Research Article

Effect of Punctuated Lectures on Undergraduate Nursing Students Classroom Learning: A Mixed Methods Design

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Abstract: Background: The punctuated lecture is the teaching learning strategy which can promote interactive and student centered learning activities to enhance their learning. Implementing punctuated lecture can enhance student engagement in learning activities. This can positively impact their learning.

Objective: To examine the effectiveness of punctuated lecture strategy on undergraduate nursing students' tests scores.

To explore the perceptions of students' regarding the process of punctuated lectures.

Materials and Methods: A mixed methods embedded design was conducted. A quasi-experimental post-test design was used with 102 undergraduate students from the Shifa College of Nursing, Islamabad. The study duration was from October, 2020-July, 2021. Punctuated lectures were applied as an intervention in three different nursing courses (Pathophysiology, Mental Health Nursing, Teaching and Learning) by selecting five topics each. After 20 minutes of session, the experimental group was asked to write reflection and feedback, and control group was involved in group discussion. Reflection and feedback, and post-test scores were used for analysis.

Result: The overall mean learning scores were higher in the experimental group in comparison to the control group (6.42 ± 2.32 versus 4.91±2.73) with a statistically significant p-value =0.001. By analysis of reflection and feedback, two categories and subcategories were identified.

Conclusion: It is concluded that punctuated lecture method is beneficial for improving learning outcomes and helping students to develop an interest in learning, clear their concepts, increase knowledge, and retain information. Nurse educators can implement punctuated lecture strategy to improve classroom learning outcomes.

Keywords: Learning, Mixed-methods embedded design, Punctuated lecture, Undergraduate nursing students, Student-centered.

INTRODUCTION

Nursing education is undergoing a radical change. Nursing educators are expected to be proficient in utilizing innovative teaching strategies effectively to enhance student learning experiences that can facilitate students to compete with the healthcare demands [1, 2]. Encouraging a paradigm shift from the traditional lecture-focused courses to interactive classes interspersed with engaging is advocated in higher education [3, 4]. Interactive learning experience is pivotal for fostering an effective and efficient educational experience enabling educators to captivate students' interest while facilitating to achieve learning outcomes [5, 6]. Student centered approach is fostering student accountability for their learning [7, 8].

The punctuated lecture is the teaching learning strategy which can promote interactive and student centered learning activities to enhance their learning [9, 10]. This approach can aid in redirecting attention if students become distracted, fostering active listening, and ultimately improving learning outcomes [11]. The Punctuated lecture is a systematic process that is completed in five steps Bradshaw and Hultquist [12].

Step I: Listen to a portion of a lecture.

Step II: Stop.

Step III: Reflect on what they were doing, thinking, and feeling during that portion of the lecture.

Step IV: Write what they were doing, thinking, and feeling during that portion of the lecture.

Step V: Give the written feedback to the lecturer.

Lectures are commonly used to educate large groups of students, aiming to spark interest, impart knowledge, and effectively explain concepts. However, due to limited interaction with faculty during lectures there are fewer opportunities for students to clarify doubts [12]. To address these limitations, active learning strategies are recommended in medical education. Research has demonstrated that when students are actively engaged in the learning process, it promotes deeper levels of thinking and enhances the encoding, storage, and retrieval of information compared to traditional lectures [13].

From an educator's perspective, it helps to enhance teaching effectiveness. Educators collect feedback from students which

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gives them a chance to prepare their lectures according to students' demands. Educators know about the strengths and weaknesses of their teaching and have a chance to improve students' learning [14]. Lumpkin *et al*. [3] conducted an action research project across five courses to evaluate the effectiveness of punctuated lecture. Through this approach, students confirmed that active engagement significantly benefited their learning experience.

The effectiveness of this strategy can be measured by the academic achievements of the students. It is one of the performance measurements of any educational system [15]. Academic achievement refers to academic outcomes that indicate how well a student has met their learning objectives. Exams or continuous assessments are frequently used to assess academic achievement [16].

Literature is scarce on this topic worldwide. Subsequent research endeavors could delve into students' perspectives regarding conventional teaching methods like didactic lecture and punctuated lecture. Such investigation could offer additional insights into the effectiveness of diverse instructional methodologies.

It is imperative to examine the effectiveness of punctuated lecture strategy on the test scores of undergraduate nursing students and to explore the perceptions of students regarding the effectiveness of punctuated lectures in their learning environment. As this is the new strategy and first time implemented on nursing students, it was necessary to broadly explore and understand the phenomena by choosing a mixed methods study design.

