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Impact of Curriculum Concept Mapping as an Instructional Tool on Students' Perceived Academic Performance

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Abstract: **This study investigates the impact of curriculum concept mapping on students' perceived academic performance, course material retention, overall perception of curriculum mapping, and self-efficacy and motivation in higher education. Curriculum concept mapping, a structured visual tool for representing and organizing course content, aims to enhance comprehension, retention, and engagement. Despite its increasing adoption, limited research explores its influence on these interconnected variables and their role in fostering academic success. The study employed a quantitative pre-test/post-test design with a sample of (N=100) undergraduate students. Participants engaged in structured concept mapping activities within a healthcare management course to organize and connect learning objectives, topics, and outcomes. Paired t-tests and linear regression analyses were conducted to evaluate changes in students' perceived academic performance and related variables. Pre-test results indicated moderate significance across all variables, while post-intervention results demonstrated statistically significant positive improvements in perceived academic performance, course material retention, overall perception of curriculum mapping, self-efficacy, and motivation. The findings reveal that curriculum concept mapping fosters enhanced comprehension of course content, a deeper connection to learning objectives, and increased confidence in academic capabilities. Students also reported improved motivation and a heightened appreciation for the curriculum's organization and relevance. These results underscore the efficacy of curriculum concept mapping as a pedagogical strategy for promoting engagement, retention, and self-efficacy in higher education. This study contributes to the growing body of literature on innovative teaching methods, offering actionable insights for educators seeking to align instructional strategies with students' academic needs and holistic development.**

Keywords: **Curriculum Concept Mapping, Course Material Retention, Perceived Academic Performance, Self-efficacy.**

I. INTRODUCTION

Introduction and Background

Over the last several decades, educators have come up with diverse instructional strategies to help students in their learning process. One such strategic tool is curriculum concept mapping (CCM). CCM is an instructional strategy aimed at enhancing students' learning experiences by visually organizing and linking key concepts within a course. PowerSchool (2022) considered CCM as a process where teachers, administrators, and other support staff come together to plan out goals for students throughout at each grade level. It sets the scope, sequence, and pace of learning, aligned across grades, subjects, and standards. By doing so, it enables a deeper understanding of the subject matter, fostering critical thinking and helping students create connections between topics. The method has gained traction as an innovative educational tool that supports meaningful learning and retention of course material. Recent studies indicated that CCM could lead to improved student outcomes, particularly in terms of perceived academic performance and persistence in staying enrolled in academic

programs (Zagday et al., 2024; Thompson & Greene, 2023). CCM has emerged as an effective educational tool for enhancing students' learning experiences through structured visual representations of interconnected concepts. This method aims to bridge the gap between fragmented knowledge and integrated understanding by helping students develop a comprehensive view of course material (Lee & Kim, 2022). By utilizing CCM, students are encouraged to identify relationships among ideas, leading to greater engagement and cognitive retention. Such benefits align well with the principles of active learning, which emphasize student-centered educational practices that promote deeper knowledge acquisition (Novak, 2020).

The primary premise of CCM is rooted in constructivist learning theory, which posits that learners build new knowledge upon existing cognitive structures through meaningful engagement and interaction with content (Vygotsky, 1978). Research highlights that using concept maps allows students to identify gaps in their understanding, thereby facilitating active learning (Novak & Canas, 2021). This approach has shown to positively influence not only academic performance but also retention, as students feel more capable of synthesizing course material over time (Johnson et al., 2021). Research highlights the relevance of CCM in improving students perceived academic performance and retention of course material. For instance, Thompson and Greene (2023) found that students who actively engaged in concept mapping reported a stronger grasp of complex subjects, leading to enhanced academic self-efficacy and lower dropout rates. The integration of CCM within curriculum design aligns with constructivist theories of learning, which argue that learners construct new knowledge more effectively when they actively relate new information to their existing cognitive structures (Vygotsky, 1978). This educational practice not only aids in academic achievement but also reinforces students' persistence in their studies, fostering a sense of ownership over their learning process (Johnson et al., 2021; Ahmed & Hussain, 2022). Despite its demonstrated advantages, there remains a gap in understanding how CCM impacts students' academic performance, especially in the areas of course material retention and self-efficacy and motivation. Additionally, studies on CCM often overlook students' subjective perceptions and experiences, which are crucial for comprehensively evaluating the method's effectiveness. Exploring these aspects can provide valuable insights into how CCM can be optimized for greater educational outcomes.

Purpose. The purpose of this study is to examine the impact of curriculum concept mapping on students' perceived academic performance and their retention of course materials within healthcare management education. This research examines how concept mapping as an instructional approach influences students' understanding, knowledge retention, and commitment to continuing their education. By exploring these perceptions, the study addresses existing gaps in the literature concerning the comparative effectiveness of concept mapping and traditional teaching strategies. The findings aim to provide educators with data-driven insights to refine teaching methods and bolster strategies that support academic performance and retention.

