Beyond Audio: An Empirical Assessment of AI-Generated Podcasts and Videocasts in Business Education

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Abstract: Generative artificial intelligence (AI) is opening new possibilities for personalized, engaging instructional content in higher education. Extending our earlier work on AI-generated podcasts, this study examines the addition of AI-generated videocasts (video overviews) alongside podcasts in an undergraduate business analytics course, asking whether a multimodal (audio + video) approach improves students' learning experience beyond audio alone in a subject area that is conceptually dense and data-intensive. The study takes a quasi-experimental approach, comparing two consecutive sections of the same course: one with access only to AI-generated audio podcasts (Fall 2025, n = 24), and one where the same podcasts were supplemented with companion AI-generated videocasts (Spring 2026, n = 20). Student-perceived academic performance, engagement, and satisfaction were measured through a 15-item survey covering prior podcast experience, AI familiarity, usage patterns, perceived impact on quiz preparation and comprehension, effectiveness relative to traditional study methods, and open-ended feedback. Results showed a consistent, though modestly powered, advantage for the multimodal condition: students in the audio + video section rated the materials more favorably than the audio-only section on nearly every measured dimension, with a statistically significant increase in willingness to recommend the format for other courses (84.2% vs. 47.6% favorable, p = .026). Qualitative responses reinforced this pattern, with audio + video students more often citing improved comprehension and valuing multiple ways to engage with material, while a smaller subset preferred less synthetic-sounding narration. Across both sections, most students rated podcasts as at least as effective as traditional study methods, and roughly half had never used podcasts as a learning tool before the course. These findings offer preliminary but encouraging evidence that integrating AI generated video and audio content strengthens students' learning experience and engagement in business analytics education, while underscoring the need for larger, multi-term samples and objective performance measures to confirm the effect. The study contributes to the emerging literature on AI-enhanced instructional design by identifying student-reported benefits and design considerations relevant to integrating generative AI tools into business education curricula.

Keywords: Business Analytics; AI-Generated Podcasts; AI-Generated Videocasts; Student Academic Performance

1. Introduction

The next generation of business professionals will operate in an environment where data-informed decision-making is not a specialized skill but a baseline expectation. Roles across marketing, operations, finance, and strategy increasingly require employees to develop and interpret dashboards, evaluate statistical output, and translate quantitative findings into actionable business recommendations. Business analytics education is therefore no longer a niche elective but a foundational component of undergraduate business curricula, tasked with preparing students to function competently in data-saturated workplaces regardless of their eventual specialization. How well this education succeeds has direct consequences for the analytical readiness of the future workforce. Yet succeeding at this task requires more than exposing students to analytics tools; it requires building a durable, working knowledge of concepts that are often abstract by nature e.g. probability distributions, statistical inference, optimization logic, and model assumptions. These topics often require a deeper understanding to build up analytics skills to be ready as a workforce. A student can memorize a formula or follow a worked example without internalizing why a method applies, when it fails, or how to reason about its output in an unfamiliar context. This gap between procedural familiarity and conceptual fluency is a persistent challenge in analytics education, and it is precisely the gap that instructional design must address if students are to apply these tools flexibly after the course ends while they stay engaged with the course material.

Podcasts have emerged as one promising supplementary format for closing this gap. As an instructional medium, podcasts allow students to engage with course material outside the constraints of the traditional classroom such as during commutes, while exercising, or in other moments otherwise unavailable for study. This flexibility has been associated with increased engagement and more consistent exposure to material, and podcasts have increasingly been adopted across higher education as a low-friction supplement to lectures and readings, valued for extending learning time without adding to students' scheduled course load. Rather than replacing core instruction, podcasts function best as reinforcement: a second exposure to material in a different cognitive mode, which can aid retention and give students a chance to revisit difficult concepts at their own pace.

Podcasts used for instructional purposes could vary considerably in format. Some can be constructed as narrated summaries that closely mirror a lecture content; others can take a conversational, dialogue-driven approach that models the reasoning process itself, walking through how a problem is framed and solved rather than simply stating conclusions. The secondary dialogue-driven format may be particularly well suited to abstract analytics topics, since hearing a concept explained, questioned, and clarified in conversational form can make statistical reasoning feel less like a fixed procedure and one that students can imagine applying themselves. In short, podcasts have the potential to render abstract quantitative reasoning more accessible through an accessible and repeatable audio format. And recently AI-generated podcasts have been a popular medium across various higher education fields.

Generative AI substantially changes the economics and flexibility of producing various contents including podcasts. Traditionally, high-quality instructional podcasts require significant time investment from instructors or instructional designers, along with recording, editing, and production expertise that many faculty members simply do not have the bandwidth to sustain across an entire course, let alone across multiple sections or semesters. AI-generated podcasts remove much of this barrier: they can be produced quickly, at low marginal cost, and updated easily whenever course content, datasets, or examples change, without requiring a new recording session. This also enables a level of customization that is difficult to achieve with traditionally produced podcasts, where content can be tailored to a specific week's material, aligned tightly to an instructor's syllabus and terminology, or adjusted in tone and pacing for a particular student population, all with far less overhead than conventional production. Because they are inexpensive to generate, instructors can also reiterate: producing multiple versions of an explanation, testing different framings of the same abstract concept, or supplementing a single lecture with several short, targeted episodes rather than committing one polished but static artifact. It is this combination of pedagogical potential and practical scalability that motivates the present study's investigation of AI-generated podcasts as a supplementary tool in business analytics education.

