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ORIGINAL ARTICLE

ENHANCING NURSING STUDENTS' LEARNING OF NUTRITION THROUGH PODCASTING: AN ACTIVE APPROACH FOR GENERATION Z STUDENTS IN MOROCCO

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ABSTRACT

Background. Student-generated video podcasting may support active learning in nursing education, but evidence from low- and middle-income settings remains limited.

Material and Methods. This two-academic-year, non-randomized consecutive-cohort study was conducted at the Taza annex of the Higher Institute of Nursing and Health Techniques, Fes, Morocco. The 2024-2025 cohort (n = 135) completed a collaborative student-generated video-podcasting activity for the therapeutic diets unit, involving group content research, script preparation, recording, presentation, peer viewing, and supervised discussion, whereas the 2025-2026 cohort (n = 119) received traditional instruction. In both cohorts, the nutrition unit was taught and assessed first, followed by the therapeutic diets unit. Each unit was evaluated by an end-of-unit written examination graded on a 10-point scale, and the overall module grade was the mean of the two unit scores. The nutrition score therefore preceded the therapeutic-diets intervention and was used as a pre-intervention academic comparator. The therapeutic-diets written examinations used different questions across academic years but assessed the same construct and learning objectives; item difficulty indices were used to minimize differences in examination difficulty. Welch t-tests and an ANCOVA model adjusted for nutrition score were used.

Results. Cohorts were comparable for gender, program, age, and pre-intervention nutrition score (6.16 ± 1.37 vs. 6.18 ± 1.35; $p = 0.907$). The intervention cohort achieved a higher therapeutic-diets written examination score than the traditional cohort (7.20 ± 1.21 vs. 6.24 ± 1.30; mean difference = 0.96, 95% CI 0.65 to 1.27; $p < 0.001$; $d = 0.77$). The adjusted mean difference was 0.97 points (95% CI 0.69 to 1.25; $p < 0.001$). Satisfaction was favorable, but internal consistency was below the conventional 0.70 threshold (Cronbach's alpha = 0.69), so item-level interpretation was retained.

Conclusions. The implemented video-based collaborative learning activity was associated with a higher therapeutic-diets written examination score. Because the intervention was multicomponent and cohorts were not randomized, the observed association cannot be attributed specifically to video podcasting. Prospective controlled replication using a common or item-banked examination is needed.

Keywords: *active learning, video podcasting, collaborative learning, nursing education, nutrition education, Morocco, quasi-experimental study*

INTRODUCTION

Higher education has undergone rapid digital transformation, especially after the COVID-19 pandemic accelerated the use of online, asynchronous, and multimedia learning resources [1]. In health professions education, this transformation has encouraged instructors to move beyond lecture-only formats toward approaches that combine flexible digital resources with structured classroom interaction.

Generation Z students now form a large part of nursing cohorts. Many are familiar with mobile learning, social media, and short multimedia formats and may value autonomy, rapid feedback, and flexible access to content [2-5]. However, digital familiarity should not be equated with academic readiness. Educational technologies are most useful when they are embedded in clear learning objectives, guided by faculty feedback, and linked to assessment.

Nutrition education is essential in nursing training because nurses contribute to patient education, disease prevention, nutritional screening, and support for people with chronic illnesses. Previous literature has reported gaps in nutrition knowledge among

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nursing students, supporting the need for approaches that improve engagement and application-oriented learning [6]. Therapeutic diet is a particularly relevant unit because it requires students to translate nutrition principles into disease-specific dietary guidance.

Podcasts and video podcasts are increasingly used in health education because they allow flexible revision and may support motivation, self-directed learning, and knowledge retention [7-11]. Student-generated video podcasting adds an active production dimension: students do not only consume content, but also select evidence, write scripts, explain dietary principles, communicate visually, and present material to peers. In practice, such activities may also incorporate collaborative learning, peer teaching, and faculty-guided discussion.

