse and interdisciplinary classrooms (Krathwohl et al., 1964; McCune, 2019; Quinn, 2012). Engagement deepens when students perceive academic material as relevant to their own aspirations and experiences and when learning environments foster confidence, curiosity, and belonging (McCune, 2019; Quinn, 2012). Narrative pedagogy offers one pathway for supporting these affective dimensions. Research across disciplines

⁴Reciprocal teaching is a structured, dialogic learning strategy in which students and instructors take turns leading discussions using four key activities: questioning, summarizing, clarifying, and predicting, to foster metacognitive awareness and deeper text comprehension (Palinscar and Brown, 1984). Originally developed for reading instruction, it has since been adapted across disciplines, including economics, to promote active engagement with complex texts (Doolittle et al., 2006).

suggests that story-based approaches enhance learning by fostering empathy, emotional resonance, and perceived relevance (Bleakley, 2005). When students encounter knowledge through human stories, they are better able to situate it in real-world contexts and view themselves as legitimate participants in disciplinary dialogue.

Narrative approaches remain relatively underutilized in economics education, particularly in econometrics, where abstraction and generalizability often take precedence over context and reflexivity. The intervention evaluated here uses narrative to bridge the gap between students and empirical research by giving students access to authors' motivations, methodological decisions, and fieldwork experiences. In doing so, it aligns with models of inclusive pedagogy that position students as active participants in knowledge construction rather than passive recipients of knowledge (O'Shea et al., 2023; Healey et al., 2014).

2.3 Podcast Pedagogy and Multimodal Engagement

Podcasts have emerged as flexible, multimodal teaching tools well suited to diverse and asynchronous learning environments. Reviews of podcast use in higher education highlight their accessibility, portability, and affective resonance, particularly for postgraduate students and those from underrepresented groups (McGarr, 2009; Fernandez et al., 2009). Compared with static texts, podcasts provide a dialogic medium that allows greater variation in pacing, tone, and structure, reducing cognitive load and making abstract material more approachable (Choi et al., 2024).

In economics education, podcasts have primarily been used as lecture supplements or revision aids. Empirical evidence suggests that they support comprehension, reflection, and self-paced learning, especially when used alongside traditional instructional materials (Moryl and Jiang, 2013; Choi et al., 2024). They also appear to promote greater student participation, particularly in diverse classrooms (Sheridan et al., 2025). Podcasts can therefore support learning across cognitive, behavioral, and affective dimensions. However, most applications remain focused on content delivery rather than engagement with primary research. Few studies have examined how podcasts can facilitate engagement with technical academic literature, particularly in postgraduate or quantitatively intensive courses. Recent work on student-created podcasts offers promising models of student voice and co-construction (Hernandez-Lopez and Mendoza-Jimenez, 2025; Trendafilov and Mihal, 2025), although these studies typically focus on undergraduate students and broader disciplinary topics.

This study extends that literature by conceptualizing podcast-integrated pedagogy not simply as a content-delivery tool but as a means of promoting engagement with empirical research through narrative, dialogue, and authorial voice. By integrating author interviews, student-generated questions, and seminar discussion, the intervention positions podcasts as relational artifacts that support both understanding and belonging. In doing so, it responds to calls for more inclusive, multimodal pedagogies in quantitative education and offers a new approach to engaging students with empirical research literature (Ashwin, 2015; Fawns, 2019; O'Shea et al., 2023).

3 Intervention Design

This study evaluates a podcast-integrated teaching intervention introduced in a core Econometrics module on a one-year postgraduate Economics course at a UK research-intensive university. The module introduces key econometric techniques, including linear regression, difference-in-differences, instrumental variables, and experimental design, through applications in development economics. Weekly seminars complement lectures by fostering critical engagement with empirical journal articles and their methodological foundations.

The student cohorts came from diverse disciplinary and geographic backgrounds.⁵ While many students had prior economics training, others came from public policy or interdisciplinary social science degrees, with varying levels of quantitative experience. This diversity enriched classroom discussion but also created challenges in adapting to the norms and expectations of technical readings. To address these challenges, the podcast-integrated teaching model was piloted in 2024 (Cohort B, $n = 27$ students), while the 2023 cohort (Cohort A, $n = 24$ students) received the traditional version of the module.⁶ There were no changes in curriculum, readings, assessments, or instructors between the two cohorts. The same instructor delivered the lectures and moderated the seminars. The intervention aimed not to replace reading but to humanize authors and demystify research, enabling students to access texts through affective and contextual entry points (Hounsell, 2007; Fawns, 2019).

The intervention was developed specifically for this module rather than building on an existing departmental seminar or speaker series. These seminars were regular scheduled teaching sessions attended only by students enrolled in the module and were not open departmental seminars or public research events. Weekly teaching consisted of a two-hour lecture and a two-hour seminar. Within each seminar, approximately one hour was devoted to discussion of an assigned empirical journal article, while the remaining time focused on econometrics problem sets and methodological exercises. For the intervention cohort, the discussion component was redesigned to incorporate three integrated elements: (i) student-generated questions submitted before the interview, (ii) a pre-recorded podcast conversation with the paper's author, and (iii) an online discussion with the author. Thus, the intervention extended beyond podcast provision alone and represented an integrated pedagogical redesign of the paper-discussion component of the seminar. Throughout the remainder of the paper, the term podcast-integrated intervention (or simply intervention) refers to the complete pedagogical package comprising student-generated questioning, pre-recorded author podcasts, and online author discussions, rather than to the podcast recordings in isolation.

The intervention was structured around five empirical papers aligned with the module's econometric topics: randomized controlled trials, difference-in-differences, triple-differences, and instrumental variables. The papers were drawn from top general or field journals, and selection reflected both methodological fit and thematic resonance. The papers covered social protection and gender (Roy

⁵Over 80% of students were international, with substantial representation from South Asia, Sub-Saharan Africa, Latin America, and Europe.

⁶Student numbers include students auditing the module. Cohort A was also unaware of the upcoming intervention, reducing the possibility of expectancy effects.

et al., 2019), disaster and infant health (Gunnsteinsson et al., 2022), education (Islam et al., 2021), ethnic competition (Siddique and Vlassopoulos, 2020), and labor standards (Bossavie et al., 2023). All five papers studied contexts in the Global South, aligning with many students' lived experiences and supporting epistemic inclusivity (Quinn, 2012). Each article was first introduced in the weekly lecture to establish its methodological relevance before students engaged with it in the seminar.

The five papers were selected before implementation of the intervention using three criteria. First, each paper needed to align closely with the econometric technique being taught that week and provide an appropriate empirical application for seminar discussion. Second, the papers were chosen to reflect substantive topics in development economics that were likely to resonate with the diverse international student cohort. Third, because the intervention relied on direct participation by one of the paper's authors, priority was given to papers for which author participation was feasible, including papers where the instructor had an existing professional relationship with at least one author or where participation was otherwise realistically attainable. This practical consideration influenced paper selection but did not affect comparability across cohorts, as the same five papers were assigned in both years.

Each selected paper was paired with a podcast episode produced in collaboration with one of the original authors. The same five journal articles were assigned in both Cohort A and Cohort B. The only pedagogical difference was that students in Cohort B additionally participated in the podcast-integrated activities and opportunities for online interaction with one of the paper authors. This design ensured that differences between cohorts were not driven by changes in reading materials or topic selection. Students actively shaped each episode. Two weeks before the seminar, they were asked to read the paper and submit one technical and one interpretive or reflective question. Participation was voluntary and not assessed. Questions were anonymized before being used to inform the interview script. Episodes consisted of 25–30 minute interviews conducted online and edited for clarity and accessibility.⁷

Rather than simply summarizing the papers' findings, the interviews, shaped by student-submitted questions, explored both the technical and human dimensions of the assigned research. Topics included research motivation, identification strategies, methodological decisions, empirical challenges, robustness considerations, fieldwork experiences, ethical dilemmas, and policy implications. The aim was to humanize the research process, foreground authorial voice, and provide students with a narrative and affective entry point into the paper, consistent with multimodal scaffolding theory (Fawns, 2019). Transcripts, captions, and a short written summary were provided for each episode to support accessibility and inclusive learning (McGarr, 2009; Hernandez-Lopez and Mendoza-Jimenez, 2025). The interviews focused primarily on enduring aspects of the research process, including the motivation for the study, research design choices, fieldwork experiences, and methodological trade-offs. Consequently, the podcast episodes remain pedagogically relevant beyond a single offering of the module. Future cohorts can reuse the core interviews while generating their own seminar discussion questions.

⁷The podcast interviews were conducted and recorded over Zoom, edited using Adobe Premiere for video versions and Adobe Audition for audio versions, and shared with students in both formats.