Problem: The problem here is, despite growing emphasis on innovative instructional strategies, student academic performance remains a critical challenge in higher education. Traditional teaching approaches may not fully support students' understanding and retention of course material, particularly in complex fields like healthcare management. Curriculum concept mapping a visual and organized approach to content delivery offers potential for enhancing comprehension and engagement. However, the effectiveness of curriculum concept mapping on students' academic performance and retention material retention is not well-documented, particularly in higher education settings where evidence is sparse. Addressing this gap could lead to valuable insights into how curriculum concept mapping can serve as an effective tool for fostering academic success and long-term retention of course material retention. Though curriculum concept mapping is an established educational tool aimed at enhancing student learning, there is a limited understanding of how students perceive its impact on their academic performance. Without insight into student perceptions, it is challenging to gauge the subjective effectiveness of concept mapping. This study aims to bridge this gap by exploring students perceived academic performance and retention benefits from using curriculum concept mapping in healthcare management programs.

Significance of the Study. This study is significant because it examines curriculum concept mapping, an innovative educational tool, and its potential to improve student outcomes. Understanding its impact on academic performance can help educators design curricula that support student success more effectively. For example, in academic disciplines like healthcare management, where students must comprehend complex concepts and retain knowledge over time, effective instructional strategies are essential. The findings of this study can also inform curriculum designers, providing them with evidence-based practices to improve student learning experiences across various disciplines. While curriculum concept mapping has shown promise in secondary education and specific subjects (Bressington et al., 2018), there is limited research

on its application in higher education, especially regarding its impact on academic performance, retention of course materials, and students' self-efficacy and motivation in professional programs. Many past studies focused on students' performance metrics using quantitative outcomes such as grades, paying less attention to students' perceptions regarding course material retention, self-efficacy and motivation, curriculum mapping impact, and academic performance.

Despite an increasing emphasis on active learning strategies and tools designed to enhance academic performance and student retention, research on the impact of curriculum concept mapping remains limited, particularly within the context of higher education programs like healthcare management. Current studies predominantly focus on general educational benefits or specific fields outside of healthcare management, which leaves a significant gap in understanding how this method affects students' perceived outcomes in specialized disciplines. Existing literature highlights the utility of curriculum concept mapping for improving comprehension, visual learning, and engagement (Novak & Cañas, 2008; González et al., 2020). However, few studies investigate how students themselves perceive the direct impact of these tools on academic performance and the retention of course materials, specifically in complex and highly structured fields such as healthcare management. Additionally, while some research exists on student engagement with visual learning tools (Kinchin et al., 2019), there is minimal data on the comparative effectiveness of curriculum concept mapping against traditional teaching methods and how factors such as students' familiarity with concept mapping influence their experience and retention. This knowledge gap highlights the need for comprehensive studies that explore curriculum concept mapping's role in enhancing perceived academic performance and retention in healthcare management courses. Addressing this gap could inform the development of targeted educational strategies and improve instructional methods tailored to this field's unique requirements. Furthermore, it provides empirical data on curriculum concept mapping's effectiveness in higher education and establishes a foundation for further research on its use in professional education contexts.

Research Questions

The study was guided by the following research questions:

RQ1: How does curriculum concept mapping as an instructional tool impact students perceive academic performance, course material retention, overall perception of curriculum concept mapping intervention, and students' self-efficacy and motivation while taking healthcare management courses?

(H_0): There is no significant difference in students perceive academic performance, course material retention, overall perception of curriculum concept mapping intervention, and self-efficacy and motivation before and after exposure to curriculum concept mapping.

(H_1): There is significant difference in students perceive academic performance, course material retention, overall perception of curriculum concept mapping intervention, and self-efficacy and motivation before and after exposure to curriculum concept mapping.

RQ2: To what extent do students' perceptions about overall curriculum mapping, course material retention, and self-efficacy and motivation pre-and post-tests predict academic performance of students in healthcare courses?

(H_0): Students' perceptions of overall curriculum mapping, course material retention, and self-efficacy and motivation as measured by pre- and post-tests do not significantly predict students' academic performance in healthcare courses.

(H_2): Students' perceptions of overall curriculum mapping, course material retention, and self-efficacy and motivation as measured by pre- and post-tests significantly predicted students' academic performance in healthcare courses.

II. LITERATURE REVIEW

Learning theories have long been instrumental in shaping research on student learning and performance outcomes. Foundational studies in the field have been influenced by theories such as social learning theory, constructivist learning theory, and experiential learning theory, among others. For this study, the Constructivist Learning Theory (CLT) serves as an ideal framework for exploring the effects of curriculum concept mapping on students' perceived academic performance and retention of course material. CLT emphasizes the active role of learners in constructing knowledge through experience, reflection, and interaction, making it particularly relevant for evaluating educational tools like curriculum concept mapping. The theory gained prominence through the work of scholars such as Jean Piaget and Lev Vygotsky. Piaget focused on cognitive development, highlighting how learners build mental models through stages, emphasizing that knowledge is actively constructed, not passively absorbed (Piaget, 1972). Vygotsky furthered this notion with his concept of social

constructivism, viewing learning as a social process shaped by interaction and collaboration, particularly through the Zone of Proximal Development (ZPD) (Vygotsky, 1978). In essence, proponents of CLT assert that learning is an active process in which students construct new knowledge based on their prior experiences. This knowledge is developed through interaction and problem-solving, rather than passive learning. CLT proponents believe that students' prior knowledge and experiences significantly influence their learning process, and that collaboration with peers and instructors deepens understanding through constructive dialogue.

Research Studies on Variables

The review of related literature focused on the study variables highlighting what is known and exploring the gaps in literature. The review attempts to provide a balanced syntheses of studies that support or are controversial to this investigation within the constructivist framework.