In Morocco, nursing education is progressively integrating digital tools while still facing challenges related to infrastructure, access, and pedagogical support [12]. Evidence from student-generated questioning, active podcast production, and podcasting in nursing and health-professions education supports the value of active and participatory approaches [13-15]. The pedagogical rationale for the present activity is grounded in active learning, constructivist learning, and student-generated content. Students are expected to construct understanding by organizing information into an explanatory product, negotiating meaning within groups, and receiving feedback during supervised viewing. The Interactive-Constructive-Active-Passive (ICAP) framework distinguishes increasingly engaged modes of learning and suggests that constructive and interactive activities can be more cognitively engaging than passive reception [16, 17]. Earlier nursing research also suggested that podcast-based learning may support knowledge retention and application [18], although the present study did not directly measure cognitive processes.

Empirical evidence remains limited on student-generated video-podcasting activities in Moroccan nursing nutrition education. This study examined whether a collaborative video-based learning activity centered on student-generated podcasts for a therapeutic diets unit was associated with higher academic performance than traditional instruction in a comparable consecutive cohort.

MATERIALS AND METHODS

Study design

This study employed a non-randomized, quasi-experimental comparative design involving non-equivalent consecutive cohorts. Given that exposure to the video-podcasting intervention was determined by academic year rather than by random allocation, the study should be interpreted as a natural educational experiment rather than as a randomized or fully controlled trial. Reporting was guided, where applicable, by the STROBE statement for observational comparative studies [19].

Setting and participants

The study was carried out at the Higher Institute of Nursing and Health Techniques (ISPITS) of Fes, Taza Annex, during the 2024-2025 and 2025-2026 academic years. The total sample included 254 undergraduate nursing students enrolled in the Nutrition and Dietary Regimens module. The 2024-2025 cohort received the student-generated video-podcasting activity (n = 135), and the 2025-2026 cohort received traditional instruction for the same therapeutic diets content (n = 119).

Eligible students were those with complete demographic data and complete nutrition and therapeutic-diets written examination scores. The sample was based on intact academic cohorts, and no random allocation, matching, or post hoc exclusion for performance was applied.

Educational intervention

In the 2024-2025 intervention cohort, students were divided into small groups and completed a structured, collaborative video-podcasting activity on therapeutic diet topics. Topics included diabetic, renal, low-sodium, hypolipidemic, hypoproteic, hyperproteic, hypocaloric, fiber-free, residue-free, and gluten-free diets. Students researched and developed scientifically accurate content, prepared a scenario and script, recorded the video podcast, and presented the final product in class. The intervention therefore comprised several linked active-learning components rather than video production alone.

Before production, the professor provided a structured video-podcast rubric covering scenario quality, scientific content accuracy, innovation and creativity, and speech delivery with overall presentation. The rubric was used to guide and evaluate the video-podcast activity itself and was separate from the academic outcome analyzed in this study. The therapeutic-diets academic score used in the statistical analyses was obtained from the end-of-unit written examination, as in the comparison cohort. Engagement, perceived usefulness, creativity stimulation, autonomy, and overall satisfaction were assessed separately through the post-activity perception questionnaire and did not contribute to the written examination score.

Traditional comparison condition

The 2025-2026 cohort received the same therapeutic diets curriculum content through traditional professor-led instruction and classroom explanation,

without the student-generated video-podcasting activity. The same professor, institutional setting, syllabus content, contact-hour structure, learning objectives, 10-point grading scale, and written end-of-unit assessment format were maintained across the two academic years. Thus, the principal difference between cohorts concerned the teaching approach used for the therapeutic diets unit: collaborative video-podcasting in 2024-2025 versus traditional instruction in 2025-2026.

In-class viewing and peer learning

All final video podcasts were presented and viewed in class under the professor's supervision. Before viewing sessions, groups authorized the educational sharing of their videos with peers. Classroom viewing was not treated as a passive projection exercise; rather, it functioned as a peer-learning session in which students compared approaches, clarified misconceptions, and linked the videos to the therapeutic diets learning objectives. Thus, the intervention combined group work, content research, script preparation, video production, presentation, peer viewing, and supervised discussion.