Implementing the intervention required a meaningful initial investment of instructor time. This included identifying and inviting participating authors, arranging interview schedules, recording and editing podcast episodes, and coordinating online discussions. These activities represented the principal implementation costs of the intervention. However, these costs were concentrated in the initial development phase. As long as the same empirical papers are retained across successive offerings of the module, and because the interviews focus primarily on enduring aspects of the research process, the resulting podcast library can be reused in future iterations of the course with only minimal additional preparation. Future cohorts can continue to generate their own discussion questions around the existing episodes or, where desired, supplement them with updated live discussions.⁸

Podcasts were released on the virtual learning platform (Canvas) one week before the seminar. Students were encouraged to listen before rereading the paper and to reflect on how hearing the author affected their understanding.⁹ Two days before the seminar, students submitted discussion questions, though this task was not formally assessed. The submitted questions were then thematically categorized for in-class discussion. In podcast-integrated seminars, the interviewed author joined live for a 30-minute Q&A, giving students the opportunity to question research decisions directly and deepen epistemic engagement (Trendafilov and Mihal, 2025).¹⁰

The module ran for twelve weeks with ten weekly two-hour seminars, supported by lectures and readings. Table 1 provides the full implementation timeline. The intervention was embedded in Seminars 4, 5, 8, 9, and 10 for Cohort B. The remaining seminars (1, 2, 3, 6, and 7) followed the traditional discussion-based format. This interleaved structure enabled both within-cohort comparisons between standard and podcast-integrated seminars for Cohort B and cross-cohort comparisons with Cohort A, which experienced the same module without the intervention. Each intervention seminar followed a consistent four-stage sequence:

- **Two weeks before the seminar:** Students read the assigned journal article and submitted two questions, one technical and one reflective, to help shape the upcoming podcast.
- **One week before the seminar:** The podcast episode was released on Canvas.
- **Two days before the seminar:** Students submitted discussion questions for the seminar.
- **Seminar day:** The class engaged in structured dialogue based on the student-submitted questions. The interviewed author joined live via Zoom for a 30-minute Q&A.¹¹

⁸All selected papers featured an author interview. In four cases, the initially invited author participated in the intervention. In one case, the invited author was unavailable because of scheduling constraints and introduced the instructor to a co-author, who participated in the intervention instead.

⁹Post-seminar surveys indicate that approximately 96% of attendees in intervention seminars reported listening to the assigned podcast. Canvas analytics further show an average listening time of 19 minutes per episode, approximately 73% of the assigned episode length, with 94% of student-episode observations involving listening to at least half of the assigned podcast. More than 80% of respondents also reported that the podcasts were enjoyable and helped make the assigned readings more accessible.

¹⁰The podcast episodes were also publicly released on various platforms (YouTube, Apple Podcasts, Spotify, etc.). One episode received over 900 plays across platforms during the semester, including from listeners in South Asia and East Africa, suggesting broader resonance and continued pedagogical use.

¹¹In two cases, the live Zoom session was scheduled after the seminar because of scheduling restrictions. The main results hold even after removing these two seminar sessions from the analysis.

This cyclical structure embedded the intervention into the pedagogical rhythm of the course. The intervention was designed to lower affective entry barriers, enhance narrative access to empirical methods, and foster student ownership of seminar dialogue. Drawing on inclusive and postdigital pedagogy (Fawns, 2019; Doolittle et al., 2006; Ashwin, 2015), the intervention positioned empirical papers as products of situated decisions, ethical dilemmas, and field realities rather than as closed technical outputs. The theoretical architecture is summarized in Appendix Figure A1, which maps the pathways from affective entry points to epistemic participation.

4 Data

This study draws on multiple sources of quantitative and qualitative data, including baseline characteristics, repeated seminar-level engagement measures, and an end-of-semester survey.¹² Baseline demographic and academic characteristics were collected at the start of the semester. These included age, gender, undergraduate grade point average (GPA), whether English was the student's first language, and whether the student had prior exposure to economics, quantitative methods, or computer programming. First-generation university status was also recorded. These variables allow assessment of cohort comparability and support analysis of treatment heterogeneity.

During the term, a structured system of repeated data collection captured multiple dimensions of student engagement across the ten weekly seminars. At the end of each seminar, attending students completed a brief post-seminar questionnaire measuring motivation, perceived comprehension of the assigned paper, emotional connection to the topic, confidence in contributing to discussion, and self-reported reading completion. The same survey instrument was administered consistently across all seminar weeks and both cohorts.¹³ During the five podcast-integrated seminars (Seminars 4, 5, 8, 9, and 10 for Cohort B), students were additionally asked whether they had listened to the assigned podcast before the seminar, whether they found it enjoyable, and whether it made the assigned paper more accessible.

Additional measures were drawn from seminar preparation activities, Canvas learning analytics, and seminar observations. Two days before each seminar, students submitted discussion questions related to the assigned reading, which were subsequently used to guide in-class discussion. The outcome measure "Questions Submitted" refers exclusively to these seminar discussion questions.¹⁴ Podcast listening duration was obtained separately from Canvas learning analytics. Seminar attendance was recorded for all enrolled students, while discussion participation and student talk time were coded from seminar audio recordings for seminar attendees. Consequently, seminar attendance and ques-

¹²The study was approved by the University of Sussex's Institutional Review Board (ER/AF558).

¹³Because the survey was administered after every seminar throughout the semester, the questionnaire items, summarized in Appendix Table A1, were intentionally kept brief and used clear, direct wording to minimize respondent burden and maximize response rates.

¹⁴For intervention seminars, the earlier questions submitted two weeks before the seminar to help shape the podcast interviews were excluded from this measure. Students were instructed to submit new discussion questions following the podcast rather than repeat their earlier questions. A comparison of the two submissions showed that only approximately 8% of seminar questions were repeated, indicating minimal duplication.

Table 1: Intervention Implementation Timeline

Teaching Week	Cohort A: Traditional Seminar	Cohort B: Integrated Intervention Seminar
1	No Seminar	No Seminar
2	T-2d: Discussion questions submitted T: Paper Discussion Seminar 1	T-2d: Discussion questions submitted T: Paper Discussion Seminar 1
3	T-2d: Discussion questions submitted T: Paper Discussion Seminar 2	T-2d: Discussion questions submitted T: Paper Discussion Seminar 2
4	T-2d: Discussion questions submitted T: Paper Discussion Seminar 3	T-2d: Discussion questions submitted T: Paper Discussion Seminar 3
5	T-2d: Discussion questions submitted T: Paper Discussion Seminar 4	T-2w: Podcast interview questions submitted T-1w: Podcast released T-2d: Discussion questions submitted T: Integrated Intervention Seminar 4
6	No Seminar	No Seminar
7	T-2d: Discussion questions submitted T: Paper Discussion Seminar 5	T-2w: Podcast interview questions submitted T-1w: Podcast released T-2d: Discussion questions submitted T: Integrated Intervention Seminar 5
8	T-2d: Discussion questions submitted T: Paper Discussion Seminar 6	T-2d: Discussion questions submitted T: Paper Discussion Seminar 6
9	T-2d: Discussion questions submitted T: Paper Discussion Seminar 7	T-2d: Discussion questions submitted T: Paper Discussion Seminar 7
10	T-2d: Discussion questions submitted T: Paper Discussion Seminar 8	T-2w: Podcast interview questions submitted T-1w: Podcast released T-2d: Discussion questions submitted T: Integrated Intervention Seminar 8
11	T-2d: Discussion questions submitted T: Paper Discussion Seminar 9	T-2w: Podcast interview questions submitted T-1w: Podcast released T-2d: Discussion questions submitted T: Integrated Intervention Seminar 9
12	T-2d: Discussion questions submitted T: Paper Discussion Seminar 10	T-2w: Podcast interview questions submitted T-1w: Podcast released T-2d: Discussion questions submitted T: Integrated Intervention Seminar 10

Notes: This table summarizes the weekly teaching activities for two consecutive cohorts enrolled in the same postgraduate Econometrics module. “Paper Discussion Seminar” refers to the standard seminar discussion of the assigned empirical journal article without podcast support or author participation. Cohort B experienced the intervention in Seminars 4, 5, 8, 9, and 10 (Teaching Weeks 5, 7, 10, 11, and 12, respectively). During intervention weeks, students submitted questions two weeks before the seminar (T-2w) to help shape the podcast interview, accessed the podcast one week before the seminar (T-1w), submitted seminar discussion questions two days before class (T-2d), and then participated in a seminar discussion with the author. In two of the five intervention weeks, scheduling constraints prevented the author from joining the scheduled seminar. In those cases, the live discussion was held separately during the same teaching week after the seminar. The scheduled two-hour seminar was shortened to 90 minutes, and the 30-minute author Q&A was rescheduled later in the same teaching week so that students received the same total amount of seminar instruction and discussion. The same instructor, lecture material, seminar schedule, assigned journal articles, and assessments were used across both cohorts. The intervention differed only in the addition of (i) student-generated podcast interview questions, (ii) pre-recorded podcast interviews with the authors of the assigned papers, and (iii) opportunities for direct interaction with those authors.

tion submission are observed for all enrolled students, whereas the questionnaire outcomes and audio-based measures are available only for students who attended the seminar. Collecting the questionnaire responses immediately after each seminar minimized recall bias and linked them directly to the corresponding seminar experience. A separate end-of-semester survey provided additional insight into students’ overall experience of the module and, for Cohort B, their overall reception of the intervention, through open-ended reflection questions. These data complemented the repeated seminar-level measures by providing broader qualitative perspectives on the intervention.