Research Questions

- What is the effect of implementing the punctuated lecture strategy on the test scores of undergraduate nursing students?
- What are the perceptions of undergraduate nursing students regarding the effectiveness of punctuated lectures in their learning environment?

MATERIALS AND METHODS

A mixed methods embedded design was used in which one data set (reflection) provides a supportive secondary role in a study based primarily on other data type (test score). Researchers used this design to answer a research question within a largely quantitative study (Quasi-experimental post-test design). This design is particularly useful when a researcher needs to embed a qualitative component within a quantitative design to examine the effectiveness of punctuated lecture on classroom learning [17]. The researcher must decide at what point in the experimental study to collect the qualitative data (before, during, or after the intervention). As researcher wanted to qualitatively examine the process of the intervention, the qualitative data was collected during the intervention and as a part of the process of punctuated lecture.

Ethical approval was obtained from the Internal Review Board's (IRB) Ethical Committee (003-21). The participants were informed about the study and written informed consent was sought from all the participants before conducting the study [18].

The study duration was from October 2020-July, 2021. The study was conducted at a Shifa College of Nursing in Islamabad, Pakistan. The college has currently 300 students enrolled in the bachelor's degree program. The school serves students from all provinces of Pakistan. The inclusion criteria was undergraduate nursing students who were enrolled in three subjects such as Mental Health Nursing, Teaching and Learning, and Pathophysiology. The students who missed three sessions of any courses were excluded from the study. Absenteeism of the students during the intervention may influence the results of the study. The participants were recruited with the permission of the concerned year coordinator by explaining the study purpose and design.

For the quantitative arm, the sample size was calculated by using G power, alpha 0.05, 0.20 (1-beta= 0.80) with a moderate effect size (d = 0.5) [19]. They were selected by census method and conveniently divided into two groups, intervention (n=60) and the control group (n=42).

All three-course teachers are the researchers who conducted five lectures in each course in the classroom setting. These teachers had more than five years of experience in teaching nursing students and conducted research in different fields. The primary researcher gave training related to the punctuated lecture to the teachers. This involved a two-hour session, introducing the steps of the punctuated lecture method. These teachers prepared the session in the field of Pathophysiology. The instructor delivered instruction on the subject matter, for example, 'Introduction of pathophysiology'; 'Cellular adaptation'; 'Acid base balance'; 'Cellular injury,' and 'Fluid and electrolyte imbalance'. In a Teaching Learning course, 'Learning style'; 'Learning theory'; 'Need assessment'; 'Bloom taxonomy,' and 'Evaluation'. In a Mental Health Nursing course: Factors affecting mental health and mental illness; Bio-psychosocial interventions; Mental health & mental illness; Tools of psychiatric nursing, and Psychopharmaco dynamic.

These sessions were prepared using materials sourced from their textbooks and online resources. Demographic data was collected included information about the following variables: year of study, age, gender, and courses.

Procedure

Experimental Group

<u>Punctuated Lectures</u>

Step I: Students listened to the lecture:

All three teachers delivered lectures to both sets of groups. The mode of delivery of the lectures was face-to-face in the classroom. The teaching content was presented to both groups.The

duration of the lecture was three hours. After every 20 minutes, during the session, the experimental group completed the following four steps of the punctuated lecture [10].This process was completed in 10 minutes.

Step II: Educators stopped after completing the concept and gave them a chance to think about whatever they were doing during the lecture and how much they understood.

Step III: Students reflected on their feelings, thinking, doing, and learning.

Step IV: Students were instructed to write down their reflections.

Step V: Students gave feedback to the educators in a brief note.

Control Group

Group Discussion

After listening to the lecture, the control groups (n=42) were asked to participate in the group discussion after every 20 minutes of the lecture. Overall, 10 minutes were given for group discussion. The group discussion method is a student-centered and active teaching approach where learners engage in educational activities through discussions, sharing their opinions and experiences [12]. Participants were divided into groups of five without specific consideration for gender segregation aiming to facilitate effective communication among group members. Group compositions remained consistent throughout the sessions. The instructor played a passive role in the teaching process, guided discussions, maintained focus, and addressed questions or issues raised by group members while moving between different groups [20].

Following the session, both groups were encouraged to pose questions about the content which the educators then addressed and resolved. To determine the effectiveness of the intervention, post-test was done after a week for comparison among groups. The tests comprised of selected-response format, Multiple Choice Questions (MCQs). Each test consisted of 10 questions, covering various depths of the content. In total, there were 15 tests, with five tests dedicated to each course. These tests were composed by the respective teachers of each course and were based on the material taught in class. These tests were administered using a traditional paper-and-pencil format.