Evaluation procedure and outcomes

The module was delivered sequentially in both academic years. The nutrition unit was taught first through traditional instruction and was assessed by a written examination immediately after completion of that unit. The therapeutic diets unit was taught afterward. Thus, the nutrition assessment occurred before the therapeutic-diets intervention in both cohorts and served as a pre-intervention academic comparator. After completion of the therapeutic diets unit, both cohorts completed a written end-of-unit examination graded on the same 10-point scale. The overall module grade was calculated as the mean of the nutrition and therapeutic-diets examination scores. The therapeutic-diets written examination score was the primary outcome analyzed in this study. The video-podcast rubric and the post-activity perception questionnaire were separated from this academic examination outcome.

The therapeutic-diets written examinations were not identical across the two academic years. Different questions were used, but both examinations were constructed to assess the same therapeutic-diets learning construct, syllabus content, and learning objectives, using the same grading scale and general examination format.

Because different examination questions were used across the two academic years, item difficulty was examined post hoc to assess the comparability of the two examination forms. For each item, the classical difficulty index (P) was calculated as the proportion of students who answered the item correctly. The distribution of item difficulty indices was then examined across the two examination forms to determine whether the examinations showed broadly comparable difficulty profiles. This analysis was used as a post hoc comparability check rather than as evidence of strict equivalence, because item difficulty may also be influenced by differences in cohort ability.

A relative unit difference score was also calculated as therapeutic diets written examination score minus nutrition score. This variable was used only as a descriptive internal comparator to show

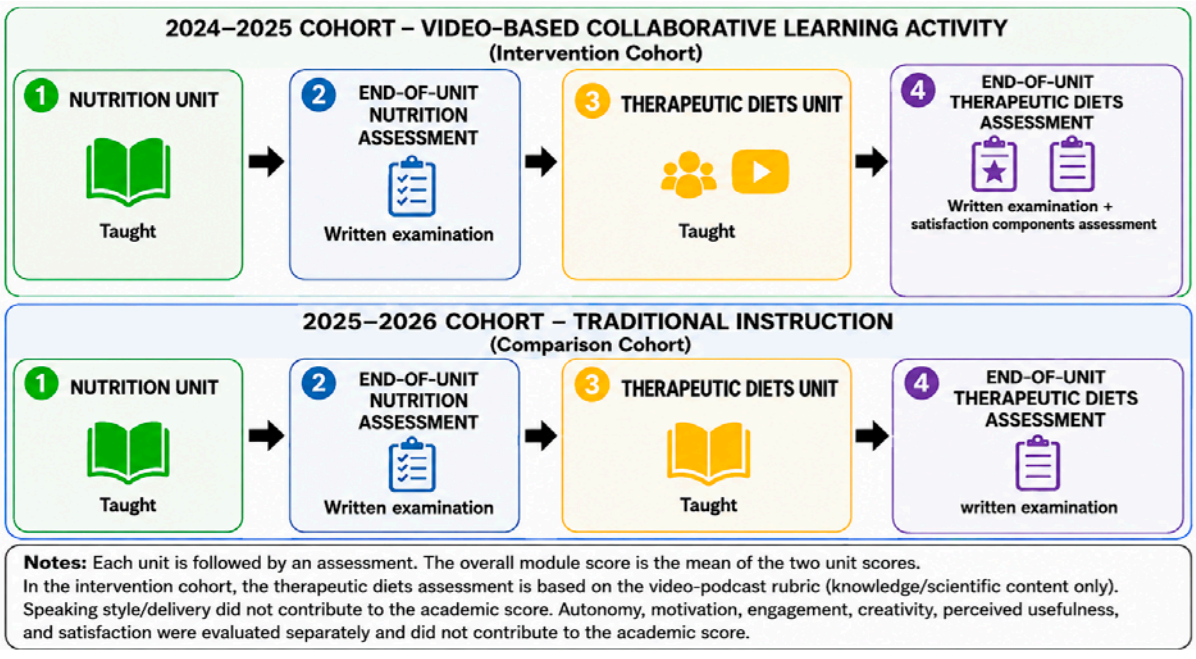

Figure 1. Study design and assessment timeline

how performance in the targeted unit differed from performance in a traditionally taught component. Because nutrition and therapeutic diets assess related but non-identical content, this difference score was not interpreted as a true pre-post learning gain for the same construct.