Table 2: Baseline Characteristics by Cohort

	Cohort A ($n = 24$)		Cohort B ($n = 27$)		Difference
	Mean	SD	Mean	SD	p -value
Age	27.63	4.31	26.92	3.87	0.051
Gender	0.67	0.47	0.62	0.49	0.327
Undergraduate GPA	3.60	0.15	3.69	0.24	0.000
English First Language	0.26	0.44	0.38	0.49	0.005
Quantitative Background	0.30	0.46	0.42	0.49	0.004
Economics Background	0.93	0.26	0.96	0.20	0.121
Programming Experience	0.26	0.34	0.38	0.39	0.000
First Generation	0.30	0.46	0.42	0.50	0.004

Although both cohorts were enrolled in the same module, taught by the same instructor, and assigned the same readings and assessments, Table 2 shows statistically significant differences in several baseline characteristics. Students in Cohort B had higher undergraduate GPAs and were more likely to report prior experience with quantitative methods, programming, and English fluency. No significant differences were observed in gender composition or prior economics background. These imbalances underscore the importance of a research design that can identify treatment effects despite non-random assignment. To this end, the analysis leverages within-student variation over time and includes robustness checks with covariate adjustment and placebo specifications.

5 Empirical Model

To estimate the impact of the podcast-integrated intervention on student engagement and learning, I employ a difference-in-differences (DiD) framework that exploits within-student variation in exposure to podcast-integrated seminars over time. The main estimating equation is:

$$Y_{is} = \alpha_i + \delta_s + \beta \text{IntegratedSeminar}_{is} + \varepsilon_{is} \quad (1)$$

Here, Y_{is} denotes the outcome for student i in seminar s , drawn from a range of engagement measures. The key treatment variable, $\text{IntegratedSeminar}_{is}$, equals 1 for the five podcast-integrated seminars (Seminars 4, 5, 8, 9, and 10) in Cohort B. The specification includes student fixed effects, α_i , which absorb all time-invariant student characteristics (e.g., gender, prior training, and baseline motivation), and seminar fixed effects, δ_s , which control for common shocks across students in a given seminar,

such as topic difficulty or workload. Standard errors are clustered at the student level because the panel consists of repeated seminar-level observations for the same students, allowing for arbitrary serial correlation within individuals over time. Although the intervention was introduced for only one cohort, the treatment indicator varies across seminar weeks within that cohort. Consequently, identification relies on within-student changes over time rather than comparisons based solely on cohort membership. The coefficient β captures the average treatment effect on the treated (ATT).

Because I do not observe multiple pre-intervention periods for both cohorts, I cannot directly test the parallel trends assumption. Instead, I conduct a supporting check for baseline comparability by estimating seminar-level regressions using Seminars 1–3, prior to the introduction of the intervention, and interacting cohort indicators with seminar dummies. This allows me to assess whether engagement patterns differed systematically across cohorts before treatment.

To assess the robustness of the main results, I estimate three alternative specifications. The first uses only Cohort B, the treated cohort, and estimates $Y_{is} = \alpha_i + \gamma \text{ InterventionWeek}_s + \lambda \text{ SeminarNumber}_s + \varepsilon_{is}$. Here, $\text{InterventionWeek}_s$ equals 1 for seminars that included the intervention and 0 otherwise. SeminarNumber_s denotes the chronological order of seminars and controls for secular trends in engagement over the semester, such as increasing familiarity with the course material or end-of-semester fatigue.¹⁵ This specification exploits within-student variation in seminar type while controlling for time-invariant student characteristics through fixed effects, α_i .

Second, I replace student fixed effects with a rich set of baseline covariates while retaining seminar fixed effects. This specification addresses observable differences between cohorts and assesses the sensitivity of the results to selection on observables. Third, I conduct a placebo test using Cohort A, which was never exposed to the intervention. I construct a fictitious treatment indicator equal to 1 for Seminars 4, 5, 8, 9, and 10, mirroring the intervention schedule in Cohort B. Finding no significant placebo effects would strengthen the interpretation that the estimated treatment effects reflect the intervention rather than systematic differences associated with the timing of those seminar weeks.

To examine treatment heterogeneity, I interact the treatment indicator with three baseline characteristics: gender, English as a first language, and quantitative background. These interactions assess whether the intervention differed by gender and whether it was particularly beneficial for students whose first language was not English or who had less quantitative preparation. I also explore dynamic treatment effects by including seminar-specific interactions, allowing the effects to vary across the seminars.

Finally, I examine whether the intervention generated spillover effects beyond the treated seminars. First, within Cohort B, I compare student outcomes in untreated seminars that occurred *after* the initial intervention (Seminars 6 and 7) with untreated seminars that occurred *before* the intervention (Seminars 1–3). Sustained improvements during these untreated seminars would suggest reinforcement or diffusion effects. Second, I compare outcomes in untreated seminars across Cohorts A and

¹⁵Because all students in Cohort B experienced the same sequence of seminars, including seminar fixed effects would be perfectly collinear with $\text{InterventionWeek}_s$ and is therefore not possible.

B. Because both cohorts experienced the same teaching format during these seminars, systematic differences would suggest that the intervention influenced broader patterns of engagement and learning beyond the treated sessions.

6 Results

6.1 Podcast-Integrated Teaching Impacts

Table 3 presents the main difference-in-differences estimates of the podcast-integrated intervention, exploiting within-student variation across seminar weeks. The results indicate that the intervention produced significant improvements in student engagement, particularly along motivational, affective, and participatory dimensions.

Table 3: Impact of Podcast-Integrated Intervention during Seminars

	(1) Seminar Attendance	(2) Motivation Score	(3) Discussion Participation	(4) Comprehen- sion Score	(5) Emotional Connection	(6) Discussion Confidence	(7) Reading Completion	(8) Talk Time (Minutes)	(9) Questions Submitted
Integrated Seminar	-0.043 (0.051)	0.515*** (0.161)	0.298*** (0.099)	0.257* (0.129)	0.375*** (0.129)	0.215 (0.165)	0.134*** (0.037)	1.017*** (0.106)	1.389*** (0.166)
Observations	510	439	439	439	439	439	439	439	510
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Seminar FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of DV	0.86	3.98	0.56	3.75	3.77	3.74	0.54	1.78	0.66
Sample	All	All	All	All	All	All	All	All	All

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors are clustered at the student level.

Seminar Attendance is a binary indicator equal to 1 if the student attended the seminar. Seminar attendance (Column (1)) and Questions Submitted (Column (9)) are observed for all enrolled students. All remaining outcomes are observed only for students who attended the seminar (average attendance rate: 86%), resulting in a smaller estimation sample for Columns (2)–(8). Motivation, Comprehension, Emotional Connection, Discussion Confidence, and Reading Completion (Columns (2) and (4)–(7)) were obtained from the post-seminar questionnaire (please see Appendix Table A1 for details), while Discussion Participation and Talk Time (Columns (3) and (8)) were coded from seminar audio recordings. Motivation Score captures self-reported motivation. Discussion Participation indicates whether the student spoke during the group discussion component of the session. Comprehension Score is based on the student's self-reported understanding of the assigned academic paper. Emotional Connection reflects the extent to which students felt emotionally connected to the seminar topic. Discussion Confidence is a self-reported measure of confidence in contributing verbally to the discussion. Reading Completion captures the self-reported percentage of the assigned paper completed before the seminar. Talk Time (Minutes) records the total number of minutes each student spoke during the seminar, measured from seminar audio recordings. Questions Submitted measures the number of seminar discussion questions submitted two days before the seminar. For intervention weeks, this outcome excludes the earlier podcast interview questions submitted two weeks before the seminar to inform the author interviews.