Curriculum Concept Mapping (CCM)

CCM is inherently aligned with constructivist principles as it engages students in active learning by visually organizing and connecting key concepts. This tool promotes deeper understanding by enabling learners to reflect on their knowledge structure and see relationships among various topics. According to Novak and Cañas (2008), concept maps foster meaningful learning, where students integrate new information with existing cognitive frameworks, thus enhancing retention and comprehension of course materials. Early empirical research by Novak and Gowin (1984) demonstrated that concept mapping can enhance students' ability to organize and retain complex information. More recent studies support these findings, showing that such mapping strategies improve critical thinking and facilitate long-term retention of course content (González et al., 2020). In healthcare management education, where knowledge integration and application are crucial, constructivist approaches like concept mapping can provide significant benefits. Applying Constructivist Learning Theory to this research positions curriculum concept mapping as a tool that not only engages students, but also actively enhances their understanding and retention through structured, student-centered learning. The CLT framework allows researchers to explore how CCM methods impact student outcomes and align with perceptions of academic performance and perseverance in healthcare management courses. Constructivist principles provide a comprehensive lens to examine how curriculum concept mapping influences students' academic performance, retention, and learning engagement in higher education contexts. Many researchers have deployed the CLT in relation to CCM to impact student learning. For example, Eram (2023) discussed philosophical alignment in relation to curriculum mapping. Eram noted that a curriculum that adheres to a particular philosophical perspective is crucial, as the chosen philosophy determines educational objectives, content selection, pedagogical methods, and assessment strategies. Eram further stated that a harmonious curriculum guarantees that students' academic journeys are purposeful, relevant, and stimulating. Unlike Eram, Hailikari, et al. (2022) studied students' perspective on constructivist alignment and its impact on learning. The results showed that different elements of constructive alignment had an impact on student learning through teaching and assessment related factors. Teaching and assessment that required students' active involvement clearly encouraged students to adopt a deep approach to learning whereas the opposite was true for more traditionally organized courses. The intended learning outcomes did not seem to influence student learning much.

Academic Performance

Students' academic performance is crucial to overall success in school. Many institutions have been updating their instructional strategies based on evidence-based professional development training. The use of curriculum concept mapping has evolved as an instructional tool to help teachers develop strategies to help students. Many studies have been conducted to validate the use of curriculum concept mapping with mixed results. For example, Okojie et al. (2022) investigated the use of CCM tool within the social studies curricula in selected schools in Nigeria. The researchers found serious gaps in scope of competencies and faculty did not show evidence of sufficient training in curriculum mapping professional development. However, an article published by PowerSchool (2022) revealed that curriculum mapping has both short-term and long-term benefits including providing a benchmark for classroom progress that teachers can use to make future curriculums more effective. Similarly, Allam and Benaide (2022) reported that one of the most effective strategies to increase overall teaching effectiveness, involvement, or curricular interaction is curriculum development. The authors noted that mapping connects all disciplines to academic outcomes and displays well-planned teachers and results in an increase in the overall performance of education and the quality of the curriculum.

Watermark, a professional educational consultancy firm reported that curriculum mapping does improve students' academic performance and student engagement (WaterMark, n.d.). Tunnell (2022) shared similar position stating that the tool helps with student engagement in their learning process while developing life-long ethical learners; ensures coherent and meaningful curriculum as the course series is designed to achieve learning targets, follows steady, systematic, and incremental educational best practices, supports student learning and development while adhering to coherence and integration, upholds staff professional responsibility (intentionally cultivating and assessing student learning), facilitates teacher collaboration, addresses accountability issues, including mandated standards, program review, academic quality, program prioritization, and budgeting concerns, implements assessment programs targeted toward student success and growth, encourages curriculum enhancements and engagement, and stimulates the immersion of curriculum, teaching, and learning.

Present meta-analysis suggests that concept maps, when compared to traditional instructional methods like lectures, class discussions, and simulations, are more effective for facilitating courses in science (Anastasiou et al., 2024). This effectiveness can be explained considering concept mapping promotes meaningful engagement and meaningful learning. Next, concept maps serve as a learning tool, simplifying complex verbal information, omitting unnecessary verbal cluttering, and presenting key concepts concisely. Furthermore, concept maps' organizational or relational format offers an additional layer of cognitive support. The organizational structure of concept maps can ultimately contribute to reducing the extraneous cognitive load. For example, biology instruction places a significant emphasis on understanding biological concepts and processes, understanding relationships between different elements could sometime be difficult without the use of concept maps.