2. Literature Review

2.1 Landscape and Adoption of Podcasts in Business and Management Education

Podcasting has been adopted as a learning resource in MBA and business courses, with studies reporting positive attitudes, perceived learning gains, and perceived flexibility from student participants. For example, Carmi (MBA course podcasting in online information review) reports that MBA students perceived podcasts as offering learning flexibility and examined learning effectiveness, with differences observed between mid-term assignments and full lectures, though the study notes variability in attitudes based on prior experience with podcasts (Carmi, 2023). These findings are echoed by additional business-education-oriented reviews that highlight learner flexibility, asynchronous access, and enhanced engagement as core benefits of podcast use in business curricula (Kurtböke et al., 2023; Carmi, 2023). Moreover, student and faculty perceptions of podcasts as a medium in professional education broader than business, including medical or leadership domains, underscoring perceived benefits such as accessibility, convenience, and the potential for learner-centered pedagogy that leverages learner-generated or instructor-generated audio (Mason et al., 2024; Devies et al., 2025). These studies collectively position podcasts as a viable supplement for traditional lectures in business education, especially in settings requiring asynchronous and flexible delivery.

2.2 Traditional vs. AI-Generated Podcasts in Business Education

Traditional podcasts (hosted, interviewer-led, or student-produced) appear in business and management education literature as a means to deliver content, support reflective practice, and foster engagement. Literature emphasizes practical benefits such as convenience, portability, and the ability to revisit content for reinforcement, which aligns with the needs of working professionals in MBA programs seeking flexible learning modalities (Carmi, 2023; Mason et al., 2024). Furthermore, AI-generated podcasts are an emerging alternative. Early investigations exploring generative AI podcasts for learning in clinical and biomedical education indicate a movement toward AI-assisted podcast production, and positive perceptions of AI-created audio within health-professional education. In business education, the recent literature has been focused on the potential of AI-enabled podcasting to enable instructors to tailor content to learning objectives and experimenting with new formats such as AI-created summaries or content generation for case discussions. For instance, (Graham & Stevens, 2026). Although not business-specific, these findings signal analogous opportunities and cautions for business programs experimenting with AI-generated audio for case discussions, guest interviews, or module recaps.

Protocols and pilot studies have begun to compare AI-generated podcast formats with traditional text-based or human-delivered content in professional education, with anticipated investigations into learning outcomes, cognitive load, and motivation (Stadler et al., 2025). They propose a protocol to compare AI-generated podcast summaries to traditional reading for medical articles, a design that offers a transferable blueprint for business education researchers seeking to compare AI-generated audio against standard learning materials in business case studies or managerial theory modules (Stadler et al., 2025). While focused on medical literature, the protocol contributes methodological guidance for evaluating AI podcasts in business education contexts.

2.3 AI-Enabled Podcasting Modalities and the Implications for Pedagogy

2.3.1 AI-Enabled Podcasting Encompasses Two Primary Modalities in Education

(i) AI-generated podcasts created by language models or text-to-speech systems to deliver instructor-selected content, and (ii) AI-assisted workflows that help produce or curate podcast content (e.g., transcripts, summaries, or scripts). The literature notes that AI podcasts can increase efficiency, broaden access, and support personalized or just-in-time learning, while also raising concerns about accuracy, trustworthiness, and the need for alignment with assessment tasks. In nursing and neurology education, studies report that students perceive AI-generated podcasts as convenient and engaging but highlight quality and trust concerns, suggesting careful integration with explicit quality controls, sources, and alignment with learning objectives (Graham & Stevens, 2026; (Mason et al., 2024; Albin et al., 2026). While these studies are not business-specific, their findings offer cautionary guidance for business educators piloting AI podcasts for executive education, entrepreneurship, or leadership modules.

In leadership education, sound pedagogical frameworks are described to guide the use of podcasts (including AI-enabled formats) to augment classroom learning or deliver leadership insights. Middleton's synthesis on studio-learning paradigms and the disruptive potential of audio-based approaches argues for considering learner agency, co-production, and the co-design of podcast content with students, including the use of learner-generated podcasts to deepen learning and reflection (Middleton, n.d.; . This suggests a productive pathway for business programs to implement AI-assisted or student-generated podcasts in capstone projects, leadership simulations, or entrepreneurship seminars.

Egilmez and Schneider (2025) recently investigated whether AI-generated, topic-specific podcasts could improve learning outcomes and student engagement in an undergraduate Business Analytics course. A quasi-experimental design compared an intervention section that received AI-generated podcast supplements with a control section using traditional instructional materials. Quantitative analyses were complemented with surveys and focus group interviews. The study concludes that AI-generated educational podcasts can positively influence both academic performance and student engagement when used as supplemental instructional materials. The findings suggest that generative AI can support more accessible, flexible, and personalized learning experiences while reducing content development effort for instructors. The authors recommend further research involving larger samples, longer intervention periods, different disciplines, and additional learning outcomes such as long-term retention and student motivation.

