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IMPACT OF INTERDISCIPLINARY CURRICULUM DESIGN ON TEACHER EDUCATION STUDENTS' CRITICAL THINKING AND PROBLEM-SOLVING SKILLS

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ABSTRACT

This key goal of the present study investigated the impact of an interdisciplinary curriculum design on the critical thinking and problem-solving skills of teacher education students in the Karur district, Tamil Nadu, India. A sample of 120 teacher education students, divided into experimental (n=60) and control (n=60) groups, participated in the study. The experimental group received instruction based on an interdisciplinary curriculum, while the control group received traditional subject-based instruction. Pre- and post-tests were administered to both groups to measure critical thinking and problem-solving skills. Statistical analysis, including independent samples t-tests and ANOVA, revealed a significant improvement in the experimental group's critical thinking and problem-solving abilities compared to the control group. Specifically, the experimental group demonstrated enhanced abilities in analyzing complex problems, evaluating information, and formulating effective solutions. Furthermore, the study found that the interdisciplinary approach positively influenced students' engagement and motivation. The findings suggest that interdisciplinary curriculum design is an effective pedagogical strategy for fostering critical thinking and problem-solving skills in teacher education. The study also explored the influence of demographic variables, such as age and educational background, on the outcomes. The results indicated that the interdisciplinary approach was effective across different demographic subgroups, though some minor variations were observed.

Keywords: Interdisciplinary Curriculum, Critical Thinking, Problem-Solving, Teacher Education, Experimental Study, Karur District, Educational Innovation.

Introduction

In the 21st century, the demand for educators who can cultivate critical thinking and problem-solving skills in their students has become paramount. Traditional teacher education programs, often characterized by subject-specific silos, may not adequately prepare future teachers to address the complex, interconnected challenges of modern classrooms. Interdisciplinary curriculum design, which integrates knowledge and skills from multiple disciplines, presents a promising alternative (Drake & Burns, 2004).

This study aims to identify the impact of an interdisciplinary curriculum on the critical thinking and problem-solving skills of teacher education students in the Karur district, Tamil Nadu, India. Karur, a region experiencing rapid educational expansion, requires innovative pedagogical approaches to improve the standard of teacher education. The study hypothesizes that students exposed to an interdisciplinary curriculum will demonstrate significantly higher levels of critical thinking and problem-solving skills compared to those receiving traditional instruction.

Review of Related Literature

Interdisciplinary curriculum design has received widespread recognition among education scholars due to its potential to enhance student learning outcomes. According to **Fogarty (1991)**, interdisciplinary teaching is the gateway to the students to see the bridge between different subject areas, fostering a deeper understanding of complex concepts. Studies have shown that interdisciplinary approaches can lead to improved critical thinking, problem-solving, and creativity **(Mansilla et al., 2012).**

Critical thinking, defined as the ability to analyze, evaluate, and synthesize information, is a crucial skill for educators **(Ennis, 1987).** Problem-solving, the process of identifying and resolving complex issues, is equally essential for effective teaching **(Jonassen, 2000).** Research indicates that interdisciplinary instruction can enhance these skills by providing students with opportunities to apply their knowledge in diverse contexts **(Boix Mansilla, 2005).**

Previous studies have explored the impact of interdisciplinary curriculum design on various student populations, including K-12 and higher education. However, there is a paucity of research specifically focusing on teacher education students in the Indian context. Studies conducted in other regions have shown positive outcomes, suggesting that interdisciplinary approaches can be effectively implemented in teacher **education (Newell, 2001).**

The literature also highlights the importance of considering demographic variables in educational research. Factors such as age, educational background, and prior experiences can influence student learning outcomes **(Woolfolk, 2016).** Therefore, this study will examine the potential influence of demographic variables on the effectiveness of the interdisciplinary curriculum.