In the intervention cohort only, students completed a structured satisfaction questionnaire after the video-podcasting activity and in-class viewing. Items used a 1-5 Likert-type response format, with higher scores indicating more favorable perceptions. Because satisfaction was measured only after the intervention and only in the podcasting cohort, these data were analyzed descriptively and were not used to infer comparative effectiveness.

Bias and control measures

Several measures were used to reduce bias and improve transparency. Both cohorts were drawn from the same institution and module and were taught by the same professor. The curriculum content, learning objectives, contact-hour structure, 10-point grading scale, and written end-of-unit assessment format were maintained across academic years. Different therapeutic-diets examination questions targeted the same construct and learning objectives, and item difficulty indices were used to minimize differences in examination difficulty. Demographic variables and the pre-intervention nutrition score were compared between cohorts to assess baseline comparability. These measures improved comparability, although they could not establish exact equivalence between the two examination forms.

As examinations contained different questions across academic years, item difficulty indices were calculated post hoc for each examination form. The resulting difficulty profiles were examined to assess whether substantial differences in examination difficulty were apparent between cohorts. This approach reduced uncertainty concerning examination comparability but cannot establish exact equivalence because observed item difficulty is partly dependent on cohort performance.

Despite these stabilizing features, the design remains vulnerable to residual bias because the cohorts belonged to different academic years and were not randomized. Possible cohort or generational differences include differences in prior academic preparation, motivation, peer culture, digital readiness, assessment behavior, and unmeasured academic support. In addition, although the therapeutic-diets examinations assessed the same construct and were matched as closely as possible for difficulty, they contained different questions. These issues were explicitly considered when interpreting the findings, and the analysis avoided causal language.

Statistical analysis

Categorical variables were reported as frequencies and percentages. Continuous variables were reported as means and standard deviations. Baseline comparability between cohorts was examined using *Chi*-square tests for categorical variables and Welch independent-samples t-tests for continuous variables. The primary between-cohort comparison focused on the therapeutic-diets written examination score. Effect sizes were reported as Cohen's d and interpreted cautiously because the design was non-randomized.

The relative unit difference score was compared between cohorts as a sensitivity descriptor but was not analyzed with within-cohort paired tests because the two scores reflected related but different academic units. A linear ANCOVA model was specified with therapeutic-diets written examination score as the dependent variable, cohort as the exposure variable, and nutrition score as the pre-intervention academic covariate. This model estimated whether the between-cohort examination-score difference persisted after adjustment for prior academic performance; it cannot correct for unmeasured cohort differences or guarantee equivalence of the two examination forms.

Satisfaction was reported item by item using means and standard deviations. The five post-activity perception items were examined for internal consistency before any aggregation. Because Cronbach's alpha was below the conventional 0.70 threshold, a global score was not used. Exploratory Pearson correlations were calculated between each perception item and the therapeutic-diets written examination score within the intervention cohort. Given the Likert-type nature of the items, multiple item-level testing, and post-intervention timing, correlations were interpreted as descriptive and non-causal. A Bonferroni reference threshold of 0.01 was used for the five exploratory correlations.

Ethical considerations

The study involved educational evaluation with adult students and did not include clinical experimentation, patient data, or interventions posing physical risk. Data were processed anonymously and confidentially, and results were reported in aggregate form. Students in the intervention cohort authorized the in-class educational sharing of their video podcasts with peers. Institutional ethics approval, waiver, and consent details are reported in declarations.

