RJPSS April.25-Sept.25 Vol. L No.2 ISSN: (P)0258-1701 (e)2454-3403 Impact Factor: 8.867
https://doi.org/10.31995/rjpss.2025.v50i02.045

Blended Teaching Effectiveness: The Relationship Between Student Concept Attainment

Ms. Shalini
Research Scholar
SMPG.(PG) College,Meerut
Email:Shalini1991rajput@gmail.com

Dr. Manju Rani
Supervisor
Assistants Professor
SMPG.(PG) College, Meerut

Abstract

The study explored how blended teaching influenced the chemistry achievement of ninth-grade students in comparison to conventional classroom instruction. A total of seventy students, both boys and girls, were divided into two groups: an experimental group that studied the topic "States of Matter" through blended teaching, and a control group that received conventional instruction. To assess learning outcomes, both groups were tested using a validated and reliable concept-attainment examination aligned with the chemistry curriculum. The results of the statistical analysis indicated that the experimental group achieved notably higher scores on the post-test.Additionally, male students outperformed female students overall, while no significant interaction was found between teaching method and gender.

Keywords

Concept attainment, Grade 9, blended teaching.

Reference to this paper should be made as follows:

Received: 15/09/25
Approved: 25/09/25

Ms. Shalini
Dr. Manju Rani

Blended Teaching Effectiveness: The Relationship Between Student Concept Attainment

Article No.45
RJPSS Apr.25-Sept.25, 2025
Vol. L No. 2, Pg. 369-381

Similarity Check - 10%

Online available at:
https://anubooks.com/journal-volume/rjpss-2025-vol-l-no-2-sept

https://doi.org/10.31995/rjpss.2025.v50i02.045

Blended Teaching: Definition and Implementation

Blended teaching is generally described as an instructional method that integrates conventional face-to-face classroom practices with elements of online learning. Rather than replacing in-person interaction, blended teaching enhances it by incorporating digital tools, thereby offering a more flexible and adaptive learning experience.

This method is considered both innovative and dynamic because it merges conventional pedagogy with e-learning, enabling effective collaboration between teachers and students. For instance, educators may use platforms such as Google Meet to deliver lessons online while simultaneously engaging learners in classroom activities, thus creating a more comprehensive learning environment. The integration of live virtual sessions with in-person tasks allows students to participate in reflective practices through activities like debates, video conferencing, brainstorming exercises, and group discussions.

For successful implementation, teachers need to evaluate the appropriateness and effectiveness of various technological tools in relation to their instructional goals. When technology is thoughtfully embedded into the curriculum, it can significantly enrich the learning process. Since both traditional and technology-driven methods have their own limitations, combining them within a blended framework often leads to improved educational outcomes.

Blended teaching is highly regarded for its adaptability, as it integrates the benefits of online innovation with the interpersonal value of face-to-face instruction. Thorn (2003) notes that it addresses the challenge of personalizing education by combining modern technological tools with established instructional practices. The International Association for K–12 Online Learning (formerly NACOL) defines blended teaching as the integration of digital content delivery with the advantages of in-person interaction. This combination supports customized learning experiences, promotes reflective thinking, and enables differentiated instruction to cater to diverse learners.

Carter, as referenced by Battye and Carter (2009), emphasizes that blended teaching is a purposeful and strategic instructional approach that merges different teaching methods and learning styles, where digital and traditional elements complement one another. Similarly, Kim (2007) conceptualizes blended learning across three dimensions: physical versus virtual, formal versus informal, and scheduled versus self-paced. For a program to qualify as blended teaching, it must include at least one element of traditional face-to-face instruction and one component delivered through an online platform, ensuring a genuine integration of both modes.

Building on this, Dziuban, Hartman, and Moskal (2004) argue that blended teaching should not be viewed merely as dividing instruction between formats but rather as a pedagogical transformation. This approach moves away from the lecture-dominated model toward a student-centered framework, encouraging learners to actively participate in their own education. It enhances interactions—between teachers and students, among classmates, with the subject content, and with outside resources—ultimately creating a more meaningful and engaging learning experience. Carman (2005) identifies five essential components of blended teaching:

1. **Live Events** – Real-time, instructor-led sessions
2. **Self-Paced Learning** – Independent study opportunities
3. **Collaboration** – Peer interaction through digital and physical formats
4. **Assessment** – Tools to evaluate student progress
5. **Performance Support** – Ongoing resources and guidance to aid learning

1.1 The Ideal Blended Classroom

The blended classroom model enables educators to combine active learning strategies with formative assessments in an effective way. While multiple educational theories are often highlighted as essential for modern education, they are rarely applied together in practice. An ideal blended teaching environment unites three widely recognized instructional theories into a single framework, thereby enhancing both teaching quality and student engagement in contemporary classrooms.