2.4 Practical and Methodological Considerations for Using Podcasts in Business Education

2.4.1 Pedagogical Design

The literature emphasizes choosing podcast formats aligned to intended learning outcomes, including instructor-led, learner-produced, or hybrid formats. For business education, this translates into thoughtful decisions about when to substitute traditional lectures with podcast segments, when to use podcasts as pre-briefs or post-briefs in case discussions, and when to employ learner-produced podcasts to demonstrate applied business concepts (e.g., strategy pitches, market analyses, or leadership reflections) (Carmi, 2023).

2.4.2 Assessment and Evaluation

Several studies advocate rigorous evaluation of podcast-based learning using validated instruments when possible, noting that much of the existing evidence relies on descriptive analytics or qualitative feedback. In business education, researchers should incorporate pre/post assessments, knowledge checks related to case content, and measures of critical thinking or reflective practice to determine the educational value of podcast interventions (Carmi, 2023; Mason et al., 2024; Stadler et al., 2025).

2.4.3 Quality Control and Ethics

Given concerns about the quality and trustworthiness of AI-generated content, business educators should implement clear sourcing, attribution, and quality assurance processes. The neurology and medical education literature recommends transparency about AI-assisted outputs and careful integration with evidence-based content, which is directly applicable to business education where case content and managerial concepts must be accurately sourced and cited (Mason et al., 2024; Graham & Stevens, 2026).

2.5 Summary of the Literature Review

2.5.1 Traditional Podcast Use in Business Education

Podcasts in MBA courses are associated with perceived learning gains and flexible learning, with students recognizing benefits of asynchronous access and the ability to revisit material (Carmi, 2023). Business education literature also reports learner satisfaction and perceived usefulness of podcasting as part of blended or online approaches, including the potential for learner-generated podcasts to foster engagement (Carmi, 2023; Mason et al., 2024).

2.5.2 AI-Generated Podcasting in Business Education

Studies in related health-professional education report that AI-generated podcasts can be convenient and engaging but raise concerns about quality and trust; these insights inform business educators about potential benefits and risks when adopting AI-generated formats for course content or summaries (Graham & Stevens, 2026; Mason et al., 2024). Protocol-level research suggests formal experimental designs to compare AI-generated podcast summaries with conventional reading, which can guide business educators in evaluating AI podcast interventions with rigorous methods (Stadler et al., 2025).

2.5.3 Pedagogical and Methodological Guidance

Analyses of learner-generated podcasting and the broader podcast literature in higher education emphasize the importance of designing learning outcomes, including learner agency, co-design, and the potential for podcasts to support active and reflective learning in leadership and entrepreneurship contexts (Middleton, n.d.; Devies et al., 2025). Reviews of podcasting in other professional education domains (e.g., medical, neurology, radiation sciences) underscore the need to integrate podcasts thoughtfully with curricula, to manage content quality, and to consider cognitive load and accessibility as part of instructional design, offering transferable considerations for business education (Mason et al., 2024; Shah et al., 2025; Arruzza et al., 2026).

3. Methods

3.1 Study Design

This study was conducted in an undergraduate Business Analytics course that incorporates both knowledge-based and application-based assessments. Knowledge-oriented evaluations included quizzes, midterm examinations, and final examinations featuring multiple-choice, true/false, and essay-format questions. Application-oriented assessments consisted of weekly homework assignments and a semester-long project requiring students to apply business analytics techniques in practical contexts.

The course is offered in both online asynchronous and face-to-face formats. Historically, students enrolled in the online asynchronous sections have demonstrated lower levels of engagement, likely due to the absence of live instruction and the challenging nature of topics such as optimization, simulation, and statistical analysis. To enhance student engagement and support academic success, AI-generated learning resources were introduced. Specifically, students were provided with AI-generated audio podcasts and videocasts, both created using NotebookLM. Quiz assessments served as the primary focus of this investigation. Each quiz consisted of approximately 10–15 questions randomly selected from a larger question bank (e.g. 20-25 questions).

The primary aim of the study was to examine the impact of AI-generated podcasts and videocasts on student academic performance and engagement within an online learning environment. A mixed method research design is employed. Quantitative analyses will compare quiz performance among students who reported using AI-generated audio only podcasts and both audio podcasts and videocasts. To facilitate this comparison,

students are asked on each quiz whether they had listened to the podcast, watched the videocast. Responses will be collected without any grade incentives and are subsequently used for statistical analysis.

To complement the quantitative findings, a post-course survey is administered through Qualtrics during Week 7 of the semester, and voluntary student interviews will be conducted. These qualitative data explored students' perceptions of the AI-generated learning materials, usage patterns, engagement levels, and recommendations for future improvements. By integrating quantitative and qualitative evidence, the study sought to better understand both the magnitude of the intervention's effects and the underlying mechanisms through which those effects occurred.

3.2 AI Podcast and Videocast Generation

Although several platforms currently support the creation of AI-generated educational media, this study utilizes Google NotebookLM, a Gemini 2.0-powered research and writing assistant. NotebookLM is selected because of its user-friendly interface, availability of a free version, and ability to rapidly generate high-quality learning content.