Course Material Retention

Academic performance has been associated with course material retention in most courses and for many students. Singer and Cottenior (2022) noted that curriculum maps may be utilized as tools to identify and address possible learning gaps that may have occurred. Once learning gaps have been identified, increased attention should be given to those areas in the class and across the program. These learning gaps may vary by student based on their ability. However, the use of just-in-time materials can provide coverage and opportunities for practice to students. Accompany assignments that require mastery of a learning outcome with links to Open Educational Resources, adaptive learning platforms, or online lectures from prerequisite courses can help to increase students course material retention, and hence increase academic performance. Curriculum maps can be a tool for communicating with students by providing students with a clear representation of the purpose, content, and expected learning path for the students. Ertwine (2023) explored the use of curriculum mapping among community college students and the impact on retention (attrition). The author found that even though retention is a problem in community colleges, increasing student engagement and activities would help in students' retention. Increased student retention relates to their academic performance and course material retention. Ertwine also noted that curriculum mapping provides students with clear, educationally coherent program maps that include specific course sequences, and progress in the program which are foundational for course material retention and remembering. Similarly, Pate (2024) discussed the importance of curriculum mapping and stated that curriculum maps help enable educators to identify gaps in the curriculum, ensure content coverage, and adjust teaching strategies to improve student achievement using an evidence-based approach. More importantly, Pate noted that the tool puts student learning into context, by helping students know where they are in the curriculum, where they are going, and where they have been. Even though students may not remember every aspect of their coursework, a searchable curriculum map is helpful for knowledge retention, building a study plan, and preparing for comprehensive program assessments (Pate, 2024).

Curriculum designers and other course content developers agree that course content is developed to deliver subject knowledge to students in an effective manner with the objective to impart the prescribed curriculum to help students understand and retain the knowledge (Somani, 2022). Somani reiterated that instructors can identify areas for improvement in a curriculum, as well as help the students in their learning process. However, the author warns that curriculum mapping is an ongoing development that focuses on improving student learning and content quality across schools. Since every new school year, instructors get new students, course content should be continually assessed and revised to ensure students get the most out of their education and for teachers to use the most effective strategies in their lessons (Somani, 2022). The author recommended that teaching methods in the lessons should be adjusted to address every student, the content should be continuously assessed and revised if educators have new classes, new students, and a new school year.

Self-Efficacy and Motivation

Bandura (1997) advanced that individuals form self-efficacy beliefs by interpreting information regarding their own capabilities which stems from mastery experiences. Mastery experiences provide information about one's successes and failures. However, successful experiences increase self-efficacy beliefs, while experiences of failure lower them. The role curriculum mapping here is to enhance students' self-efficacy, which in turn induces learning and motivation (Hidajat, 2023). When planning a curriculum, considering students' self-efficacy means designing learning experiences that actively build confidence in their abilities to succeed, fostering a belief that they can achieve challenging goals, ultimately leading to increased engagement and better academic outcomes. Hayat et al (2020) studied the relationships between academic self-efficacy, learning-related emotions, and metacognitive learning strategies with academic performance in medical students. The results revealed that the students' self-efficacy has an impact on their learning-related emotions and metacognitive learning strategies, and these, in turn, affect the students' academic performance. Moreover, learning-related emotions influence the metacognitive learning strategies, which in turn mediate the effect of emotions on academic performance. These findings are in line with that of Adiyiah et al. (2020). Adiyiah et al. found that effective regular use of concept mapping strategy has a strong and positive influence on students' self-efficacy beliefs about their development which enhances their motivation to learn and performance in biology.

Self-efficacy beliefs enforce students' motivation. Studies have shown that when a student is motivated by any or certain aspects of a course, there is a tendency that the student may strive hard to do the best in the course. A well-structured course provides students with the opportunity to learn. Conversely, students face a lot of problems with ill-structured courses that may leave the student disoriented, thus impacting performance.

Challenges in Curriculum Mapping

One of the key challenges in curriculum mapping is ensuring alignment between learning outcomes, instructional methods, and assessments. Often, educators encounter difficulties in clearly defining measurable learning outcomes that connect across different courses and levels. Disparities in teaching approaches among faculty members can create inconsistencies in how content is delivered and assessed. Furthermore, mapping a curriculum requires ongoing collaboration among instructors, which can be hindered by time constraints, lack of training, or resistance to change. These misalignments can prevent students from acquiring foundational knowledge necessary for higher-level learning, which in turn can impact academic performance and retention rates.

Another challenge lies in maintaining the relevance and adaptability of curriculum maps to evolving educational and industry standards. In fields like healthcare management, rapid changes in technology, data analytics, and regulations mean that curriculum maps can quickly become outdated. Many instructors and curriculum designers have noted that keeping curriculum maps for future use requires continuous review and modification, which can be resource intensive. Additionally, integrating new elements, such as digital literacy or AI training, can face resistance due to faculty unfamiliarity with these topics or a lack of institutional support. These challenges complicate efforts to create a cohesive and dynamic curriculum that equips students with the skills needed for real-world applications.

III. METHODOLOGY

This pre-experimental (pretest-posttest) design, correlational study aims to investigate the impact of curriculum concept mapping on students perceived academic performance and retention of course materials in healthcare management programs. The research design includes a pre-test, an intervention phase (curriculum concept mapping activities), and a post-test. The study adopts a quasi-experimental, pre-posttest design to examine students' perceptions before and after the implementation of curriculum concept mapping strategies. This design allows for comparison of data collected at two different points in time, measuring the effect of the intervention while controlling baseline characteristics.

The study involves undergraduate and graduate healthcare management students enrolled in 100 - 500 level courses. Participants included students who have not previously been exposed to curriculum concept mapping as a learning technique and later exposed to the technique. The sample size (N=96) was determined using G* Power analysis, but the was increased to (N=100) for convenience ensuring adequate representation to achieve statistical significance.