The content and construct validity of MCQs were reviewed by the five experts. The experts had more than five years of experience in teaching different courses, Pathophysiology, Mental Health Nursing, and Teaching and Learning. The experts commented the test were understandable and interpretable by the intended audience. They were effectively aligned with the objectives of the topics covered in each subject and adequately represented the constructs and concepts they aimed to measure. The reliability of tests was calculated. Cronbach's alpha for Pathophysiology, Mental Health Nursing, and Teaching and Learning courses were 0.7, 0.8, and 0.7 respectively. MCQs were analyzed by the Optical Mark Reader (OMR) system by the exam assistant.

STATISTICAL ANALYSIS

The quantitative data were analyzed by the researchers, using SPSS version 21. Descriptive statistics, frequencies, and percentages were calculated for the demographic data. Test scores were compared through an independent t-test with a 0.05 significance level. Data were presented in tables.

Both steps IV (Reflection) and Step V (feedback) from the students were analyzed by content analysis. The content analysis was done manually by using both deductive and inductive approaches where the categories were generated from the research questions and data respectively. Content analysis is a process of analyzing the data into codes, categories, and subcategories [21].

Both quantitative data (test scores) and qualitative data (reflection) were compared and integrated to get a comprehensive understanding of the effectiveness of punctuated lectures [22].

Study Rigour

The Lincoln and Guba [23] criteria of trustworthiness were adopted to ensure the trustworthiness of the study. This criterion includes credibility, dependability, confirmability, and transferability. For credibility, the precise description of the participants data was provided. For dependability, the transcripts were verified and cross-checked with the co-researchers. Furthermore, a comprehensive description of the data collection and analysis process was provided for the reader to understand the study. For conformability, the codes, categories, and subcategories were finalized with the consensus of the co-researcher. For Transferability, a detailed description of the entire study process and the study context was provided to ensure transferability.

RESULT

A total of 102 nursing students, including 60 in the experimental group and 42 in the control group. There was 20% male and 40% female in the experimental group and 12% male and 30% female in the control group. The age of participants ranges from 21-50 years. In the experimental group, 66% (40) of students were enrolled in the courses pathophysiology, 20% (12) teaching and learning, and 13% (08) mental health nursing. While in the control group, 61% (26) of students enrolled in the courses, pathophysiology, 23% (10) in teaching and learning, and 14% (6) in mental health nursing (Table **1**).

Table 1. Description of Frequencies in Percentage and Number of Demographic Variables.

Variables		Experimental	Non Experimental
Gender	Male	19(20)	11(12)
	Female	39(40)	29(30)
Age	21-30	49(50)	25(26)
	31-40	8(8)	12(12)
	41-50	2(2)	4(4)
Course	Pathophysiology	66(40)	61(26)
	Teaching and Learning	20(12)	23(10)
	Mental Health Nursing	13(8)	14(6)

Quantitative Findings

After the intervention, the mean score of test scores was significantly higher in the experimental group compared to the control group (6.42 ± 2.32 versus 4.91 ± 2.73) indicating a significant difference with a p-value 0.001 (Table **2**). This indicates that the difference is unlikely to have occurred by chance alone and suggests a real effect of the intervention (punctuated lecture) on learning outcomes. Moreover, the overall moderate effect size of the punctuated lectures on test scores was determined by Cohen's d = 0.5 (Table **2**). The effect size in each course revealed a moderate effect size in Pathophysiology, Teaching and Learning, and Mental Health Nursing, respectively (Cohen's d=0.5, 0.7, 0.7).

Comparison across the courses shows that the mean scores of the experiment group in Pathophysiology, Teaching and Learning, and Mental Health Nursing courses were higher compared to the control group.

Table 2. The Overall Mean Scoring of Pathophysiology, Teaching and Learning, and Mental Health Nursing Courses.

Test Scores	EG		CG		T value	D.F	P-Values
	Mean	S.D	Mean	S.D			
Pathophysiology	6.75	2.19	5.33	2.60	8.10	745.00	0.001
Teaching and Learning	5.70	2.26	3.90	2.85	4.08	126.00	0.001
Mental Health Nursing	5.02	2.60	3.06	2.42	3.89	98.00	0.001
Overall	6.42	2.32	4.91	2.73	9.33	977	0.001
Cohen and T test was applied. Overall Cohen's d= 0.5. Cohen's d in pathophysiology =0.5, in teaching and learning is 0.7, and in mental health nursing 0.7.							
*significant p-value < 0.05; (Ranges of effect size small 0.2, medium 0.5, large 0.8) EG=Experimental Group, CG=Control Group After 20 mins of the session, students in the experimental groups were asked to think about their learning and complete steps III, IV, and V (refer steps of the punctuated lecture).							