Students exposed to the podcast-integrated intervention reported a 0.515-point increase in motivation on a five-point Likert scale (Column 2), equivalent to approximately one-half of a response category and more than 12% of the baseline mean. This finding suggests that integrating student questioning, author interviews, and live discussion within seminars can strengthen affective engagement by making empirical research more accessible, relatable, and personally meaningful. This finding is consistent with [Chiang and Sumell \(2019\)](#), who show that reflective pedagogies improve motivational outcomes in economics education, and with [Moryl \(2013\)](#), who find that podcasts can support deeper engagement with course material.

In addition to boosting motivation, the intervention also significantly increased discussion participation (Column 3) and perceived comprehension of the assigned paper (Column 4). Although the

comprehension effect is statistically significant only at the 10% level, it suggests that the intervention may have helped students engage more effectively with complex empirical papers prior to class.¹⁶ These findings are consistent with evidence that structured pre-class learning activities enable students to devote greater cognitive resources to discussion during class (Asarta, 2024). The intervention also increased students' emotional connection to the topic (Column 5). Although discussion confidence increased, the estimated effect was not statistically significant (Column 6). This pattern suggests that the intervention more readily influenced observable engagement and emotional connection than students' underlying perceptions of their own competence, which may evolve more gradually (Chiang and Sumell, 2019; Birdi et al., 2023).

On average, each student spoke an additional 1.017 minutes during seminar discussions (Column 8). Although this may appear modest in absolute terms, seminar discussions were time-constrained and involved multiple students sharing limited discussion time. Relative to the baseline mean of 1.78 minutes, this represents a substantial increase in individual verbal participation. Students also submitted significantly more seminar discussion questions before class (Column 9). Rather than emphasizing the percentage increase from a low baseline, the results indicate roughly one to one-and-a-half additional discussion questions per student during intervention seminars. Because question submission was voluntary and ungraded, this increase provides further evidence of stronger pre-seminar preparation and engagement (Sutton-Brady et al., 2009). The only outcome that showed no significant change was attendance (Column 1). This finding is unsurprising, as attendance in the postgraduate module remained consistently high across both cohorts. The absence of any significant negative effects across the nine outcomes implies that the intervention was at worst benign and at best beneficial.

Together, these findings suggest that podcast-integrated teaching, when embedded within seminar discussions, can strengthen both affective and behavioral dimensions of student engagement in economics education. They support recent calls for more diverse instructional approaches in economics curricula (Birdi et al., 2023; Johnson and Meder, 2024). Although the evidence comes from a single postgraduate module, it adds to a growing body of research indicating that podcasts can be effective pedagogical tools when thoughtfully integrated into broader learning activities.

6.2 Robustness

While I cannot formally test the parallel trends assumption because I do not observe repeated pre-treatment periods for both cohorts, I conduct a supporting check by interacting the Cohort B indicator with week dummies for the first three seminars, prior to any intervention. Table 4 shows that the vast majority of coefficients are small and statistically insignificant, and joint tests fail to reject the null of equal cohort trends for seven of the nine outcomes. Two outcomes, comprehension score and reading completion, show marginally significant differences. However, the lack of consistent direction or

¹⁶More generally, the estimated effects for the self-reported outcomes should be interpreted relative to the underlying five-point Likert scales. For example, the increase in motivation corresponds to approximately one-half of a response category, while the improvement in perceived comprehension corresponds to approximately one-quarter of a response category. Although modest in absolute terms, these represent meaningful shifts on bounded attitudinal scales.

magnitude across the broader set of engagement indicators suggests that these differences are unlikely to reflect systematic divergence. Overall, these results provide cautious but reasonable support for the identification strategy.

Table 4: Pre-Treatment Cohort Trends Across Seminar Outcomes (Weeks 1–3)

	(1) Seminar Attendance	(2) Motivation Score	(3) Discussion Participation	(4) Comprehen- sion Score	(5) Emotional Connection	(6) Discussion Confidence	(7) Reading Completion	(8) Talk Time (Minutes)	(9) Questions Submitted
Week 2 × Cohort B	-0.074 (0.171)	-0.044 (0.445)	0.011 (0.190)	0.804** (0.301)	0.364 (0.246)	-0.201 (0.319)	-0.146 (0.143)	0.464 (0.325)	0.157 (0.202)
Week 3 × Cohort B	-0.153 (0.136)	-0.325 (0.364)	0.063 (0.155)	-0.282 (0.242)	0.205 (0.234)	0.278 (0.270)	0.119 (0.107)	0.133 (0.262)	0.028 (0.210)
Observations	153	112	112	112	112	112	112	112	153
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Seminar FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of DV	0.78	3.63	0.24	2.88	2.93	2.88	0.52	1.56	0.32
Joint Test p -value	0.523	0.652	0.920	0.021	0.276	0.513	0.076	0.366	0.704
Sample	Weeks 1–3	Weeks 1–3	Weeks 1–3	Weeks 1–3	Weeks 1–3	Weeks 1–3	Weeks 1–3	Weeks 1–3	Weeks 1–3

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors are clustered at the student level.

Table reports differences in engagement trends between Cohorts A and B during Seminars 1–3, prior to any podcast exposure. The joint test p -value reports the significance of the combined cohort-week interactions for each outcome.

To further assess the robustness of the findings, I conduct three complementary checks using alternative specifications. First, I estimate the main difference-in-differences model using only Cohort B, with variation driven by whether a given seminar included the podcast-integrated intervention. As shown in Appendix Table A2, the results remain consistent in sign and magnitude with the main specification.¹⁷ Importantly, this cohort-restricted model relies solely on within-student and within-seminar variation and does not depend on cross-cohort comparability. Second, I re-estimate the main model with a richer set of baseline controls, including gender, age, undergraduate GPA, English as a first language, prior economics and quantitative experience, and first-generation status, as well as seminar and cohort fixed effects. Appendix Table A3 shows that these estimates are nearly identical to the baseline results. This suggests that the estimated intervention effects are unlikely to be driven by observable differences between cohorts.

Finally, I conduct a placebo test using the untreated cohort (Cohort A), assigning a fictitious “treatment” in the same weeks that Cohort B received the podcast-enhanced sessions. As shown in Appendix Table A4, the placebo coefficients are consistently small and statistically insignificant across most outcomes, with a few isolated exceptions that show no consistent direction. This reinforces that the estimated effects in the main analysis are not driven by secular trends or other coincidental changes in teaching practices. Together, these robustness checks bolster confidence that the observed effects are attributable to the podcast-integrated teaching intervention, rather than to spurious time trends, omitted variables, or cohort-specific dynamics.

¹⁷Seven out of nine outcomes remain statistically significant at conventional levels in Appendix Table A2, and the two that lose significance (seminar attendance and reading completion) were also among the smallest effects previously observed.