Data Collection Procedures

In this study, the researcher utilized two distinct instruments regarding similar construct – curriculum concept mapping, to measure students' perceptions of academic performance, course material retention, overall perception of curriculum mapping, and self-efficacy and motivation. Since this research involves measuring latent variables (e.g., perceived course material retention), a reliability analysis of survey instruments was performed. For each survey instrument, the researcher calculated the Cronbach's alpha (α). According to Gliem and Gliem (2003), an $\alpha > .70$ is considered an acceptable level. Instrumentation for the study consisted of 1) Pre-Test Questionnaire (Cronbach's Alpha = .816). The pre-test questionnaire, designed to assess students' initial perceptions and baseline understanding of curriculum concept mapping, demonstrated strong reliability with a Cronbach's alpha of .816. A Cronbach's alpha above .816 is generally considered good, indicating high internal consistency. This suggests that the pre-test questions consistently measure the same underlying constructs related to students' prior knowledge and attitudes before engaging with the concept mapping intervention. 2) Post-Test Questionnaire (Cronbach's Alpha = .830). The post-test questionnaire aimed to evaluate changes in students' perceptions and their overall experience after exposure to curriculum concept mapping. With a Cronbach's alpha of .830, this instrument exhibited even higher internal reliability compared to the pre-test. This value indicates excellent consistency, affirming that the post-test effectively captured the students' reflective responses regarding the impact of concept mapping on their academic performance and understanding.

Responses to the instruments question were based on a 5-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree," to quantify students' responses. During the intervention phase, students participate in guided concept mapping activities aligned with the course content. The concept maps are designed to visually organize and represent key concepts, helping students make connections between different topics. The intervention was conducted over a period of five weeks, integrated into the regular course schedule. Data was collected at two time points. Permission was sought and granted by participating schools. Courses were taught for a five-week cycle. Modalities to facilitate the study were worked out and the study started the following session. Participation was voluntary and surveys items were collected after 20 minutes. Of the 150 undergraduate and graduate students targeted for the study, 120 surveys were returned and 30 students backed out of the study. Of the 120 surveys, 100 were accepted as complete and accepted for analysis. Twenty surveys were rejected because of incompletion. Data was stored and analyzed using SPSS 28.

Before conducting any analysis, I conducted an Exploratory Data Analysis (EDA) and subjected the data to test of outliers to determine normality. I looked at the skewness and kurtosis statistics, as well as the normal P-Plot. Results indicated that the data was acceptable normal as they fell between -1 and + 1. Parametric testing was employed.

IV. RESULTS

Demographic Characteristics

Demographic descriptives and characteristics of participants are shown below. TABLE 1 shows that the means and standard deviations for gender, age, ethnicity, and educational level were (1.51, .50; 2.14, .93; 2.32, 1.12; and 1.79, .80) respectively. TABLE 2 shows the distribution of demographic characteristics of participants. The age group (18 – 25) had 26/100 (26%); age group (26 – 33) years 43/100 (43%); (34 – 41) years 24/100 (24%); (42 – 49) years 5/100 (5%); and (50 – 57) years 2/100 (2%). There were more females in the study 51/100 (51%) compared to males 49/100 (49%). Associates and certificate students formed 82/100 (82%) of the participants.

TABLE 1. DESCRIPTIVES FOR DEMOGRAPHIC VARIABLES

DV	*M*	*SD*
Gender	1.51	.50
Age	2.14	.93
Ethnicity	2.32	1.12
Educational level	1.79	.80

Note: DV = Demographic Variables; M = Mean; SD = Standard Deviation

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TABLE 2. NUMBER AND PERCENTAGES OF PARTICIPANTS

Demographics characteristics	***n***	***Cum. %***
Age		
18 – 25	26	26
26 – 33	43	69
34 – 41	24	93
42 – 49	5	98
50 - 57	2	100
Gender		
Male	49	49
Female	51	100
Educational level		
Non-Degree/Certificate	42	42
Associates	40	82
Bachelors	15	97
Masters	3	100
Ethnicity		
Blacks	30	30
White	27	57
Hispanic	27	84
Asian	13	97
Other	3	100

Hypothesis Testing

Inferential statistics were employed for data analysis. Since all variables were normally distributed, parametric testing occurred. Paired t-tests were used to compare pre-test and post-test scores in assessing the impact of curriculum concept mapping instructional strategy on students perceived academic performance and course material retention. Additionally, a regression analysis was conducted to explore relationships between students' familiarity with concept mapping and their perceived outcomes.

The first research question (RQ1) focused on how curriculum concept mapping as an instructional tool impacted students, and self-efficacy and motivation post intervention. A paired-samples t-test was conducted for any statistical significance between variables. See perceive academic performance, course material retention, overall perception of curriculum concept mapping intervention Table 3 below.