John Hattie, Professor of Education at the University of Melbourne, introduced the concept of *Visible Learning*. According to him, learning becomes "visible" when teachers are able to view the process from the learner's perspective and when students begin to see themselves as their own teachers. To foster visible learning, educators must design lessons that take into account students' understanding and perceptions, while also providing timely and constructive feedback to help learners make meaningful progress.

As blended teaching has expanded, its pedagogy has evolved beyond the traditional lecture format. Teachers are increasingly seen as mentors who guide, support, and motivate students throughout the learning process. This flexible model allows educators to create experiences that encourage collaboration, peer interaction, and social learning, while also aligning with learners' interests and abilities (Eduviews, 2009). One of its key strengths lies in accommodating individual learning preferences. While some instructional elements remain structured, students often have the flexibility to choose how they engage with content (Harding, Kaczynski & Wood, 2005). This makes differentiated instruction more practical and allows for self-paced learning, which supports deeper engagement across diverse learners.

Another significant benefit of blended classrooms is the rapid development of a strong sense of community (Garrison & Kanuka, 2004). Students participate in face-to-face activities and extend these experiences through collaborative and reflective online discussions. Such interactions not only enhance comprehension but also stimulate critical thinking. Furthermore, blended instruction promotes learner autonomy, self-confidence, and organizational skills by encouraging students to take responsibility for their own educational journey.

1.2 Review of Related Literature

Numerous researchers have investigated how blended teaching influences students' academic achievement and their grasp of concepts. For example, Maccoun (2016) investigated its impact on fifth-grade biology students in a Baghdad high school. Two classes chosen at random were designated as the experimental and control groups; the experimental group was taught using a virtual learning approach, while the control group received instruction through conventional methods. After excluding failing students (five from each group), the final sample included 60 learners. A 30-item multiple-choice test was administered to measure concept acquisition, and results showed that the experimental group achieved significantly higher levels of conceptual understanding than the control group.

Similarly, Al-Rimawi (2014) examined the influence of blended learning on sixth graders' immediate and long-term retention of scientific concepts. The study, which used a quasi-experimental design, involved 60 male students from a school in Amman. Participants were divided into control and experimental groups, and findings indicated a significant improvement in both short-term and delayed concept retention among students taught through the blended approach.

In another study, Al-Ajab (2006) investigated the use of blended instruction for teaching computer skills to pre-medical students at Arabian Gulf University in Bahrain. The research involved 157 students enrolled in a computer skills course that integrated e-learning with face-to-face instruction through the university's Webcat system. The results highlighted that the blended approach was more effective in developing essential academic skills compared to traditional instruction.

Al-Hasan (2013) also explored the role of blended teaching in enhancing biology concept acquisition among second-year students in private secondary schools. The study sample consisted of 41 students, out of which 26 were in the experimental group (blended instruction) and 25 were in the control group (traditional instruction). Data collected through a concept test and an attitude questionnaire showed that students in the blended teaching group demonstrated higher conceptual gains and more positive attitudes toward the method.

Finally, Shahin (2008) assessed the effectiveness of blended instruction on fifth-grade students' conceptual understanding and scientific process skills in Tanta. The findings revealed significant differences favoring the experimental group, suggesting that blended teaching not only improved conceptual knowledge but also enhanced students' perceptions of the overall learning experience.

1.3 Analysis of Previous Studies

Taken together, these studies highlight that blended teaching generally produces stronger outcomes than traditional instruction. Maccoun (2016) demonstrated its effectiveness with older students, while Al-Rimawi (2014) confirmed its value in middle school science education. Al-Hasan (2013) and Shahin (2008) further explored its influence on learners' attitudes and skill development, and Al-Ajab (2006) extended its application to higher education contexts. The present study builds on these earlier findings by focusing specifically on ninth-grade chemistry students. While drawing methodological guidance from prior research, it emphasizes the potential of blended teaching to enhance learning in this particular subject area and grade level.