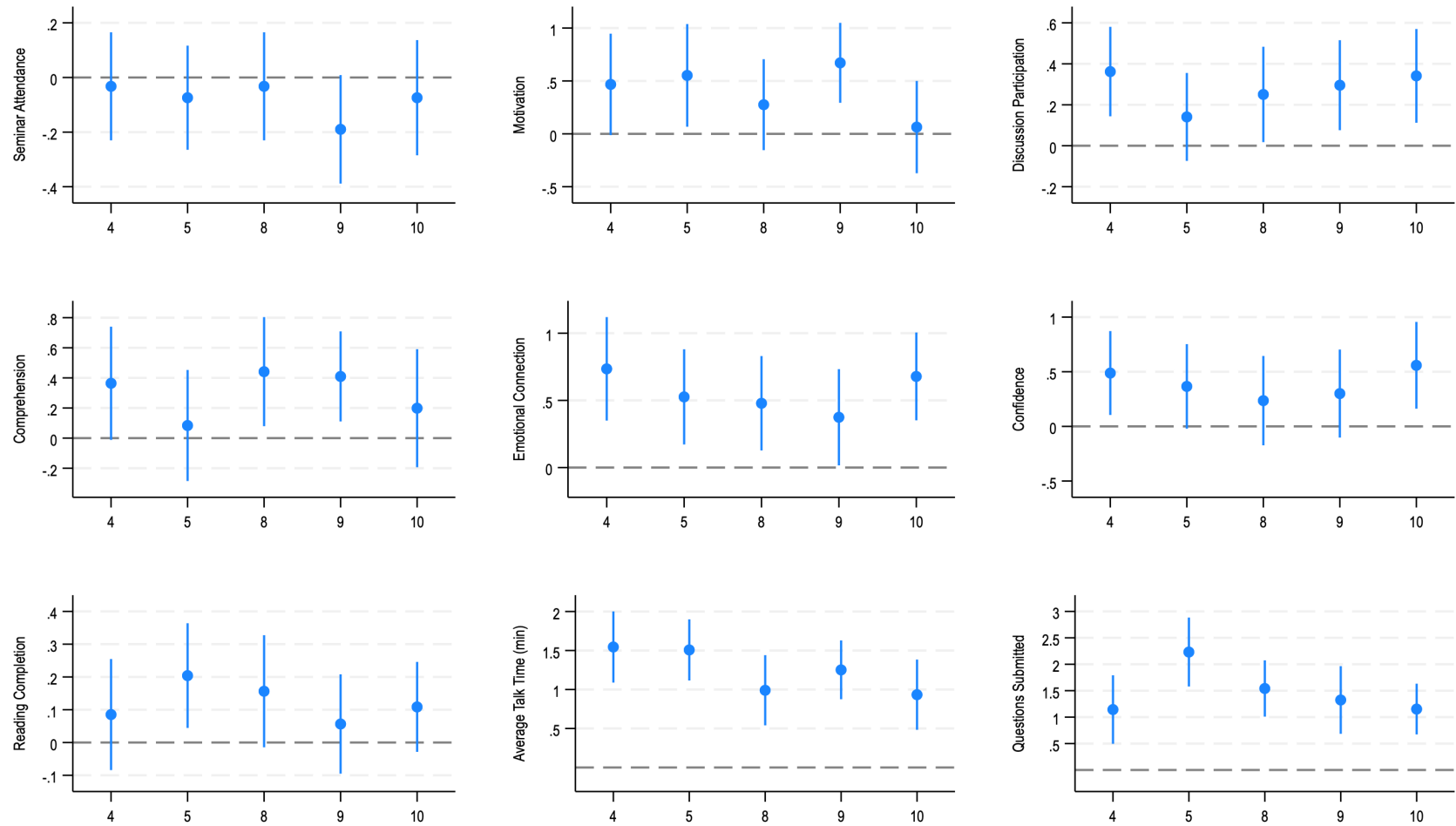
6.3 Dynamic Treatment Effects

To assess whether the effects of the podcast-integrated intervention changed over time, I estimate week-specific treatment effects for each of the five intervention weeks (Weeks 4, 5, 8, 9, and 10). Figure 1 plots the estimated coefficients and 95% confidence intervals for all nine engagement outcomes. These estimates assess whether the intervention's effects changed over time and whether any observed gains reflected novelty rather than sustained pedagogical value. If the intervention's influence stemmed primarily from novelty, one would expect treatment effects to decline in later weeks as students became accustomed to the format. The results provide little evidence that the estimated effects were driven by novelty.

For key self-reported outcomes, including motivation, discussion participation, emotional connection, and comprehension, the estimated effects remain stable or increase slightly in the later weeks. These patterns suggest that the intervention continued to support student engagement throughout the semester rather than fading as students became familiar with the format. Behavioral measures, including talk time and advance question submission, also show sustained positive effects across the intervention weeks, albeit with some week-to-week variation. Average talk time per student peaks in the first intervention week (Week 4) and declines modestly thereafter but remains above baseline levels. Question submission follows a similar pattern, peaking in Week 5 before stabilizing at a higher level.

These patterns are consistent with sustained improvements in pre-seminar preparation and student engagement, echoing previous research highlighting the value of recurring, structured engagement activities in economics education (Moryl, 2013; Johnson and Meder, 2024; Sutton-Brady et al., 2009). Overall, the dynamic estimates provide little evidence that the intervention's effectiveness diminished with repeated exposure.

Figure 1: Dynamic Treatment Effects of the Podcast-Integrated Intervention



Notes: This figure plots the estimated treatment effects of the podcast-integrated intervention seminars (Weeks 4, 5, 8, 9, and 10) with 95% confidence intervals. The underlying regressions include all seminar weeks (with Seminar 1 as the reference) and absorb both student and seminar fixed effects, with standard errors clustered at the student level. For brevity, only the estimated coefficients for the podcast-integrated seminars are displayed.

6.4 Potential Spillover Effects & Treatment Heterogeneity

The intervention may also have generated spillover effects beyond the directly treated seminars. To examine this possibility, I first test for within-cohort spillovers by comparing student engagement in untreated seminars that occurred after versus before the intervention was introduced. Table 5 reports these estimates using data from Cohort B, whose members were exposed to the intervention from Seminar 4 onwards. Among students in Cohort B, self-reported outcomes such as motivation, participation, comprehension, emotional connection, and confidence all increased significantly in the untreated sessions following the intervention period. For example, the post-intervention increase in discussion comprehension exceeds one full point on a 5-point Likert scale, while emotional connection and discussion confidence increase by over 1.2 and 1.5 points, respectively.¹⁸ These patterns are consistent with reinforcement effects or behavioral diffusion within the cohort and are suggestive of sustained improvements in student engagement beyond the directly treated seminars.

Table 5: Spillover Effects in Untreated Weeks within Treated Cohort (Cohort B)

	(1) Seminar Attendance	(2) Motivation Score	(3) Discussion Participation	(4) Comprehen- sion Score	(5) Emotional Connection	(6) Discussion Confidence	(7) Reading Completion	(8) Talk Time (Minutes)	(9) Questions Submitted
Spillover Post	0.125* (0.065)	0.483** (0.201)	0.362*** (0.096)	1.201*** (0.165)	1.291*** (0.146)	1.518*** (0.119)	0.048 (0.057)	0.072 (0.112)	0.021 (0.089)
Observations	120	101	101	101	101	101	101	101	120
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Seminar FE	No	No	No	No	No	No	No	No	No
Mean of DV	0.84	3.69	0.37	3.31	3.41	3.44	0.52	1.59	0.30
Sample	Untreated Seminars: Cohort B								

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors are clustered at the student level.

“Spillover Post” is an indicator for whether the observation is from an untreated seminar session (Seminar 6 or 7) that occurred after the initial intervention began in Cohort B. These regressions are limited to untreated sessions and identify whether any sustained or spillover effects are observable in non-treated weeks.

To explore whether these within-cohort improvements simply reflected inherent differences between cohorts, I next compare Cohort B and Cohort A during untreated seminar weeks. Appendix Table A5 shows no systematic differences across cohorts; aside from a marginal increase in discussion confidence for Cohort B, all other outcomes are statistically indistinguishable. These findings suggest that the within-cohort improvements are unlikely to be driven solely by fixed cohort differences. At the same time, because the within-cohort comparison cannot distinguish potential spillover effects from broader changes over the course of the semester, these findings should be interpreted with appropriate caution.

I then explore whether treatment effects vary across student groups. Table A6 shows no consistent gender-based heterogeneity: female students appear slightly more likely to submit questions in advance, but interaction terms are largely insignificant. This suggests that the intervention supported engagement broadly across genders, an encouraging result given concerns about confidence disparities in economics classrooms (Bayer and Rouse, 2016; Bayer and Wilcox, 2019; Chiang and Sumell,

¹⁸The spillover estimates are, in some cases, larger than the average treatment effects reported in Table 3. This may reflect cumulative behavioral reinforcement together with the absence of seminar fixed effects in this specification. Accordingly, these estimates should not be interpreted as directly comparable with the main treatment effects.

2019). By contrast, language background appears more salient. Table A7 shows that students who do not speak English as a first language experienced significantly larger gains in motivation, consistent with Sutton-Brady et al. (2009), who emphasize the accessibility of audio content for diverse learners. However, they remained less likely to participate verbally in seminar discussions, indicating that affective gains may not fully overcome persistent linguistic barriers to verbal participation. Finally, Table A8 reveals no negative heterogeneity by quantitative background. In fact, students without prior quantitative training showed equal or greater improvements in motivation and talk time. This suggests that the intervention may help narrow gaps in both confidence and comprehension for students less familiar with empirical economics, echoing calls in the literature to broaden epistemic access through varied pre-class formats (Moryl, 2013; Birdi et al., 2023; Johnson and Meder, 2024).

6.5 Qualitative Evidence

While the quantitative analysis reveals significant gains across affective and behavioral dimensions of engagement, it cannot fully capture how students interpreted and internalized the intervention. To complement the quantitative findings, I draw on qualitative evidence from end-of-semester reflections and student-submitted questions for the podcast. Together, these provide insight into how students experienced the intervention and how it influenced their engagement with empirical research.

Prior research emphasizes the affective domain (students' emotional, motivational, and identity-related responses) as central to epistemic access and sustained engagement (Krathwohl et al., 1964; Ashwin, 2015; McCune, 2019). These issues are especially relevant in econometrics, where journal articles can appear technically dense and emotionally distant. The podcast-integrated intervention sought to reduce these barriers by foregrounding authors' voices, research motivations, and fieldwork experiences, reframing empirical research as a socially situated and human process (Quinn, 2012; Fawns, 2019).