TABLE 3. PAIRED T-TEST STATISTICS AND RESULTS

Variables Pairs	***M***	***SD***	***SEM***	***d***	***t***	***df***	***P***
1. (P-PAP1) - (PP-PAP2)	17.38 – 21.13	1.64 – 1.71	.16 - .17	1.7	- 21.66	99	< .001
2. (P-PCoMR1) – (PP-PCoMR2)	18.57 – 21.39	1.70 – 1.62	.17 - .16	1.7	- 16.39	99	< .001
3. (PP-OPCM1) – (PP-OPCM2)	18.57 – 21.38	1.68 – 1.64	.17 - .16	1.7	- 16.62	99	< .001
4. (P-SEaM1) – (PP-SEaM2)	18.57 – 21.38	1.70 – 1.61	.17 - .16	1.7	- 16.05	99	< .001

Note: M = Mean; SD = Standard Deviation; SEM = Standard Error of the Mean; d = Cohen's d

P-PAP1 = Pretest Perceived Academic Performance; P-PCoMR1 = Pretest Perceived Course Material Retention; PP-OPCM1 = Pretest Perceived Overall Curriculum Mapping; P-SEaM1 = Pretest Perceived Self Efficacy and Motivation; PP-PAP2 = Post test Perceived Academic Performance; PP-PCoMR2 = Posttest Perceived Course Material Retention; PP-OPCM2 = Post test Perceived Overall Curriculum Mapping; PP-SEaM2 = Posttest Self Efficacy and Motivation

The results indicated that the intervention (curriculum concept mapping) had a statistically significant positive impact on students perceived academic performance, course material retention, overall perception of curriculum concept mapping intervention, and self-efficacy and motivation. See results below:

1. Perceived Academic Performance - Pair 1: (P-PAP1) - (PP-PAP2): [(M = 17.38, SD = 1.33) (M = 21.44, SD = 1.7), t(99) = -30.48, p < .001, d = 1.7]
2. Course material retention - [Pair 2: (P-PCoMR1) – (PP-PCoMR2): [(M = 18.57, SD = 1.68) (M = 21.39, SD = 1.7), t(99) = -16.75, p < .001, d = 1.7]
3. Overall perception of curriculum concept mapping intervention - [Pair 3: (PP-OPCM1) – (PP-OPCM2): [(M = 18.57, SD = 1.69) (M = 21.38, SD = 1.7), t(99) = -16.62, p < .001, d = 1.7]
4. Self-efficacy and motivation post intervention - [Pair 4: (P-SEaM1) – (PP-SEaM2): [(M = 18.57, SD = 1.75) (M = 21.38, SD = 1.7), t(99) = -16.05, p < .001, d = 1.7].

There was a notable increase in the mean scores after implementing concept mapping for all paired interventions, with strong effect sizes of 1.7 each (Cohen's d = 1.7), indicating a substantial difference and practical significance. The p-value (< .001) confirms that the observed improvement is unlikely to be due to chance.

Across all four pairs:

1. The mean differences indicated higher post-test scores after the intervention.
2. All p-values are <.001, confirming the results are statistically significant.
3. The intervention (e.g., curriculum concept mapping) was effective in improving performance across the assessed domains. These results collectively suggested that the curriculum concept mapping intervention significantly enhanced outcomes for students

This finding implies that curriculum concept mapping may be more effective than prior methods in enhancing students' academic performance as perceived by the students. These perceptions support the use of curriculum concept mapping and its potential as a valuable teaching tool in educational settings.

To address Research Question 2 (RQ2), which explores the extent to which students' perceptions of overall curriculum mapping, course material retention, and self-efficacy and motivation predict academic performance in healthcare courses, a multiple linear regression analysis was conducted. The analysis examined predictors of perceived academic performance (P-PAP1 & P-PAP2, dependent variables) based on overall curriculum mapping, course material retention, and self-efficacy and motivation (P-PCoMR1 & P-PCoMR2; PP-OPCM1 & PP-OPCM2; P-SEaM1 & P-SEaM2, independent variables) as reported by students before and after the intervention. The model summary indicated statistically significant results for these predictors, both prior to and following the intervention. (See Table 4 for detailed results.

TABLE 4. MODEL SUMMARY

The overall regression model was statistically significant, F(3,96) = 5.23, p = .002, explaining 14% of the variance in academic performance (R^2 = .14, adjusted R^2 = .12) for pre intervention; and , F(3,96) = 49.45, p = .001, explaining .61% of the variance in academic performance (R^2 = .61, adjusted R^2 = .60) for post-intervention scores.

	R	***R²***	***Adjusted R²***	***SEE***	***df***	***F***	***Sig***
P-PAP1	.38[a]	.14	.12	1.55	99	5.23	<.002[b]
P-PAP2	.78[a]	.61	.60	1.09	99	49.45	<.001[b]

a. Predictors: (Constant), P-SEaM1, P-PCoMR1, PP-OPCM1; P-SEaM2, P-PCoMR2, PP-OPCM2

b. Dependent Variables: P-PAP1; P-PAP2

V. DISCUSSION

The purpose of this study was to examine the impact of curriculum concept mapping as an instructional tool on students' perceived academic performance in healthcare courses. This research examines how concept mapping impacted students' understanding, knowledge retention, and efficacy and motivation to continue their education. The findings of the study,

specifically RQ1 - based on pre-test and post-test results, highlighted a significant positive impact of curriculum concept mapping on students' academic performance, course material retention, overall perception of concept mapping, and self-efficacy and motivation. The comparison between pre- and post-intervention scores provides clear evidence of the transformative role that concept mapping plays in enhancing learning outcomes in healthcare courses.

