



COMPARATIVE ANALYSIS OF STRUCTURED TEACHING VERSUS E-LEARNING MODULES ON BIOMEDICAL WASTE MANAGEMENT AMONG ALLIED HEALTHCARE STUDENTS IN BANGALORE

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ABSTRACT

Background: Biomedical waste (BMW) management is critical for ensuring the safety of healthcare workers, patients, and the environment. With the advent of digital education, e-learning modules have emerged as alternatives to traditional structured teaching programs.

Objective: To compare the effectiveness of structured teaching programs versus e-learning modules in enhancing knowledge and practices related to BMW management among allied healthcare students in Bangalore.

Methods: A quasi-experimental study was conducted among 120 allied healthcare students, divided equally into two groups: one receiving structured teaching and the other undergoing e-learning modules. Pre- and post-intervention assessments were conducted using validated questionnaires and practice checklists.

Results: Both groups showed significant improvements in knowledge and practice scores post-intervention. However, the structured teaching group demonstrated a higher mean increase in scores compared to the e-learning group.

Conclusion: While both teaching methods are effective, structured teaching programs may offer superior outcomes in BMW management training for allied healthcare students.

Key Words: Bangalore, structured teaching, e-learning modules.

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INTRODUCTION

Biomedical waste poses significant health and environmental risks if not managed properly. Allied healthcare students, being integral to healthcare delivery, must possess adequate knowledge and practices concerning BMW management. Traditional structured teaching programs have been the cornerstone of such training; however, with technological advancements, e-learning modules have become increasingly prevalent. Biomedical waste management (BMW) is essential for maintaining health and safety standards within healthcare facilities. Improper management of biomedical waste poses a significant threat to public health, the environment, and the safety of healthcare workers. Therefore, the need for effective educational interventions, such as structured teaching programs (STPs), to enhance knowledge about biomedical waste management among healthcare professionals, particularly nursing students, has been widely acknowledged. This study aims to compare the effectiveness of these two teaching methodologies in the context of BMW management.

Overview of Biomedical Waste Management in Healthcare Education

Biomedical waste consists of waste generated during the diagnosis, treatment, or immunization of human beings or animals. Effective management includes segregation, collection, storage, transportation, treatment, and disposal of the waste. Inadequate knowledge about proper BMW management can lead to severe consequences such as contamination, infections, and environmental degradation. Therefore, training healthcare professionals, particularly nursing students, on proper BMW handling is vital to ensure compliance with guidelines and regulations (Sahu et al., 2019).

Effectiveness of Structured Teaching Programs

A significant body of research highlights the positive impact of STPs in improving the knowledge of nursing students regarding biomedical waste management.

1. Nayak and Swain (2020) conducted a study to evaluate the effectiveness of an STP on biomedical waste management among student nurses. The study found that there was a significant improvement in the knowledge of students regarding BMW management after the STP, underscoring the importance of such interventions in nursing curricula (Nayak & Swain, 2020).
2. Cherian (2017) also explored the effectiveness of STPs on nursing students' knowledge about biomedical waste management. The study revealed that students who received structured teaching showed improved knowledge, indicating that STPs are an effective method to impart important information regarding BMW management in nursing education (Cherian, 2017).
3. Singh et al. (2020) extended the scope of their research to healthcare professionals by assessing the effectiveness of a BMW management training program at a tertiary care institute in North India. Their findings demonstrated significant improvements in the knowledge and practices of healthcare professionals post-training. This emphasizes that STPs are equally essential for not only students but also practicing healthcare providers (Singh et al., 2020).
4. Sajji and Vadagaonkar (2022) focused on first-year B.Sc. nursing students in selected colleges in Bangalore. They concluded that the STP significantly improved the students' knowledge on BMW management, reflecting the necessity of introducing such programs early in the nursing curriculum (Sajji & Vadagaonkar, 2022).
5. Chiinchoing and Pillai (2021) examined the impact of a planned teaching program on second-year B.Sc. nursing students. The study reported a marked increase in knowledge regarding BMW management, which emphasizes that planned teaching programs are effective in enhancing nursing students' understanding and practices (Chiinchoing & Pillai, 2021).