As illustrated in Figure 1, the process begins by accessing NotebookLM and signing in with a Google account. Users then create a new notebook and upload source materials, which may include PDFs, webpages, YouTube videos, audio recordings, Google Docs, text documents, and Google Slides. For this study, the complete pool of quiz questions and answers, together with detailed chapter presentation slides, was uploaded as the primary source material used to generate the learning resources.

Once the materials were uploaded, users could interact with the content through NotebookLM's chat interface to ask questions, generate summaries, and explore key concepts. Alternatively, they could access NotebookLM Studio, which provides a variety of AI-generated outputs, including audio podcasts, videocasts (video overviews), interactive or non-interactive discussions, mind maps, reports, flashcards, and practice quizzes.

Using these capabilities, both AI-generated audio podcasts and AI-generated videocasts are created to supplement student learning. The generated resources synthesize course content into accessible and engaging formats designed to reinforce key concepts and improve comprehension. The final step involves saving and distributing podcasts, videocasts, and supporting study materials to students, thereby providing an integrated and interactive learning experience that could be accessed outside of the traditional classroom environment. Lastly, the text transcriptions of the podcasts are also made available for ADA-compliance purposes.

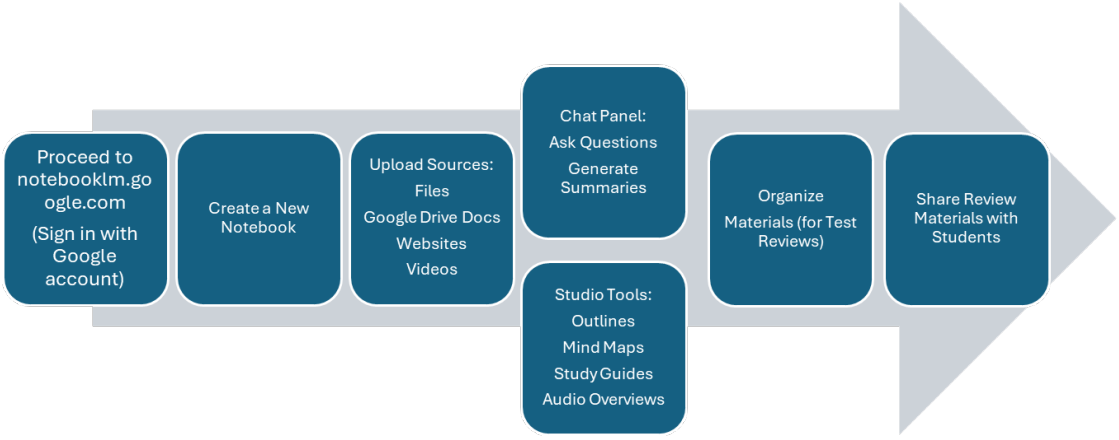


Figure 1: Steps to develop an AI Generated Podcast (Egilmez and Schneider, 2025)

3.3 Assessment: Empirical Survey

The survey was a single-administration, self-report questionnaire delivered via Qualtrics to students in two sections of Business Analytics I (Fall 2025 and Spring 2026), designed to assess how AI-generated podcasts (and, in Spring 2026, companion videocasts) affected academic performance and course engagement. It opened with an IRB-approved consent/information sheet (Lindenwood University) and took an estimated 10–15 minutes to complete. The instrument contained 15 substantive items, organized into four blocks:

1. Respondent background (Q1–Q2, Q5–Q7) - major, year in program, race/ethnicity (select all that apply), gender identity, and age group, used to characterize the sample rather than as study variables.
2. Prior experience and usage patterns (Q3, Q4, Q8, Q9) - whether students had used podcasts as a learning tool before this course, self-rated familiarity with AI-generated content (5-point scale), how often they listened to the podcasts before weekly quizzes (5-point frequency scale), and average weekly listening time (banded minute ranges).
3. Perceived impact (Q10–Q12) - two 5-point Likert agreement matrices (Strongly disagree–Strongly agree): a 4-item academic-performance block (felt more prepared, performed better on quizzes, understood concepts better, retained key concepts) and a 3-item engagement block (material more engaging, more motivated to study, would recommend in other courses), plus a single comparative item (Q11) rating podcast effectiveness relative to traditional study methods (5-point scale from "Much less effective" to "Much more effective").
4. Open-ended feedback (Q13–Q15) - three free-text questions on what students liked most, what could be improved, and suggestions for integrating the podcasts more effectively into the course.

4. Results

This supplementary analysis directly compares the Fall 2025 section, where students had access to AI-generated audio podcasts only, to the Spring 2026 section, where the same audio podcasts were supplemented with companion videocasts. Thus, Fall 2025 is the control and Spring 2026 is the intervention (treatment) group. The goal is to see whether adding a video component changed students' experience and perceived value relative to audio alone.

Because responses to the 5-point agreement and frequency items are ordinal rather than continuous, group differences were tested with the Mann-Whitney U test (two-tailed, $\alpha = .05$) rather than a t-test. Effect sizes are reported as the rank-biserial correlation (r), where values around .10 are considered small, .30 medium, and .50 large. Open-ended responses (Q13–Q15) were re-coded by semester using the same thematic categories as the main report, so the theme counts here are broken out by section rather than pooled.