The improvement in academic performance observed in the post-test results compared to the pre-test demonstrated the effectiveness of concept mapping in fostering deeper understanding and critical thinking. By enabling students to organize and synthesize information, concept mapping supports the development of problem-solving skills that are essential in the healthcare field. These findings align with previous research indicating that concept mapping facilitates meaningful learning, allowing students to connect new knowledge with existing frameworks (Locker & Whelan, 2024; Novak & Cañas, 2008). Similarly, the marked increase in course material retention highlights the cognitive benefits of concept mapping. The visual and structured approach reduces cognitive overload, enabling students to process and retain information more effectively. This result aligns with cognitive load theory and supports the idea that visual aids can enhance memory retention and retrieval (Shibi, 2021; Sweller, 1988; Mayer, 2005). The shift from pre-test to post-test scores further underscores the potential of concept mapping as a strategy to address gaps in retention, which is particularly important in disciplines that require mastery of complex and interconnected content.

Students' perceptions of concept mapping also improved significantly, as reflected in the post-test findings. Initially, students may have been unfamiliar with or uncertain about the technique, but the intervention helped them recognize its value in clarifying complex concepts and fostering meaningful connections. Positive perceptions of learning activities have been shown to increase student engagement and participation, ultimately leading to better academic outcomes. This suggests that integrating concept mapping into educational practices can not only improve learning outcomes but also enhance students' overall experience with the curriculum.

The enhancement in self-efficacy and motivation further illustrates the motivational benefits of concept mapping. Comparing pre-test and post-test results reveals how the structured approach of concept mapping builds students' confidence in tackling challenging material. Bandura's (1997) theory of self-efficacy explains this phenomenon, as successful task execution reinforces the belief in one's capabilities, which, in turn, encourages persistence and effort. The observed improvements in motivation are a natural extension of increased self-efficacy, as students who feel capable are more likely to engage with and persist in their academic tasks (Frausto et al., 2024).

These findings carry significant implications for curriculum design and instructional strategies. The integration of concept mapping into healthcare curricula has the potential to address common educational challenges, such as student disengagement, low retention rates, and gaps in comprehension. By providing a clear framework for organizing and understanding complex material, concept mapping empowers students to take a more active role in their learning. Furthermore, its positive impact on motivation and confidence highlights its role as a tool for fostering an inclusive and supportive learning environment. Overall, the pre-test and post-test findings demonstrate the substantial benefits of curriculum concept mapping in improving academic performance, retention, perception, self-efficacy, and motivation. By addressing both cognitive and motivational aspects of learning, concept mapping emerges as a valuable strategy for enhancing student outcomes and creating more effective educational experiences.

The analysis conducted for Research Question 2, examined the extent to which course material retention, students' perceptions of overall curriculum mapping, and self-efficacy and motivation predicted their academic performance in healthcare courses. The results of the multiple linear regression analysis revealed that these independent variables significantly predicted students' academic performance both before and after the intervention. Notably, the prediction strength was higher after the intervention, suggesting that the implemented changes positively influenced students' perceptions and their subsequent impact on academic outcomes. Before the intervention, students' perceptions of curriculum mapping and related factors showed a moderate predictive relationship with academic performance. This indicates that even prior to exposure to the curriculum concept mapping intervention, students' understanding of the course structure, their ability to retain material, and their confidence and motivation played roles in their academic success. However, the strength of these predictions improved post-intervention, highlighting the effectiveness of curriculum mapping in enhancing these factors.

The post-intervention results demonstrated a stronger predictive relationship, emphasizing the role of the intervention in aligning the curriculum with students' cognitive and motivational needs. The increased prediction strength suggests that

curriculum mapping not only improved students' understanding and retention of course material but also boosted their confidence and motivation. This aligns with Bandura's (1997) theory of self-efficacy, which posits that belief in one's abilities significantly influences performance. Enhanced self-efficacy and motivation, coupled with improved material retention, likely created a positive feedback loop that further supported academic success.

These findings underscore the critical importance of using structured instructional strategies, such as curriculum mapping, to enhance students' academic performance. By clearly organizing course material and fostering a supportive learning environment, curriculum mapping addresses both the cognitive and emotional aspects of learning. This dual approach ensures that students are not only better prepared academically but are also more motivated and confident in their abilities to succeed. The significant improvements observed between pre-test and post-test scores underscore the importance of incorporating concept mapping into curriculum design. The technique not only improves academic performance and retention but also fosters positive attitudes toward learning and enhances intrinsic motivation. These findings suggest that integrating concept mapping into healthcare curricula can address critical challenges such as student disengagement, low retention rates, and knowledge gaps. The pre-test and post-test findings provide compelling evidence of the positive impact of curriculum concept mapping on academic performance, retention, perception, self-efficacy, and motivation. By bridging the gap between complex information and student understanding, concept mapping fosters meaningful learning and equips students with essential skills for academic and professional success. These results advocate for the broader adoption of concept mapping in curriculum design as a strategy to enhance both cognitive and motivational outcomes.

Limitations of the study

Despite its promising results, the study's reliance on self-reported measures and a relatively short intervention period may limit the generalizability of its findings. The use of a convenience sample may limit the generalizability of the findings. Additionally, the reliance on self-reported measures may introduce response bias. Future research could address these limitations by including a larger, more diverse sample and incorporating objective measures of academic performance. This methodology provides a structured approach to exploring the effects of curriculum concept mapping, offering valuable insights into students' perceptions and the potential benefits of this instructional strategy in healthcare management education.

Ethical Considerations

The study follows ethical guidelines for research involving human subjects, including informed consent, confidentiality, and voluntary participation. Participants were informed about the purpose of the study, and their anonymity was protected throughout the research process.