Findings of Reflection and Feedback

Each of the three authors thoroughly examined all qualitative comments provided by the students. Next, the authors developed the categories and subcategories and selected the quotes that most accurately represented them (Table **3**).

Table 3. Categories and Subcategories.

Categories	Subcategories
Reflection	Feeling Thinking Doing Learning Promoting Factors Hindering Factors Learning Outcomes
Feedback	Environment Educators Attributes Effectiveness of Teaching Strategies

Reflection

The subcategories that emerged from the category of reflection such as feeling, thinking, doing, and learning.

Feeling

Students mentioned various feelings during the lecture, for example, "they felt hungry, sleepy, and afraid" because they arrived late to class. Some of the students expressed that the lecture was lengthy and difficult. One of the students reflected that "I was a little bit anxious about the content"(P1).

Thinking

Students expressed that they were thinking about real-life scenarios related to the topic and relating their clinical experience with the topic. Some of them mentioned that they were thinking about something else rather than the lecture: such as taking a bath, washing clothes, breakfast, being marked late in attendance, document submission, etc.

Doing

Students expressed that during the lecture, they were concentrating well on the lecture. Additionally, students reflected that they became aware of their actions during the lecture. One of the students expressed, "I was busy in taking notes and actively listening to the lecture"(P4).

Learning

Promoting Factor

One of the students shared that when they do pre-reading, it promotes their learning. A student also appreciated the stretch break provided during the lecture was also beneficial. One of the students reflected that "This strategy improves my concentration level. I was able to become more attentive and grasp lecture content"(P9).

Hindering Factor

The students mentioned various hindering factors for their learning such as sessions conduct in the evening and students asking irrelevant questions hinder in learning. A few of the students highlighted, "Kindly stop students who are asking irrelevant questions during and irrational talk because there is too much disturbance in class" (P17) .

Learning Outcomes

The students articulated that these punctuated lectures helped them develop an interest in learning, cleared their concepts, increase knowledge, and retained information which ultimately increased their confidence. Most of the students reported, "Retention of material in the brain" (P18), and "increase knowledge"(P2). In addition, one more student said, "It increases confidence" (P3).

Feedback

The subcategories were emerging from the category of feedback such as environment, educators' attributes, and effectiveness of the teaching strategy.

Environment

The students explained that by using punctuated lectures, they felt good, friendly, and comfortable during lectures. For instance, most of the students shared, "There was a friendly environment due to this strategy" (P5).

Educators' Attributes

The attributes of an ideal teacher include knowledge of the subject and commitment to the profession. They said that educators come on time, are punctual, and focus on the needs of the learner as well as ensure every learner's involvement. Another student mentioned "The way you teach is nice. You pull everybody involved in class"(P7) . One of the students stated "I feel your[-Faculty] teaching style is good, you are brilliant, your motivation boosts us to apply the knowledge" (P27).

Effectiveness of Teaching Strategy

One student elaborated, "This method [Punctuated Lecture], teaching strategy' is most useful as students involve through listening, writing, and feedback. I think this method should have to be used in every lecture" (p1). "This is a very useful and amazing strategy for learning. In this method, we learn much more instead of those lectures that are only delivered by the educator" (P10) (Table **4**).

Table 4. Comparison of Qualitative and Quantitative Findings.

Quantitative	Qualitative	Inferences
The overall mean learning scores were higher in the experimental group in comparison to the control group (6.42±2.32, 4.91± 2.73) with a statistically significant p-value <0.001	The Punctuated lecture helps students to develop an interest in learning, clarify their concepts, increase their knowledge, and retain information.	This implies that the punctuated lecture method likely played a role in the observed higher mean learning scores in the experimental group, potentially due to its effectiveness in engaging students, enhancing understanding, and facilitating knowledge retention.
The overall moderate effect size was shown with a (Cohen's d is 0.5). The moderate effect size was shown in all test scores of three courses (Cohen's d=0.5, 0.7, 0.7).	The punctuated lecture is a learning strategy where students use different skills such as listening, writing, develop critical thinking skills.	The combination of these activities likely engages students actively in the learning process, prompting them to analyze, synthesize, and evaluate information, which are essential components of critical thinking.

DISCUSSION

The mixed methods embedded design was employed to comprehensively examine the efficacy of the punctuated lecture strategy. The study utilized a quasi-experimental post-test design, with both experimental and control groups receiving lectures. However, the experimental group underwent additional steps inherent to the punctuated lecture approach, such as writing

reflections and providing feedback, while the control group engaged in group discussions. The effectiveness of the punctuated lecture was evaluated through test scores and participants' reflections and feedback.