Caveat: with only 19–22 valid responses per semester, this comparison has limited statistical power - real differences of a moderate size may not reach statistical significance. Results should be read as suggestive evidence, not a definitive causal test of "audio-only vs. audio + video."

4.1 Quantitative Comparison: Fall 2025 vs. Spring 2026

Mean scores and significance tests for every rated item, ordered as they appear in the survey, and depicted in Table 1. Additionally, a visual comparison of Fall 25 and Sprin 26 sections were provided in Figure 2. The interpretation of the quantitative findings are provided in the upcoming sub-sections referencing Table 1 and Figure 2.

Table 1: Mean Scores and Significance Tests

Item	Fall n	Fall mean	Spring n	Spring mean	p-value	Effect size (r)	Higher group	Significant (p<.05)
AI-content familiarity (Q4)	22	2.86	20	3.3	0.156	0.245	Spring 2026	No
Listening frequency (Q8)	22	3.5	20	3.5	0.948	0.014	Tie	No
Time spent/week (Q9)	21	2.05	20	1.75	0.402	0.143	Fall 2025	No
Felt prepared for quizzes (Q10.1)	21	3.57	19	4	0.273	0.19	Spring 2026	No
Performed better on quizzes (Q10.2)	21	3.57	19	4.05	0.27	0.195	Spring 2026	No
Understood concepts better (Q10.3)	21	3.52	19	3.95	0.271	0.195	Spring 2026	No

Item	Fall n	Fall mean	Spring n	Spring mean	p-value	Effect size (r)	Higher group	Significant (p<.05)
Retained key concepts (Q10.4)	21	3.71	19	3.84	0.836	0.038	Spring 2026	No
More effective than trad. methods (Q11)	20	3.65	19	3.68	0.893	0.026	Spring 2026	No
Material more engaging (Q12.1)	21	3.76	19	4	0.523	0.113	Spring 2026	No
More motivated to study (Q12.2)	21	3.43	19	3.37	0.864	0.033	Fall 2025	No
Would recommend in other courses (Q12.3)	21	3.43	19	4.26	0.026	0.398	Spring 2026	Yes

p-values from two-tailed Mann-Whitney U tests. Effect size (r) is the rank-biserial correlation. Only "Would recommend in other courses" (Q12.3) reached conventional statistical significance (p = .026), with Spring 2026 rated higher.

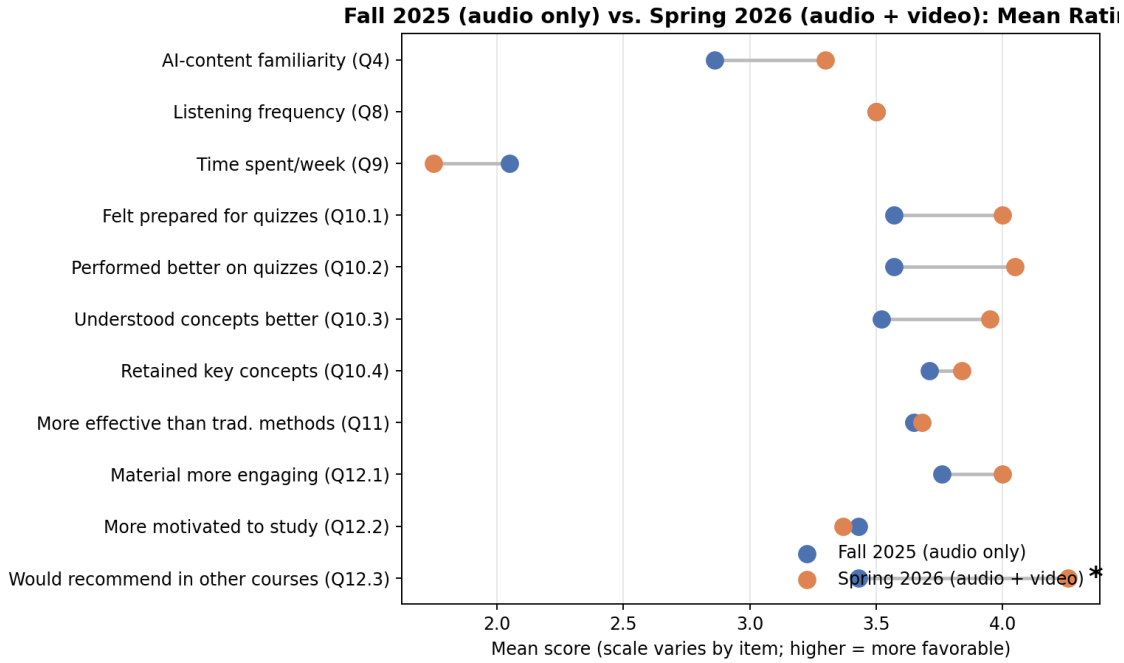


Figure 2: Dumbbell chart of mean ratings by semester. (An asterisk (*) marks the one statistically significant difference (Q12.3))

4.1.1 Familiarity and Usage Patterns (Q4, Q8, Q9)

Self-reported familiarity with AI-generated content was somewhat higher in Spring 2026 (mean 3.30 vs. 2.86), though not statistically significant (p = .156). This may reflect growing general familiarity with AI tools over time rather than the effect of the video addition. Listening frequency was essentially identical between semesters (mean 3.50 in both, p = .948). Time spent per week was slightly lower in Spring 2026 (mean 1.75 vs. 2.05, p = .402, not significant) consistent with a videocast potentially delivering the same content more efficiently, though the difference is not statistically reliable.