Implications for Practice

The combined findings for Research Questions 1 (RQ1) and 2 (RQ2) have critical implications for educational practice, particularly in healthcare courses. RQ1 demonstrated that curriculum concept mapping significantly enhanced students' academic performance, course material retention, self-efficacy, and motivation. RQ2 further revealed that students' perceptions of curriculum mapping, material retention, and self-efficacy and motivation strongly predicted academic performance, with the predictive strength being higher after the intervention. Together, these results underscore the transformative potential of curriculum mapping in improving both cognitive and affective dimensions of learning.

For practice, these findings highlight the necessity of integrating curriculum concept mapping into course design as a standard instructional strategy. By creating a structured and visually clear representation of course material, concept mapping helps students establish meaningful connections between topics, fostering deeper understanding and retention. This approach is particularly valuable in healthcare courses, where the interconnectedness of knowledge is crucial for professional application. Additionally, the results emphasize the importance of addressing students' motivational and self-efficacy needs as part of instructional practices. Educators should incorporate strategies that build confidence and engagement, such as collaborative learning, formative assessments, and personalized feedback. These approaches can enhance students' belief in their abilities, which, as demonstrated, directly contributes to better academic outcomes.

The findings also call for a data-driven approach to curriculum development. Regularly assessing students' perceptions and performance through pre- and post-intervention measures allows educators to identify gaps and refine instructional strategies. This iterative process ensures that the curriculum remains aligned with student needs and effectively supports their academic and professional development.

Implication for Research

The study provides significant implications for future research, particularly in exploring instructional strategies and their broader impact on student outcomes in healthcare education and beyond. These findings suggest several avenues for further inquiry: First, future research could investigate the long-term effects of curriculum concept mapping on students' academic performance, retention, and self-efficacy across diverse disciplines. Longitudinal studies would provide insights into whether the observed benefits persist over time and how they influence students' professional readiness and career success. This would address the question of sustainability and scalability of curriculum mapping as an educational intervention.

Second, while the current study focused on healthcare courses, further research could examine the applicability and effectiveness of curriculum concept mapping in other fields. Comparative studies across disciplines would offer a broader understanding of how this strategy adapts to different content areas, student demographics, and learning environments.

Third, the role of technology in enhancing curriculum concept mapping warrants exploration. With advancements in digital tools, researchers could investigate how integrating technology, such as AI-driven mapping software or collaborative platforms, impacts students' engagement and learning outcomes. This line of inquiry would align with the growing emphasis on digital transformation in education.

Fourth, future studies could delve deeper into the interplay between self-efficacy, motivation, and academic performance. For example, examining how various factors, such as prior knowledge, learning styles, or cultural backgrounds influence the effectiveness of curriculum mapping could inform tailored interventions that address diverse student needs.

Lastly, researchers could expand the scope of inquiry to include faculty perspectives and experiences in implementing curriculum concept mapping. Understanding the challenges, benefits, and support systems needed for educators to adopt this strategy could inform professional development programs and institutional policies.

These research directions not only build on the findings of this study but also contribute to a deeper understanding of how curriculum design strategies can enhance learning outcomes and support evidence-based practices in education.

Implications for Theory

The findings of the study have significant theoretical implications, particularly in advancing understanding of how curriculum concept mapping aligns with and extends existing educational theories. The observed improvements in academic performance, course material retention, self-efficacy, and motivation reinforce key principles from established frameworks such as Bandura's (1997) theory of self-efficacy and Mayer's (2005) cognitive theory of multimedia learning, while also suggesting new directions for theoretical development.

First, the results support Bandura's theory of self-efficacy by demonstrating that curriculum mapping positively influences students' confidence in their abilities. The structured and visual nature of concept mapping provides clear pathways for understanding complex material, which, in turn, enhances students' belief in their capacity to master course content. This finding underscores the theoretical link between structured instructional strategies and affective outcomes, suggesting that self-efficacy can be intentionally cultivated through thoughtful curriculum design.

Second, the findings align with Mayer's cognitive theory of multimedia learning, which emphasizes the importance of organizing information in ways that reduce cognitive load and facilitate meaningful learning. Curriculum concept mapping embodies these principles by presenting interconnected ideas visually, helping students integrate new information with existing knowledge. The study's results extend this theory by showing how such strategies not only enhance comprehension but also improve motivation and long-term retention.

Additionally, the study contributes to constructivist learning theories, particularly those emphasizing active and student-centered learning. Concept mapping encourages students to actively engage with the material, make connections, and construct their own understanding, aligning with Vygotsky's (1978) concept of scaffolding and Piaget's (1970) constructivist framework. The results highlight how these theoretical foundations can be operationalized in curriculum design to achieve measurable improvements in learning outcomes.

Finally, the findings open avenues for expanding existing theories by integrating the role of perception in academic performance. The predictive relationship between students' perceptions of curriculum mapping, material retention, and motivational factors with academic success suggests the need for a theoretical framework that more explicitly accounts for students' cognitive and emotional responses to instructional design.

In summary, this study not only validates existing theories but also expands their scope by demonstrating the multifaceted impact of curriculum concept mapping. It provides a basis for future theoretical work that integrates cognitive, affective, and perceptual dimensions of learning to explain and optimize educational outcomes.

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