RESULTS

Participant characteristics

The database included 254 undergraduate nursing students: 135 in the 2024-2025 video-podcasting

Table 1. Sociodemographic characteristics by cohort

Variable	2024-2025 video-podcasting cohort (n = 135)	2025-2026 traditional cohort (n = 119)	p-value
Gender, n (%)			
Female	94 (69.6)	83 (69.7)	0.984
Male	41 (30.4)	36 (30.3)	
Program, n (%)			
General Nursing	93 (68.9)	85 (71.4)	0.659
Family and Community Health Nursing	42 (31.1)	34 (28.6)	
Age (years), mean ± SD	21.71 ± 1.69	21.98 ± 1.87	0.234

p-values are from *Chi*-square tests for categorical variables and Welch t-tests for continuous variables.

cohort and 119 in the 2025-2026 traditional cohort. The two cohorts were similar in gender distribution, program distribution, and age. The nutrition score, obtained before the therapeutic diets unit and taught traditionally in both cohorts, was also nearly identical between groups and supported pre-intervention academic comparability.

Academic outcomes

Pre-intervention nutrition scores were nearly identical between the video-podcasting and traditional cohorts (6.16 ± 1.37 vs. 6.18 ± 1.35; mean difference = -0.02, 95% CI -0.36 to 0.32; p = 0.907). The therapeutic-diets written examination score was higher in the video-podcasting cohort than in the traditional cohort (7.20 ± 1.21 vs. 6.24 ± 1.30; mean difference = 0.96, 95% CI 0.65 to 1.27; p < 0.001; d = 0.77). In both cohorts, these scores were obtained from written end-of-unit examinations graded on the same 10-point scale. The examinations contained different questions across academic years but assessed the same therapeutic-diets construct and were reviewed using item difficulty indices to minimize differences in examination difficulty.

The relative unit difference score was 1.04 ± 1.42 in the video-podcasting cohort and 0.06 ± 1.36 in the traditional cohort. This descriptive pattern indicates that the intervention cohort performed higher in the targeted therapeutic diets unit relative to its own traditionally taught nutrition component. Because the two academic components are not identical constructs, this finding should not be read as a within-student pre-post gain.

In the adjusted ANCOVA model, cohort remained associated with the therapeutic-diets written examination score after controlling for the pre-intervention nutrition score (adjusted mean difference = 0.97 points on the 10-point scale,

Table 2. Academic outcomes by cohort

Outcome	2024-2025 video-podcasting cohort	2025-2026 traditional cohort	Statistical result
Nutrition written examination score /10 (pre-intervention comparator; written examination in both cohorts)	6.16 ± 1.37	6.18 ± 1.35	Mean difference = -0.02; 95% CI -0.36 to 0.32; Welch t = -0.12; p = 0.907; d = -0.01
Therapeutic-diets written examination score /10 (written end-of-unit examination in both cohorts)	7.20 ± 1.21	6.24 ± 1.30	Mean difference = 0.96; 95% CI 0.65 to 1.27; Welch t = 6.06; p < 0.001; d = 0.77
Relative unit difference score (therapeutic diets – Nutrition)	1.04 ± 1.42	0.06 ± 1.36	Mean difference = 0.98; 95% CI 0.64 to 1.32; Welch t = 5.63; p < 0.001; d = 0.71
Adjusted model for therapeutic-diets written examination score	--	--	Adjusted mean difference = 0.97; 95% CI 0.69 to 1.25; t = 6.81; p < 0.001

95% CI 0.69 to 1.25; t = 6.81; p < 0.001). This model shows that the examination-score difference persisted after adjustment for prior academic performance, but it does not establish causality and cannot eliminate residual bias arising from the non-randomized consecutive-cohort design or from non-identical examination questions.

Values are mean ± SD unless otherwise stated. The relative unit difference score is descriptive rather than a true pre-post gain. The adjusted model included cohort and pre-intervention nutrition score as predictors of the therapeutic-diets written examination score.