4.1.2 Academic Performance Impact (Q10)

All four academic-performance items were rated more favorably in Spring 2026 than Fall 2025 (e.g., "felt more prepared for quizzes": 78.9% top-2-box in Spring vs. 61.9% in Fall), but none of these differences reached statistical significance at this sample size (all p > .27). Moreover, the most consistent gap was on "understood

chapter concepts/terms better" (73.7% vs. 57.1% top-2-box) and "performed better on quizzes" (78.9% vs. 61.9%) — both point in the direction of the combined audio + video format helping comprehension, though this is a directional trend, not a confirmed effect.

4.1.3 Effectiveness vs. Traditional Study Methods (Q11)

63.2% of Spring 2026 respondents rated the format as more effective than traditional study methods, versus 55.0% in Fall 2025, which indicates a modest, non-significant difference (p = .893).

4.1.4 Course Engagement (Q12)

"Made course material more engaging" and "would recommend in other courses" were both rated higher in Spring 2026. "Would recommend using AI-generated podcasts/videocasts in other courses" was the one statistically significant difference in the entire survey: 84.2% of Spring 2026 respondents gave a top-2-box rating vs. 47.6% in Fall 2025 (p = .026, medium-to-large effect r = .40). This is the clearest quantitative signal that the audio + video combination was more well-received than audio alone. "Felt more motivated to study" was the only item rated (marginally) higher in Fall 2025 (mean 3.43 vs. 3.37), though the difference is negligible and not significant (p = .864).

4.2 Qualitative Comparison (Open-Ended Feedback)

Open-ended responses were re-coded by semester using the same thematic categories as the main report. Percentages are the share of each semester's respondents who mentioned a theme (respondents could mention more than one). Question 13 (See Figure 3) investigated what students liked the most and Question 14 asked for qualitative feedback on what to improve (See Figure 4). And, lastly, students were asked if they would like this concept to be integrated to other parts of the course beyond quizzes (See Figure 5).

Better understanding/retention" was mentioned far more often in Spring 2026 (53.8% vs. 25.0% of Fall respondents), and Spring 2026 was the only semester where students spontaneously mentioned the video component (15.4%) as a reason they liked the format - e.g., one student wrote the videos let them "hear what I have learned in a different way," and another cited having "four different ways to take in the information.

As seen in Figure 3, most of the Spring 2026 respondents (53.8%) said nothing needed improvement, compared to 20.0% in Fall 2025 - consistent with higher overall satisfaction once video was added. "Reduce AI-generated feel" appeared only in Spring 2026 (15.4%), suggesting the video format made the AI-generated quality more noticeable to some students even as overall satisfaction rose. As seen in Figure 4, Spring 2026 students were more likely to ask for greater emphasis or promotion of the podcasts/videocasts in the course (16.7% vs. 0%), a further indirect sign of stronger buy-in for the combined format.

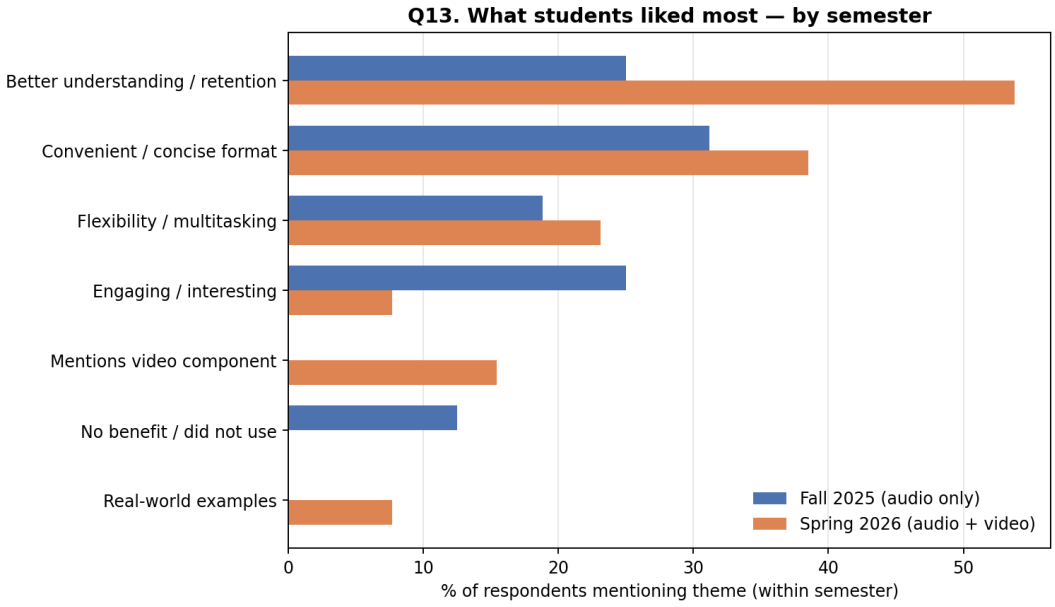


Figure 3: Q13: What did you like most?