Results indicated that the experimental group achieved higher mean learning scores compared to the control group. Additionally, students expressed that the strategy effectively engaged them, improved understanding, and aided in retaining knowledge. It is noteworthy that the students believe punctuated lecture positively impacted their learning.

Students expressed that their reflection activity stimulates them to see their actions and behaviors during the lecture. In a study of Chang15 students expressed that reflection helps them to evaluate and identify their mistakes and errors in their performance and move towards improvement. These findings are also consistent with the metacognitive theory where students are aware of their strengths and weaknesses by monitoring their performance and learning strategies [24]. The reflective strategy helps students to be more aware of their actions and reasons for doing it [25]. This may be necessitated to improve the inaccuracies in learning and plan accordingly.

The findings of the present study indicate that evaluating student perceptions is crucial for the effective implementation and achievement of student centered approach. While student centered approach does not eliminate the importance of didactic lectures, it promotes the integration of active learning strategies alongside lectures.

Considering the favorable views expressed by students regarding how these activities contribute to their learning and the construction of new knowledge, educators are encouraged to incorporate them into their classes. Doing so can diversify the pace and style of instruction, reinforce content, and facilitate learning opportunities for students.

Students reported that they were able to concentrate well during the punctuated lecture. This finding is consistent with the existing study [26]. They emphasize the use of active teaching-learning strategies can create a conducive environment in the class that allows students to pay attention, concentrate, and actively participate in the class, consequently, promoting students' learning.

According to students' narration, punctuated lectures helped them to develop confidence, interest in their learning, clarify their concepts, increase their knowledge, and retain information. All these positive outcomes of this strategy can empower students to learn. The relationship of retention of information with the use of punctuated lecture can be a research area for the researcher.

From the students' narration, pre-reading and providing stretch break during the lecture is also beneficial for promoting students' learning. Furthermore, there are certain attributes of educators that promote students' learning such as subject command, commitment to the profession, good communication skills, time management, preparation for class, hardworking, punctuality, confidence, organization, explaining things easily, repeating things, ensured every learner's involvement and motivate students [27, 28].

During a lecture, students felt hungry, sleepy, afraid of late marking of attendance, thinking about routine home activities, the session was conducted in the evening and irrelevant discussion by the students during the class were the factors that hindered their learning. Some environmental factors, instructional methods, and personal factors need to be investigated for their potential to affect the student's performance.

The results of this research project offer substantial evidence regarding students' perceptions of the value of using punctuated lecture in their learning process. When students perceive that teachers are invested in their success, demonstrated through the adoption of student centered approach, they are more likely to engage fully in the learning journey and assume greater ownership of their educational progress. Increased engagement in class participation correlates with improved learning outcomes and a greater sense of enjoyment in the learning experience. This study underscores the positive reception among students towards the utilization of punctuated lecture.

STRENGTHS AND LIMITATIONS

Mixed methods embedded design allowed to integration of qualitative and quantitative data collection and analysis within a single study. By using multiple methods, researchers were able to cross-validate the findings through triangulation. Triangulation increases the credibility and reliability of the research outcomes as it reduces the likelihood of bias inherent in any single method.

The study was conducted in one nursing college, therefore, the findings of this study may not be generalized. Despite its potential to enhance validity, mixed methods embedded design also introduces potential validity threats. For example, biases from one method may inadvertently influence the other, leading to skewed interpretations or conflicting findings.

CONCLUSION

Overall, the research findings imply that implementing the punctuated lecture method is beneficial in improving learning outcomes and fostering a more positive learning experience for students. The qualitative and quantitative findings confirmed the effectiveness of the punctuated lecture that helps students to develop an interest in learning, clear their concepts, increase knowledge, retain information. Activities involving reflection and self-regulation are regarded as critical components of learning and development. Through a reflective exercise in which students evaluate their actions and behaviours throughout the lecture, identify their errors, and improve their performance. The feedback to the educators is a valuable aspect of this strategy.

Through feedback, educators can improve their teaching style and strategies and, as a result, improve the learning outcome of the students. Educators can use the findings to implement punctuated lectures in their classes. Furthermore, a randomized control trial can be carried out to assess the effects of punctuated lecture in various subjects.

AUTHORS' CONTRIBUTION

- **Nafisa Iqbal**: Contributed to conception, Study design, Acquisition of data, Analysis and interpretation of data.
- **Bushra Sultan**: Acquisition of data, Analysis and interpretation of data, Literature research, Drafting the article.
- **Bibi Hajira**: Acquisition of data, Analysis and interpretation of data, Revising it critically for important intellectual content.

CONFLICT OF INTEREST

Declared none.

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