Satisfaction findings in the video-podcasting cohort

Students in the video-podcasting cohort reported favorable item-level perceptions of the activity. The highest rating was observed for autonomy, followed by perceived usefulness and overall satisfaction. Because the five items showed weak internal consistency (Cronbach's alpha = 0.69), results are presented at the item level and were not aggregated into a single satisfaction scale.

Items were rated from 1 to 5, with higher scores indicating more favorable perceptions. Cronbach's alpha across the five items was 0.69; item-level interpretation is therefore preferred over a summed scale.

Correlation between satisfaction items and therapeutic-diets written examination score

Exploratory Pearson correlations within the video-podcasting cohort showed positive associations between all post-activity perception items and the therapeutic-diets written examination score. The strongest association was observed for the item related to autonomy/learning at one's own pace (r = 0.42, p < 0.001), followed by engagement (r = 0.34, p < 0.001) and overall satisfaction (r = 0.33, p < 0.001). These perception items were not part of the academic score. Because they were measured after the activity, the correlations should be interpreted as descriptive associations rather than evidence that the perceptions caused performance differences.

Pearson correlations were calculated in the video-podcasting cohort only (n = 135). The Bonferroni reference threshold for five exploratory correlations was p < 0.01. Post-activity perceptions were assessed after the intervention; correlations are non-causal.

DISCUSSION

This two-academic-year consecutive-cohort study found that students exposed to the implemented video-based collaborative learning activity for the therapeutic diets unit achieved higher written end-of-unit examination scores than students who received traditional instruction. The difference was close to one point on a 10-point scale and remained after adjustment for the nutrition score obtained before therapeutic diets instruction began. The same professor, curriculum content, contact-hour structure, learning objectives, grading scale, and written assessment format were maintained across academic years. The two therapeutic-diets examinations used different questions, but they targeted the same construct and were reviewed using item difficulty indices to achieve comparable difficulty. These features strengthen

Table 3. Satisfaction components and questionnaire items in the video-podcasting cohort

Satisfaction component	Questionnaire item	Mean ± SD
Engagement	The podcasting sessions kept me actively engaged.	3.88 ± 0.87
Perceived usefulness	The podcasting method helped me understand therapeutic diets better.	4.18 ± 0.67
Creativity stimulation	Creating or watching the podcasts stimulated my creativity.	3.79 ± 0.78
Autonomy	Podcasting allowed me to learn at my own pace.	4.50 ± 0.30
Overall satisfaction	Overall, I am satisfied with the podcasting learning experience.	4.04 ± 0.67

Table 4. Correlation between satisfaction components and therapeutic-diets written examination performance

Satisfaction component	Correlation with therapeutic-diets written examination score	p-value
Engagement	r = 0.34	< 0.001
Perceived usefulness	r = 0.26	0.002
Creativity stimulation	r = 0.24	0.006
Autonomy	r = 0.42	< 0.001
Overall satisfaction	r = 0.33	< 0.001

comparability, although the non-randomized design and non-identical examination forms prevent a causal interpretation.

A central methodological distinction is that the nutrition score was a pre-intervention academic comparator, not an intervention outcome. It was collected after completion of the nutrition unit and before the therapeutic diets unit began in both cohorts. The overall module grade was the mean of the two written end-of-unit examination scores, but the present analysis treated the nutrition score as the prior academic comparator and the therapeutic-diets written examination score as the outcome. Because the two units assess related but non-identical content, the relative unit difference should not be interpreted as a classic pre-post gain.

The intervention should not be interpreted as video podcasting in isolation. It combined group work, content research, script preparation, video recording, presentation, viewing of other groups' videos, peer learning, and professor-supervised discussion. Any observed association may therefore reflect one or several of these components, including active production, collaboration, peer explanation, or increased time on task. The present design cannot disentangle their individual contributions. Accordingly, the findings are more appropriately interpreted as evidence concerning the implemented video-based collaborative learning activity rather than a specific isolated effect of the video-podcasting medium.