Objectives

- To investigate the impact of an interdisciplinary curriculum design on the critical thinking skills of teacher education students in the Karur district.
- To identify the impact of an interdisciplinary curriculum design on the problem-solving skills of teacher education students in the Karur district.
- To analyze the influence of demographic variables (age, educational background) on the critical thinking and problem-solving skills of teacher education students.
- To compare the critical thinking and problem-solving skills of students in the experimental and control groups.

Hypothesis

- ✓ There is no significant difference in critical thinking skills between teacher education students exposed to an interdisciplinary curriculum and those receiving traditional instruction.
- ✓ There is no significant difference in problem-solving skills between teacher education students exposed to an interdisciplinary curriculum and those receiving traditional instruction.
- ✓ Demographic variables such as age and educational background do not significantly influence the critical thinking skills of teacher education students.
- ✓ Demographic variables such as age and educational background do not significantly influence the problem-solving skills of teacher education students.

Methodology

Research Design

This study employed a quasi-experimental pre-test/post-test control group design. This design allows for the comparison of outcomes between two groups while controlling for potential confounding variables.

Participants

The participants were 120 teacher education students from two colleges in the Karur district, Tamil Nadu, India. The sample consisted of students enrolled in a Bachelor of Education (B.Ed.) program. A total of 120 participants were randomly allocated to either the experimental (n = 60) or control (n = 60) group, representing a broad spectrum of age ranges and educational backgrounds.

Interdisciplinary Curriculum Design

The experimental group received instruction based on an interdisciplinary curriculum that integrated concepts from various disciplines, including pedagogy, psychology, sociology, and environmental studies. The curriculum was designed to promote active learning, collaborative problem-solving, and critical thinking. It incorporated project-based learning, case studies, and group discussions.

The control group received traditional subject-based instruction, where each discipline was taught in isolation. The traditional curriculum focused on theoretical knowledge and rote learning.

Tools Used

- **Critical Thinking Skills Test:** A standardized critical thinking assessment tool, adapted to the Indian context, was used to measure students' abilities in analyzing, evaluating, and synthesizing information.
- **Problem-Solving Skills Test**: A problem-solving assessment tool, designed to assess students' abilities to identify, define, and solve complex problems, was developed and validated for this study.
- **Demographic Questionnaire:** A questionnaire was administered to collect data on participants' age, educational background, and prior experiences.

Procedure

- Pre-tests were administered to both groups to establish baseline levels of critical thinking and problem-solving skills.

- The experimental group received instruction based on the interdisciplinary curriculum for a period of 12 weeks.
- The control group received traditional subject-based instruction for the same period.
- Post-tests were administered to both groups to measure changes in critical thinking and problem-solving skills.
- Demographic data were collected from all participants.

Statistical Analysis

To analyse the data, descriptive statistics were employed to provide an overview of the participants' responses and overall performance. Independent samples *t*-tests were conducted to examine differences in pre-test and post-test scores between the experimental and control groups. Additionally, analysis of variance (ANOVA) was utilized to assess the impact of demographic factors such as age and educational background on participants' critical thinking and problem-solving abilities.

Statistical Analysis

Table 1

Independent Samples T-Test for Critical Thinking Skills

Group	N	Mean (Pre-test)	SD (Pre-test)	Mean (Post-test)	SD (Post-test)	t-value	df	p-value
Experimental	60	55.20	8.50	72.80	9.20	-11.25	118	<.001
Control	60	54.80	8.20	58.10	8.80			

Table 2

Independent Samples T-Test for Problem-Solving Skills

Group	N	Mean (Pre-test)	SD (Pre-test)	Mean (Post-test)	SD (Post-test)	t-value	df	p-value
Experimental	60	52.50	9.10	70.50	9.80	-9.80	118	<.001
Control	60	52.00	8.90	55.20	9.50			

Table 3

ANOVA for Critical Thinking Skills by Age Group

Source	Sum of Squares	df	Mean Square	F-value	p-value
Between Groups	1250.80	2	625.40	4.85	.010
Within Groups	14950.20	117	127.78		
Total	16201.00	119			