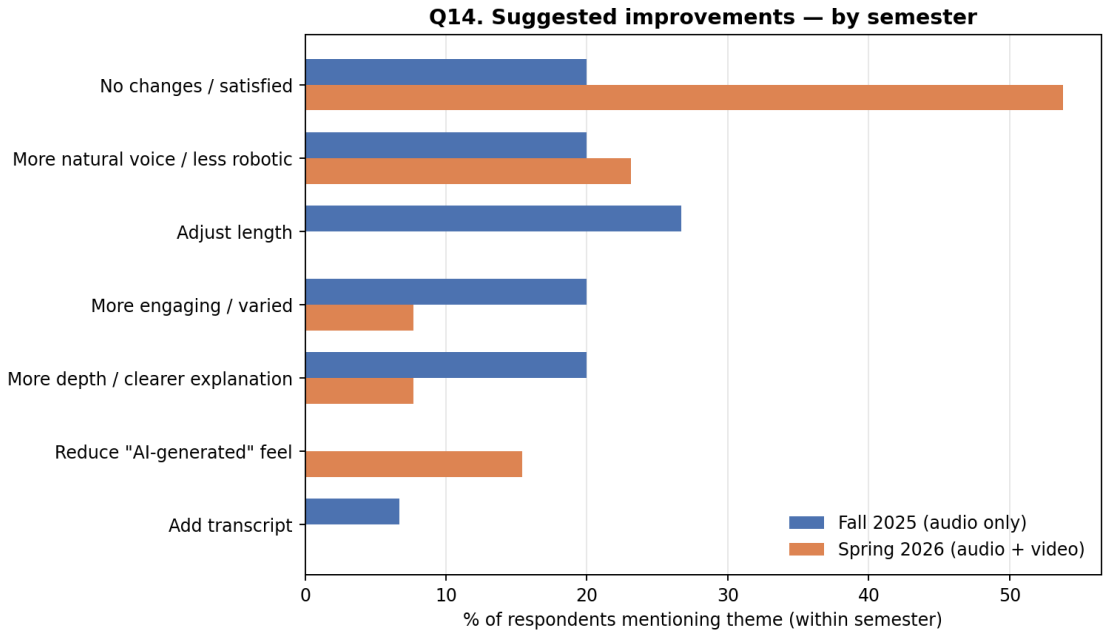


Figure 4: Q14. What could be improved?

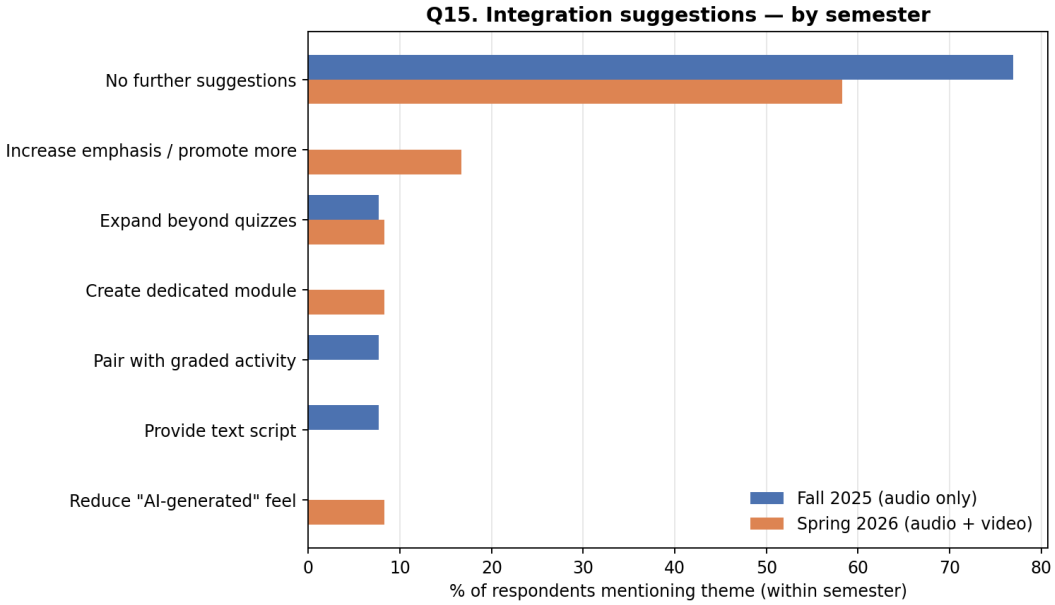


Figure 5: Q15. Suggestions for integration

4.3 Which Format Do Students Prefer?

Taken together, the evidence consistently, though not always statistically significantly and given the small sample, favors the Spring 2026 audio + video combination over audio alone offered in Fall 2025. The detailed highlights of the empirical survey findings are as follows:

- Every rated item except one ("felt more motivated to study," a negligible, non-significant difference) was scored higher in Spring 2026 than Fall 2025.
- The single statistically significant difference in the whole survey, willingness to recommend the format in other courses, favored Spring 2026 by a wide margin (84.2% vs. 47.6% top-2-box, p = .026).