The findings are consistent with literature suggesting that active production tasks can promote engagement and deeper processing compared with passive content reception [13-18]. From a constructivist perspective, creating a video podcast requires students to identify essential dietary principles, organize evidence, translate content into accessible language, and anticipate peer questions. Supervised viewing and discussion may add further interactive processing. These mechanisms are plausible, but the present study did not directly measure cognitive engagement, peer interaction quality, or time on task.

The intervention also aligns with some preferences described among contemporary nursing students, including visual learning, autonomy, interactivity, and collaborative work [20-22]. However, the 'digital native' concept should be used cautiously. Comfort with digital platforms does not guarantee educational benefit. The positive association observed here is more defensibly linked to a guided, assessment-linked active-learning activity than to students' generational membership itself.

The satisfaction findings add a limited motivational and perceptual perspective. The item related to autonomy/learning at one's own pace was the highest rated and had the strongest correlation with the therapeutic-diets written examination score. Engagement and overall satisfaction were also positively associated with the score. Importantly, engagement, perceived usefulness, creativity stimulation, autonomy, and overall satisfaction were assessed separately and did not contribute points to the academic therapeutic-diets examination score. The direction of the observed associations remains uncertain, and both perceptions and performance may have been influenced by unmeasured factors.

The weak internal consistency of the five satisfaction items is important. A low Cronbach's alpha indicates that the items should not be treated as a single validated satisfaction construct. Reporting item-level findings avoids overinterpreting a composite score and provides more transparent information about which aspects of the activity students valued.

This study has several limitations. First, cohorts were not randomized, and the comparison involved different academic years; residual cohort or generational differences may therefore remain despite stable teaching conditions. Second, although post hoc item difficulty analysis indicated broadly comparable examination difficulty, the examinations contained different questions and were administered to different cohorts. Therefore, exact equivalence between the two examination forms cannot be established. Third, the intervention itself was multicomponent, combining group work, content research, script preparation, video production, presentation, peer viewing, and supervised discussion; the design cannot isolate the contribution of video podcasting from the other active-learning components. Fourth, the nutrition score was a useful pre-intervention academic comparator but assessed related rather than identical content. Fifth, post-activity perception items were measured only after the intervention and only in the video-podcasting cohort. Sixth, the study was conducted in one Moroccan nursing institution, limiting generalizability.

Despite these limitations, the study has practical implications. A structured video-based collaborative learning activity incorporating student-generated podcasts may be considered a feasible active-learning option in nursing nutrition education when guided by a clear rubric, supervised by the professor, and integrated into classroom discussion. The present findings should be viewed as preliminary because the cohorts were non-randomized and the written examination questions were not identical across academic years. Future studies should use prospective parallel-group or crossover designs in which both groups complete the same independent written knowledge examination or an item-banked equivalent, while podcast-production quality and post-activity perceptions are assessed separately.

CONCLUSIONS

The implemented video-based collaborative learning activity was associated with a higher therapeutic-diets written examination score than traditional instruction in this non-randomized consecutive-cohort study. The nutrition assessment was completed before the therapeutic diets unit in both cohorts, and both cohorts were assessed with written end-of-unit examinations on the same 10-point scale. Although different therapeutic-diets questions were used across academic years, the examinations targeted the same construct and were reviewed using item difficulty indices to achieve comparable difficulty. Because the intervention combined several active-learning components and cohorts were not randomized, the observed score difference cannot be attributed specifically to video podcasting. Prospective controlled studies using the same or item-banked written examination in both groups are needed.

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Conflict of interest
The author declares no financial or non-financial competing interests related to this work.

Ethics approval
The requirement for formal ethics approval was waived because the study used anonymized routine educational evaluation data from adult students and did not involve patient data or clinical intervention.

Consent to participate
Students were informed about the educational activity and anonymized use of aggregate educational data; participation in the satisfaction questionnaire was voluntary.

Data availability
The anonymized data supporting the findings of this study are available from the corresponding author upon reasonable request.

Use of AI tools
AI-assisted tools were used to support language editing. No AI tool is listed as an author.

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