Student reflections suggest that this reframing was pedagogically meaningful. One wrote, *"The podcasts gave [the papers] a voice. It turned it into a story, not just a study."* Another shared, *"I've never felt emotionally connected [to a journal article] before. This time I found myself caring about the people and policies being studied."* A third noted, *"Listening to the podcast helped me connect to the why behind the what."* In contrast, students in Cohort A more often described the readings as "dense" or "intimidating." One explained, *"I skimmed most of them. They just felt too dense to follow."* Another added, *"I didn't feel confident enough to say much in class."* These reflections point to both cognitive and affective disengagement, suggesting that research papers were often viewed as something to get through rather than something to engage with.

The intervention appeared especially meaningful for students from non-quantitative or interdisciplinary backgrounds. One reflected, *"I don't come from a stats background, so I used to avoid speaking in econometrics classes. But after the podcast, I felt like I had something to say."* Another noted, *"The fact that the authors explained their dilemmas made me realise I don't have to understand everything perfectly to ask a good question."* These reflections suggest changes extending beyond perceived comprehension toward greater confidence and stronger identification with the research process. Similar patterns have

been documented in previous studies (Choi et al., 2024; Hernandez-Lopez and Mendoza-Jimenez, 2025; Sheridan et al., 2025).

Additional evidence comes from the student-submitted questions that informed the podcast interviews. These questions spanned both technical and reflective domains, consistent with the intentional design of the interviews, which were structured around the assigned research papers rather than functioning as general conversations. Across the five podcast-integrated seminars, students voluntarily submitted 78 questions. Drawing on Bloom’s taxonomy and affective engagement frameworks (Krathwohl et al., 1964), I classified these into five categories: Clarification, Application, Critique, Affective/Motivational, and Meta-Research. Table 6 summarizes the distribution.

Table 6: Thematic Classification of Student Questions

Category	Description	Example Question	Frequency
Clarification & Comprehension	Understanding core research design, econometric strategy, and findings	Why was a triple-difference design used?	28%
Application & Policy Relevance	Applying the paper’s findings to real-world or policy contexts	How can these results inform gender policy in South Asia?	19%
Critical Evaluation	Questioning assumptions, robustness, limitations	Did you consider endogeneity of the tornado path?	16%
Affective & Motivational	Exploring author motivations, emotions, positionality	What inspired you to work with survivors of IPV?	23%
Meta-Research & Career Advice	Questions about academic careers, publishing, and fieldwork ethics	How did you choose your research questions during your PhD?	14%

Categorization of questions submitted across five podcast-integrated seminars (Cohort B). Frequencies are reported as percentages.

Although 28% of questions focused on econometric methods, identification strategies, and research design, nearly half addressed broader issues, including policy relevance, critique, researcher motivation, and academic careers. Notably, 23% explored affective or motivational topics, asking about authors’ inspirations, challenges, and experiences conducting research. Such questions are relatively uncommon in econometrics classrooms, where technical rigor often takes precedence over reflection (Becker, 2004; Trendafilov and Mihal, 2025). Their prevalence suggests that the intervention encouraged students to engage with research as a human endeavor rather than solely as a technical exercise.

Questions involving critical evaluation (16%) and meta-research (14%) also suggest engagement beyond basic comprehension, with students reflecting on research design, scholarly practice, and the broader process of knowledge production. These patterns are consistent with reciprocal learning approaches that position students as active participants rather than passive recipients of knowledge (Doolittle et al., 2006). Within the integrated intervention, the podcast interviews served as a conversational scaffold that encouraged inquiry alongside technical understanding.

The qualitative evidence complements the quantitative findings by illustrating how students experienced the intervention. Rather than viewing journal articles solely as technical documents, many began to engage more directly with the motivations, decisions, and experiences underlying the research process. These reflections provide insight into the mechanisms through which the intervention may have enhanced engagement with empirical research.

7 Discussion

7.1 Pedagogical Contributions

This study contributes to the growing literature on inclusive, affective, and multimodal pedagogy in economics education in three ways. First, it provides evidence that embedding podcast-integrated interventions into seminar teaching can lower barriers to engaging with technical empirical research. Rather than replacing assigned readings, the intervention complemented them by providing narrative and contextual entry points into complex journal articles. This extends the findings of [Choi et al. \(2024\)](#) and [Johnson and Meder \(2024\)](#), who argue that emotionally engaging and diversified instructional approaches can improve students' experiences in economics classrooms.

Second, the findings demonstrate the value of combining multiple learning modes (text, audio, and discussion) within a coherent instructional sequence. Consistent with [Moryl \(2013\)](#), the intervention served as a bridge between independent reading and seminar participation, encouraging stronger preparation and more active discussion. The increase in student-generated questions, particularly those concerning researcher motivation, ethics, and scholarly practice, suggests that the intervention promoted engagement extending beyond technical comprehension.

Third, the study contributes to a broader understanding of learning in quantitative economics education by highlighting the importance of affective outcomes alongside cognitive ones. Although economics education has traditionally emphasized conceptual mastery, motivation, emotional connection, and participation also shape students' engagement with challenging material. This complements recent work by [Sheridan et al. \(2025\)](#) and [Hernandez-Lopez and Mendoza-Jimenez \(2025\)](#), who argue that effective pedagogy should attend to students' emotional as well as intellectual experiences.

7.2 Potential Mechanisms

The evidence suggests that the podcast-integrated intervention enhanced student engagement through several complementary mechanisms. Importantly, the intervention was designed as an integrated pedagogical package comprising three interconnected components: (i) student-generated questions before each interview, (ii) pre-recorded podcast interviews with the authors of the assigned papers, and (iii) opportunities for dialogue with those authors. Accordingly, the observed effects should be interpreted as arising from the combined intervention rather than from the podcast recordings alone.

Student-generated questioning appears to have encouraged more active preparation before each seminar. Rather than approaching journal articles solely as technical exercises, students were asked to formulate both methodological and reflective questions in anticipation of scholarly conversations. The increase in seminar discussion questions, together with the qualitative evidence showing greater reflection and critical inquiry, is consistent with this interpretation. In this sense, question generation functioned as an annotative framework that promoted active engagement before students encountered the podcast or participated in discussion ([Porter, 2022](#); [Doolittle et al., 2006](#)).

The podcast interviews provided narrative and contextual scaffolding for the assigned readings. By discussing research motivations, methodological decisions, fieldwork experiences, and ethical challenges, the interviews complemented the technical content of the journal articles with insights into how the research was conceived and conducted. This narrative framing appears to have reduced affective barriers and strengthened students' emotional connection to the material, consistent with previous work highlighting the role of authorial voice in supporting learner engagement (Choi et al., 2024; Hernandez-Lopez and Mendoza-Jimenez, 2025; Fawns, 2019). Discussions with the researchers extended this process by allowing students to question the authors about their work and engage in conversations about how empirical knowledge is produced and interpreted. The observed increases in discussion participation and student talk time are consistent with this interpretation and align with pedagogical approaches emphasizing reciprocal learning and active participation (Ashwin, 2015; Trendafilov and Mihal, 2025; O'Shea et al., 2023).

The intervention did not affect all outcomes equally. While motivation, emotional connection, discussion participation, and perceived comprehension improved, discussion confidence showed a smaller and statistically insignificant effect. This pattern suggests that increasing students' willingness to engage with research may be easier than changing their confidence in speaking publicly, particularly for students from linguistically diverse backgrounds. Additional instructional strategies, such as structured peer discussion or guided reflection, may therefore be needed to translate greater engagement into greater confidence.

Overall, the evidence suggests that the intervention's effectiveness stemmed from the interaction of its three components rather than from any single element in isolation. Student-generated questioning promoted active preparation, the podcast interviews provided narrative and contextual support, and the discussions created opportunities for scholarly dialogue. Although the present study cannot isolate the contribution of each component, future research could experimentally vary these elements to identify their individual and complementary effects on student learning.

7.3 Practical Implications and Limitations

This study offers several practical insights for economics educators seeking to increase engagement in technically intensive modules. Implementing the intervention required a substantial initial investment of instructor time to recruit participating authors, coordinate interviews, produce the podcast episodes, and facilitate the accompanying discussions. However, much of this effort was front-loaded, allowing the resulting podcast library to be reused across future offerings of the module.¹⁹ Each episode was recorded through a single online interview guided by student-submitted questions, edited using standard software, and distributed through the university's learning platform. Although producing the episodes required relatively little technical expertise, the primary implementation costs lay in instructor coordination rather than technology.

¹⁹Although future cohorts will not shape the podcast interviews through their own submitted questions, they can still generate new discussion questions around the existing episodes. This allows the core podcast resources to be reused without requiring new interviews to be recorded each year.