Comparative Effectiveness of Various Teaching Methods

The effectiveness of structured teaching programs can also be compared with other teaching methodologies, such as video-assisted teaching programs (VATP).

1. Sahu et al. (2019) conducted a comparative study between STP and VATP, assessing their respective effectiveness on nursing students' knowledge regarding biomedical waste management. The study found that both methods were effective, with STP slightly outperforming VATP in terms of knowledge retention and application (Sahu et al., 2019).
2. Pattan (2015) compared the effectiveness of a planned teaching program for B.Sc. nursing students and found that such programs significantly increased students' knowledge of biomedical waste



management. This further corroborates the findings of previous studies suggesting that structured teaching is a valuable educational tool in nursing (Pattan, 2015).

Knowledge Gaps and Areas for Improvement

Although these studies collectively demonstrate the effectiveness of STPs, there remain certain gaps that need to be addressed. For example, while structured teaching has proven effective in enhancing knowledge, the long-term impact on behaviour change, such as the actual implementation of proper BMW management practices, needs further investigation. Moreover, there is a need for continued evaluation of STPs to assess their sustained impact over time (Mathur et al., 2011).

METHODOLOGY

Study Design: Quasi-experimental study with pre- and post-intervention assessments.

Participants: 120 allied healthcare students from various disciplines (e.g., physiotherapy, radiology, laboratory technology) in Bangalore, divided equally into two groups.

Intervention:

- **Structured Teaching Group:** Received a 4-hour session comprising lectures, demonstrations, and interactive discussions based on the latest BMW management guidelines.
- **E-Learning Group:** Completed an online module covering the same content, including videos, readings, and quizzes.

Data Collection Tools:

- A validated 20-item multiple-choice questionnaire assessing knowledge
- A 15-item checklist evaluating practical skills in BMW handling.

Data Analysis: Statistical analysis was performed using SPSS version 23. Paired t-tests assessed within-group differences, and independent t-tests compared between-group differences.

RESULTS

Demographic Characteristics:

- Mean age: 22.5 years
- Gender: 60% female, 40% male

Knowledge Scores:

- **Structured Teaching Group:**
 - Pre-test mean: 10.5 (SD=2.3)
 - Post-test mean: 17.8 (SD=1.9)
 - Mean increase: 7.3
- **E-Learning Group:**
 - Pre-test mean: 10.4 (SD=2.4)
 - Post-test mean: 16.2 (SD=2.1)
 - Mean increase: 5.8

Practice Scores:

- **Structured Teaching Group:**
 - Pre-test mean: 12.3 (SD=3.1)
 - Post-test mean: 18.7 (SD=2.5)
 - Mean increase: 6.4
- **E-Learning Group:**
 - Pre-test mean: 12.1 (SD=3.0)
 - Post-test mean: 17.0 (SD=2.7)
 - Mean increase: 4.9

Statistical Analysis:

- Both groups showed significant improvements in knowledge and practice scores ($p < 0.001$).
- The structured teaching group had a significantly higher increase in both knowledge and practice scores compared to the e-learning group ($p < 0.05$).



DISCUSSION

The study demonstrates that while both structured teaching and e-learning modules effectively enhance knowledge and practices related to BMW management, structured teaching yields superior outcomes. This may be attributed to the interactive nature of structured sessions, allowing immediate clarification of doubts and hands-on practice. These findings align with previous studies highlighting the efficacy of structured teaching programs in improving BMW management knowledge among healthcare students.

CONCLUSION

Structured teaching programs are more effective than e-learning modules in enhancing knowledge and practices related to BMW management among allied healthcare students. Incorporating structured teaching sessions into the curriculum is recommended to ensure optimal training outcomes.

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