- Qualitatively, Spring 2026 students spontaneously praised the multi-modal format (having "four different ways to take in the information") and reported comprehension benefits more often than Fall 2025 students.
- Spring 2026 students were also more likely to say nothing needed improvement and to ask for the format to be used more, both signs of stronger satisfaction.

The main countersignal is that the video addition made the "AI-generated" quality more salient for a few Spring 2026 students, who asked for a more human-sounding voice or less "AI-like" feel - a consideration for future production quality rather than evidence against the multi-modal approach itself.

Overall: the data are directionally consistent with audio + video outperforming audio alone from the students' perspective, anchored by one statistically significant result (recommendation intent) and a uniform pattern of higher point estimates across every other measure. However, with n ≈ 20 per section, most individual comparisons do not reach statistical significance on their own, so this should be treated as encouraging preliminary evidence rather than a confirmed effect - a larger sample (e.g., combining several future sections) would be needed to test it more rigorously.

5. Conclusion

This study compared student-reported outcomes across two consecutive offerings of Business Analytics I: a Fall 2025 section that used AI-generated audio podcasts alone (n = 24), and a Spring 2026 section that paired the same audio podcasts with companion videocasts (n = 20). Across nearly every measured dimension - perceived exam preparation, comprehension, retention, course engagement, and effectiveness relative to traditional study methods - the combined audio + video condition produced higher mean ratings than audio alone. The single statistically significant difference, a markedly higher willingness to recommend the format in other courses (84.2% vs. 47.6% top-2-box, p = .026, r = .40), together with converging qualitative evidence (students in Spring 2026 spontaneously cited the value of having "four different ways to take in the information" and reported comprehension gains more often), provides a coherent, if preliminary, picture: supplementing AI-generated audio with a video component appears to improve students' subjective experience of the material without introducing new complaints beyond a modestly increased sensitivity to the content's AI-generated origin. Taken together, the evidence favors continuing and refining the multi-modal (audio + video) approach over reverting to audio alone.

Limitations of this study should be understood as follows. Non-experimental, non-randomized design: Students were not randomly assigned to the audio-only or audio + video condition; the two groups are different cohorts taking the course in different terms. Any pre-existing differences between the Fall 2025 and Spring 2026 cohorts (prior exposure to podcasts, general familiarity with AI tools, major composition, motivation levels) are confounded with the treatment itself and cannot be ruled out as alternative explanations for the observed differences. Moreover, small sample size and limited statistical power: With 19–22 valid responses per semester, the comparison can reliably detect only large effects. Most of the observed differences, while consistently favoring Spring 2026, did not reach conventional statistical significance and should not be interpreted as null findings as they may simply reflect insufficient power. Thirdly, self-reported outcomes only: All academic-performance items (Q10) are students' perceptions of their own preparation and performance, not objective measures such as quiz scores or course grades. Perceived and actual performance can diverge, particularly for a novel study tool that may increase confidence without a proportional increase in mastery. And, lastly, single institution, single course, single instructor: All data come from one course (Business Analytics I) at one institution. Findings may not generalize to other subjects, student populations, or instructors.

Future work could be strategized in the following ways. Future iterations should merge (de-identified) survey responses with actual quiz and exam scores to test whether the higher self-reported preparation and comprehension in the audio + video condition correspond to measurable performance gains. Use a within-subject or crossover design: Rotating audio-only and audio + video modules within the same section (e.g., alternating by chapter) would let each student serve as their own control, removing the cohort-level confounds inherent in the current between-section comparison. Increase sample size across multiple terms: Pooling additional Fall and Spring sections over two or more years would substantially increase statistical power and allow the currently non-significant but consistently favorable trends (e.g., quiz preparation, comprehension) to be tested more conclusively. Adopt validated instruments: Replacing ad hoc Likert items with established, validated scales for engagement, motivation, and self-efficacy (with reported reliability coefficients) would strengthen the measurement quality of future surveys, and a pre-registered analysis plan would guard against

post hoc interpretation. Investigate the "AI-generated feel" concern directly: Since a subset of Spring 2026 students specifically requested a more natural, less "AI-like" narration voice, future work should experimentally vary voice/production quality (e.g., synthetic vs. human-recorded narration) to determine whether this is a meaningful driver of student satisfaction or a minor concern. Conduct follow-up qualitative interviews or focus groups: A small number of semi-structured interviews would allow deeper exploration of why students in the audio + video condition were more willing to recommend the format, and whether this reflects the video content itself, increased modality choice, or other course-level changes between terms. Examine differential effects by subgroup: Larger future samples would allow exploration of whether the benefit of adding video differs by prior podcast experience (Q3), self-reported AI familiarity (Q4), or academic major - questions the current sample is too small to address with adequate power.

Ethics Declaration

The IRB approval was received prior to conducting the empirical survey.

AI Declaration

Claude AI and MS Copilot were used for language proficiency improvement purposes.

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