Importantly, the podcasts were not intended to replace reading or lectures. Rather, they provided conceptual and affective entry points into the assigned readings. By foregrounding author motivations, fieldwork challenges, and methodological decisions, the interviews helped contextualize abstract material and lower initial barriers to engagement. This approach may be particularly valuable in theory-heavy, quantitatively intensive, or research-focused courses where students often perceive empirical papers as dense or impersonal. Importantly, educators should not view the intervention as simply producing podcast recordings. Its pedagogical value lies in integrating student-generated questioning, podcast interviews with the original authors, and structured seminar dialogue into a coherent learning sequence. It is this integration, rather than any single component in isolation, that appears to underpin the improvements in student engagement. The approach is also well suited to diverse and interdisciplinary cohorts, including students with limited quantitative preparation or those for whom English is an additional language. By incorporating narrative, voice, ethics, and motivation, the intervention supports multiple dimensions of learner identity and provides more inclusive pathways into technical material. More broadly, the findings reinforce calls within economics education to adopt multimodal pedagogies that promote epistemic access and belonging alongside cognitive mastery (Moryl, 2013; Johnson and Meder, 2024; Choi et al., 2024).

Nevertheless, several limitations warrant consideration. The study is based on relatively small cohorts, reflecting the typical enrollment of a specialized postgraduate econometrics module. Although the repeated-measures design substantially increases the number of student–seminar observations and the within-student estimation strategy makes more efficient use of the available data, the modest sample size nonetheless limits statistical power, particularly for detecting smaller treatment effects and treatment heterogeneity. Replication with larger cohorts and across multiple institutions would therefore be valuable.

An important limitation is that the intervention increased students’ structured engagement with the assigned papers through additional activities before the seminar. Consequently, the present design cannot disentangle whether the observed improvements arose from increased exposure to the material, the specific features of the integrated intervention, or the interaction between these elements. Relatedly, because the intervention bundled multiple pedagogical components, the study cannot determine whether similar gains would have arisen from requiring additional question-generation activities alone, independent of the podcast interviews or author dialogue. Future studies could address this by comparing the intervention with active control conditions involving equivalent preparation time, such as instructor-produced summaries or AI-generated audio renditions of the assigned readings.

The study also employed a quasi-experimental design based on adjacent cohorts rather than random assignment. Although the robustness checks and placebo tests support the identification strategy, unobserved cohort-level differences cannot be ruled out entirely. Moreover, the intervention was implemented at a single UK institution, which may limit generalizability to other institutions, disciplines, or educational settings. Several outcomes, particularly confidence and emotional connection, relied on self-reported measures that may be susceptible to social desirability bias. Although these findings are complemented by behavioral measures such as talk time and question submission, they should

nevertheless be interpreted with appropriate caution. Participation in question submission and the end-of-semester reflections was also voluntary, raising the possibility of selection bias, although the high response rates reduce this concern.

A further limitation is that the study did not include seminar-specific objective measures of learning. Although students reported significantly higher perceived comprehension of the assigned papers, perceived learning does not necessarily correspond to actual learning (Deslauriers et al., 2019; Choi et al., 2024). The module's coursework and final examination were designed to assess overall mastery of econometrics rather than understanding of the five empirical papers targeted by the intervention. Consequently, these assessments cannot provide a credible estimate of the intervention's effect on objective learning. Future studies should therefore incorporate common pre- and post-seminar quizzes or other standardized knowledge assessments that directly measure understanding of the assigned readings. Such measures would make it possible to distinguish improvements in perceived comprehension from gains in objective learning.

Despite these limitations, the convergence of evidence across the quantitative and qualitative analyses strengthens confidence in the findings. Rather than relying on technological novelty, the intervention appears to have been effective because it reframed empirical research as a human, situated, and dialogic process. For instructors seeking to build more inclusive and engaging learning environments in quantitative disciplines, the podcast-integrated intervention offers a practical and theoretically grounded pedagogical approach that invites students to see themselves not only as readers but also as participants in the research process.

8 Conclusion

Econometrics is typically introduced as a technical discipline centered on model estimation and causal inference. While this framing is epistemically appropriate, it can obscure the human, ethical, and contextual dimensions of empirical research, making the subject appear abstract and inaccessible to many students (Becker, 2004; Marburger, 2006; Shabab, 2024). The intervention evaluated in this study sought to broaden that perspective by pairing assigned journal articles with student-informed author interviews and opportunities for dialogue with researchers. In doing so, it presented empirical research as a human and situated process rather than simply a technical product.

The findings suggest that this approach meaningfully enhanced student engagement. Students exposed to the intervention reported higher motivation, stronger perceived comprehension, greater emotional connection to the research, and more active participation in seminar discussions. These improvements were broadly consistent across time and across students with different quantitative backgrounds, although the effects varied for students who did not speak English as a first language. The results suggest that carefully designed pedagogical interventions combining narrative, authorial voice, and structured dialogue can reshape how students relate to academic content, researchers, and their own disciplinary identities. At the same time, the findings should be interpreted primarily as evidence of improved engagement and perceived understanding rather than definitive evidence of

improved objective learning, an important question for future research.

Implementing this intervention required a substantial initial investment, including selecting appropriate papers, recruiting participating authors, producing podcast interviews, and coordinating discussions. However, these costs were concentrated in the development phase. Once created, the podcast library can be reused across future module offerings, substantially reducing ongoing implementation costs. Future research should examine the feasibility of adapting this approach across larger cohorts, multiple institutions, and other disciplines, including collaborative models in which instructors share podcast resources. Experimental studies could also isolate the individual contributions of student questioning, podcast listening, and author discussions to student learning.

More broadly, this study suggests that improving engagement with technical material does not necessarily require fundamental changes to curriculum content. Rather, it requires rethinking how students encounter that content. By making research more dialogic, contextualized, and personally meaningful, podcast-integrated teaching offers one practical pathway toward a more inclusive economics classroom.

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Appendix

Table A1: Summary of Post-Seminar Feedback Instrument

Construct	Survey Item	Response Format
Motivation	Today's seminar increased my motivation to engage with the assigned academic paper.	5-point Likert scale
Comprehension	Today's seminar improved my understanding of the assigned academic paper.	5-point Likert scale
Emotional Connection	Today's seminar helped me feel more connected to the topic discussed.	5-point Likert scale
Discussion Confidence	I felt confident contributing to today's seminar discussion.	5-point Likert scale
Reading Completion	Approximately what percentage of the assigned academic paper did you complete before today's seminar?	0%, 10%, ..., 100%
Podcast Listening*	Did you listen to the assigned podcast before today's seminar?	Yes / No
Podcast Enjoyment*	I found the assigned podcast enjoyable.	5-point Likert scale
Podcast Accessibility*	The podcast made the assigned academic paper more accessible.	5-point Likert scale

This table summarizes the post-seminar feedback instrument used during the study. The same feedback form was administered immediately after every seminar in both cohorts, following completion of all scheduled seminar activities (including the live author discussion, where applicable). Responses to all attitudinal items used a five-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree). Reading Completion was reported using eleven response categories ranging from 0% to 100% in 10-percentage-point increments. Seminar Attendance was recorded separately. Discussion Participation and student Talk Time were coded from seminar audio recordings, while Questions Submitted was obtained from seminar submission records. Podcast listening duration reported in the manuscript was obtained from Canvas learning analytics rather than from self-reported listening time.

*The three podcast-specific items (Podcast Listening, Podcast Enjoyment, and Podcast Accessibility) were administered only during podcast-integrated intervention seminars in Cohort B.

Table A2: Robustness Check: Cohort B Only (Time-Varying Exposure)

	(1) Seminar Attendance	(2) Motivation Score	(3) Discussion Participation	(4) Comprehen- sion Score	(5) Emotional Connection	(6) Discussion Confidence	(7) Reading Completion	(8) Talk Time (Minutes)	(9) Questions Submitted
Intervention Week	0.052 (0.042)	0.566*** (0.156)	0.337*** (0.087)	0.484*** (0.102)	0.469*** (0.116)	0.264** (0.128)	0.061* (0.033)	0.966*** (0.084)	1.580*** (0.179)
Seminar Number	0.009 (0.010)	0.037 (0.024)	0.035*** (0.012)	0.161*** (0.017)	0.178*** (0.020)	0.192*** (0.019)	0.009 (0.006)	-0.016 (0.014)	-0.043 (0.026)
Observations	240	212	212	212	212	212	212	212	240
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Seminar FE	No	No	No	No	No	No	No	No	No
Mean of DV	0.88	4.05	0.61	3.83	3.95	3.90	0.57	2.08	1.02
Sample	Cohort B	Cohort B	Cohort B	Cohort B	Cohort B	Cohort B	Cohort B	Cohort B	Cohort B

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors are clustered at the student level.