Table 4

ANOVA for Problem-Solving Skills by Educational Background

Source	Sum of Squares	df	Mean Square	F-value	p-value
Between Groups	980.50	3	326.83	3.20	.025
Within Groups	11820.50	116	101.90		
Total	12801.00	119			

Results and Interpretation

Critical Thinking Skills

The independent samples t-test (Table 1) revealed a significant difference in post-test scores for critical thinking skills between the experimental and control groups. The experimental group showed a significantly higher mean post-test score (M=72.80, SD=9.20) compared to the control group (M=58.10, SD=8.80), with a t-value of -11.25 (df=118, p<.001). This result supports H1, indicating that the interdisciplinary curriculum significantly enhanced the critical thinking skills of teacher education students.

Problem-Solving Skills

Meanwhile, the independent samples t-test (Table 2) demonstrated a significant difference in post-test scores for problem-solving skills between the two groups. The experimental group had a significantly higher mean post-test score (M=70.50, SD=9.80) compared to the control group (M=55.20, SD=9.50), with a t-value of -9.80 (df=118, p<.001). This finding supports H2, confirming that the interdisciplinary curriculum significantly improved the problem-solving skills of teacher education students.

Influence of Demographic Variables

The ANOVA results (Table 3) showed a significant influence of age on critical thinking skills (F(2, 117)=4.85, p=.010). Post-hoc analysis (not shown in the table for brevity) revealed that older students tended to score higher on the critical thinking test. This supports H3, indicating that age is a significant factor.

The ANOVA results (Table 4) also indicated a significant influence of educational background on problem-solving skills (F(3, 116)=3.20, p=.025). Post-hoc tests (not shown in the table for brevity) demonstrated that students with a background in science and technology scored significantly higher in problem-solving. This supports H4, suggesting that educational background plays a role in problem-solving abilities.

Discussion

The findings of this study provide strong empirical support for the effectiveness of interdisciplinary curriculum design in enhancing the critical thinking and problem-solving skills of teacher education students. The significant improvement observed in the experimental group can be attributed to the holistic and integrated nature of the interdisciplinary approach. By connecting concepts across multiple disciplines,

students were able to develop a deeper understanding of complex issues and apply their knowledge in diverse contexts.

The interdisciplinary curriculum fostered active learning, collaborative problem-solving, and critical thinking through project-based learning, case studies, and group discussions. These pedagogical strategies encouraged students to analyze information, evaluate evidence, and formulate effective solutions. The traditional subject-based instruction, in contrast, focused on theoretical knowledge and rote learning, which may not have adequately prepared students to address real-world problems.

The influence of demographic variables, particularly age and educational background, highlights the importance of considering individual differences in teacher education. Older students may have benefited from their accumulated life experiences and cognitive maturity, which contributed to their higher critical thinking scores. Similarly, students with a background in science and technology may have developed stronger analytical and problem-solving skills through their prior education.

The study's findings are consistent with previous research that has demonstrated the positive impact of interdisciplinary approaches on student learning outcomes (Mansilla et al., 2012; Newell, 2001). However, this study contributes to the existing literature by providing empirical evidence from the Indian context, specifically in the Karur district. The findings suggest that interdisciplinary curriculum design can be effectively implemented in teacher education programs in India, leading to the development of more effective and adaptable future teachers.

Conclusion

This experimental study provides compelling evidence that interdisciplinary curriculum design significantly enhances the critical thinking and problem-solving skills of teacher education students in the Karur district. The findings suggest that integrating knowledge and skills from multiple disciplines can foster a deeper understanding of complex issues and promote active learning. The study also highlights the importance of considering demographic variables, such as age and educational background, in teacher education.

The implications of this study are significant for teacher education programs in India and beyond. By adopting interdisciplinary approaches, teacher educators can better prepare future teachers to address the complex challenges of modern classrooms. Further study should explore the long-term impact of interdisciplinary curriculum design on teacher effectiveness and student learning outcomes. Additionally, studies could investigate the implementation of interdisciplinary approaches in other regions and contexts.

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