Each column presents results from a fixed effects regression using only students from Cohort B. *Intervention Week* is a binary indicator equal to 1 if the seminar occurred in a treated week (Weeks 4, 5, 8, 9, or 10). *Seminar Number* is a linear control for time. Outcomes are defined as in Table 3.

Table A3: Robustness Check: Controlling for Cohort and Student Characteristics

	(1) Seminar Attendance	(2) Motivation Score	(3) Discussion Participation	(4) Comprehen- sion Score	(5) Emotional Connection	(6) Discussion Confidence	(7) Reading Completion	(8) Talk Time (Minutes)	(9) Questions Submitted
Intervention Week	-0.043 (0.051)	0.503*** (0.160)	0.307*** (0.099)	0.257*** (0.127)	0.379*** (0.129)	0.226 (0.166)	0.131*** (0.037)	1.013*** (0.109)	1.389*** (0.167)
Observations	510	439	439	439	439	439	439	439	510
Individual FE	No	No	No	No	No	No	No	No	No
Seminar FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of DV	0.86	3.98	0.56	3.75	3.77	3.74	0.54	1.78	0.66
Sample	All	All	All	All	All	All	All	All	All

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors are clustered at the student level.

This table presents a robustness check controlling for cohort-level differences and observable student characteristics. Individual fixed effects are excluded. *Intervention Week* is an indicator for podcast-integrated seminars (Weeks 4, 5, 8, 9, 10) for Cohort B. Control variables include: age, gender, undergraduate GPA, English as a first language, quantitative background, economics background, prior programming experience, and first-generation status. Outcomes are defined as in Table 3.

Table A4: Robustness Check: Placebo Test Using Untreated Cohort A

	(1) Seminar Attendance	(2) Motivation Score	(3) Discussion Participation	(4) Comprehen- sion Score	(5) Emotional Connection	(6) Discussion Confidence	(7) Reading Completion	(8) Talk Time (Minutes)	(9) Questions Submitted
Placebo Treatment	0.103** (0.050)	0.028 (0.156)	0.032 (0.067)	0.175 (0.121)	0.106 (0.127)	0.181 (0.180)	-0.069* (0.036)	-0.175 (0.107)	0.106 (0.090)
Seminar Number	0.007 (0.009)	0.037 (0.025)	0.035** (0.013)	0.161*** (0.020)	0.159*** (0.020)	0.137*** (0.027)	0.008 (0.005)	0.022 (0.019)	-0.018 (0.011)
Observations	270	227	227	227	227	227	227	227	270
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Seminar FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of DV	0.84	3.92	0.51	3.67	3.60	3.59	0.52	1.50	0.35
Sample	Cohort A	Cohort A	Cohort A	Cohort A	Cohort A	Cohort A	Cohort A	Cohort A	Cohort A

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors are clustered at the student level.

This placebo test restricts analysis to Cohort A, which did not receive the podcast-integrated seminars. *Placebo Treatment* is a fictitious indicator equal to 1 in Seminars 4, 5, 8, 9, and 10, matching the weeks when Cohort B received the intervention. Outcomes are defined as in Table 3.

Table A5: Cross-Cohort Comparison in Untreated Seminar Weeks (No Direct Podcast Exposure)

	(1) Seminar Attendance	(2) Motivation Score	(3) Discussion Participation	(4) Comprehen- sion Score	(5) Emotional Connection	(6) Discussion Confidence	(7) Reading Completion	(8) Talk Time (Minutes)	(9) Questions Submitted
Cohort B	0.064 (0.055)	-0.121 (0.121)	-0.062 (0.066)	0.034 (0.089)	0.174 (0.109)	0.207* (0.111)	-0.025 (0.030)	0.043 (0.096)	-0.026 (0.070)
Observations	255	206	206	206	206	206	206	206	255
Individual FE	No	No	No	No	No	No	No	No	No
Seminar FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of DV	0.81	3.76	0.40	3.30	3.33	3.34	0.53	1.57	0.31
Sample	Untreated Seminars: Cohorts A and B								

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors are clustered at the student level.

These regressions restrict the sample to seminars that were never subject to direct podcast treatment (Seminars 1–3 and 6–7). The binary variable “Cohort B” indicates whether a student belonged to the treatment cohort. These estimates serve as a robustness check to examine whether Cohort B students show systematically higher engagement in untreated seminars, potentially due to indirect exposure or internalization of podcast-influenced behaviors.

Table A6: Heterogeneity in Treatment Effects by Gender

	(1) Seminar Attendance	(2) Motivation Score	(3) Discussion Participation	(4) Comprehen- sion Score	(5) Emotional Connection	(6) Discussion Confidence	(7) Reading Completion	(8) Talk Time (Minutes)	(9) Questions Submitted
Intervention	-0.104 (0.082)	0.596*** (0.198)	0.374** (0.141)	0.232 (0.157)	0.544*** (0.159)	0.312 (0.223)	0.097* (0.051)	1.035*** (0.157)	0.978*** (0.146)
Intervention × Female	0.098 (0.084)	-0.125 (0.223)	-0.117 (0.154)	0.038 (0.169)	-0.260 (0.173)	-0.149 (0.201)	0.057 (0.051)	-0.028 (0.163)	0.658*** (0.236)
Observations	510	439	439	439	439	439	439	439	510
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Seminar FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of DV	0.86	3.98	0.56	3.75	3.77	3.74	0.54	1.78	0.66
Sample	All	All	All	All	All	All	All	All	All

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors are clustered at the student level.

Each column reports a separate regression estimating heterogeneous treatment effects by gender. “Intervention” indicates the average treatment effect of the podcast-integrated seminars for male students, while “Intervention × Female” captures the differential effect for female students. The sum of these two coefficients represents the treatment effect for female students.

Table A7: Heterogeneity in Treatment Effects by First Language (English vs. Non-English)

	(1) Seminar Attendance	(2) Motivation Score	(3) Discussion Participation	(4) Comprehen- sion Score	(5) Emotional Connection	(6) Discussion Confidence	(7) Reading Completion	(8) Talk Time (Minutes)	(9) Questions Submitted
Intervention	-0.081 (0.055)	0.212 (0.224)	0.489*** (0.097)	0.325** (0.162)	0.584*** (0.156)	0.235 (0.197)	0.097* (0.056)	0.921*** (0.131)	1.178*** (0.224)
Intervention × Non-English	0.062 (0.069)	0.482** (0.229)	-0.304** (0.120)	-0.108 (0.172)	-0.333* (0.166)	-0.031 (0.183)	0.060 (0.055)	0.152 (0.145)	0.338 (0.287)
Observations	510	439	439	439	439	439	439	439	510
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Seminar FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of DV	0.86	3.98	0.56	3.75	3.77	3.74	0.54	1.78	0.66
Sample	All	All	All	All	All	All	All	All	All

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors are clustered at the student level.

Each column reports a separate regression estimating heterogeneous treatment effects by English language background. “Intervention” indicates the average treatment effect for native English speakers. “Intervention × Non-English” captures the differential treatment effect for students whose first language is not English. The total treatment effect for non-native English speakers is the sum of the two coefficients.

Table A8: Heterogeneity in Treatment Effects by Quantitative Background

	(1) Seminar Attendance	(2) Motivation Score	(3) Discussion Participation	(4) Comprehen- sion Score	(5) Emotional Connection	(6) Discussion Confidence	(7) Reading Completion	(8) Talk Time (Minutes)	(9) Questions Submitted
Intervention	-0.066 (0.084)	0.428* (0.244)	0.316** (0.120)	0.139 (0.158)	0.443*** (0.154)	0.293 (0.206)	0.132*** (0.044)	0.878*** (0.099)	1.516*** (0.217)
Intervention × Non-Quant	0.040 (0.084)	0.147 (0.248)	-0.031 (0.145)	0.199 (0.168)	-0.115 (0.174)	-0.131 (0.188)	0.004 (0.047)	0.234* (0.132)	-0.217 (0.290)
Observations	510	439	439	439	439	439	439	439	510
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Seminar FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of DV	0.86	3.98	0.56	3.75	3.77	3.74	0.54	1.78	0.66
Sample	All	All	All	All	All	All	All	All	All

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors are clustered at the student level.

Each column reports a separate regression estimating heterogeneous treatment effects by quantitative academic background. “Intervention” captures the average treatment effect for students with a quantitative background. “Intervention × Non-Quant” captures the differential treatment effect for students with no prior quantitative training. The total treatment effect for non-quantitative students is the sum of the two coefficients.

Figure A1: Theoretical Framework