2. Study Problem and Research Questions

Ninth-grade students often struggle with conceptual understanding in chemistry, and existing teaching strategies have not proven effective for addressing this issue. This study seeks to explore whether blended teaching can improve their concept acquisition. The central research question is:

Does the average performance of ninth-grade students on a chemistry concept attainment scale differ based on the teaching method (traditional vs. blended), gender, or the interaction between these variables?

The corresponding null hypothesis states:

There is no statistically significant difference at the 0.05 level in the mean scores of students' chemistry concept attainment due to teaching method, gender, or the interaction between the two.

2.1 Relevance of the Study

The significance of this research lies in its focus on blended teaching, a contemporary instructional approach that combines digital technologies with traditional classroom practices. The study seeks to investigate how this method can improve the teaching and learning of chemistry by integrating information and communication technologies (ICT) with established pedagogical techniques, without completely replacing conventional methods. Rather than discarding traditional instruction, blended teaching enhances and modernizes it through the thoughtful use of digital tools.

A central aim of this research is to examine the application of blended teaching strategies in primary education, particularly during the formative stages of learning. Additionally, the study intends to serve as a resource for teachers and curriculum designers by highlighting innovative technologies and online resources that can enrich instructional content. This includes identifying suitable websites, educational software, and conventional teaching practices that can be effectively integrated to support and strengthen student learning.

2.2 Limitations of the Study

1. The research is confined to exploring the effect of blended teaching on the conceptual understanding of chemistry among ninth-grade students in the Bijnor District.
2. The sample includes male students from Universal Academy School and female students from A.N. International School, both located in Bijnor, and limited to 2023–2024 academic year.
3. The sampled schools s were chosen based on their willingness to cooperate and provide the necessary support for the research process.
4. Concept attainment in science was measured using a test specifically designed and developed for this study.

3 Operational Definitions

- **Blended Teaching**: According to Harriman (2004), this approach combines classroom-based face-to-face instruction with live online learning. Khamis (2003) further describes it as an integrated learning model that supports learners at various stages of the learning process by merging traditional and digital educational methods.
- **Concept Attainment**: This refers to an inductive learning method where learners identify essential characteristics (attributes) of a concept by comparing examples and non-examples. It helps students form accurate understandings of abstract concepts.
- **Ninth Grade**: Refers to all students enrolled in Grade IX during the 2022–2023 academic session.

3.1 Study Design

This study employed an **experimental and quantitative** research design. It was conducted during the 2022–2023 academic year in two private schools located in Bijnor District, Uttar Pradesh, India. Prior approval was obtained from school authorities, and informed consent was collected from all student participants.

https://doi.org/10.31995/rjpss.2025.v50i02.045

3.2 Sampling

The **purposive sampling method** was used to select a total of 70 ninth-grade students, who were divided into non-equivalent groups. Thirty students were assigned to a control group (traditional face-to-face instruction), while forty students formed the experimental group (blended teaching approach combining online and in-person instruction). Following the instructional intervention, both groups were given a concept attainment test, and the obtained data were subjected to statistical analysis.

3.3 Hypotheses

The research was guided by the following hypotheses:

- **Ho1** : There is no significant difference in the concept attainment scores of the control group and the experimental group prior to the teaching intervention.
- **Ho2** : No significant difference exists in the concept attainment scores of the control and experimental groups following the teaching intervention.
- **Ho3** : No significant difference exists in the concept attainment scores of the experimental group when comparing pre-intervention and post-intervention results.
- **Ho4** : No significant difference is observed in the concept attainment scores of the control group when comparing pre-intervention and post-intervention results.

3.4 Tools of the Study

To measure concept attainment, both pre-tests and post-tests were administered, developed exclusively for this study. The assessments covered chemistry topics from the Grade IX curriculum and contained a combination of objective and subjective questions. Each test comprised 21 items with a total score of 54 marks and was designed to be completed within 30 minutes. All students completed the full set of questions. A parallel version of the test was used for the post-test. Test reliability was confirmed through the **test-retest method** and analysed using **Pearson's correlation coefficient**.

4. Analysis of the Data

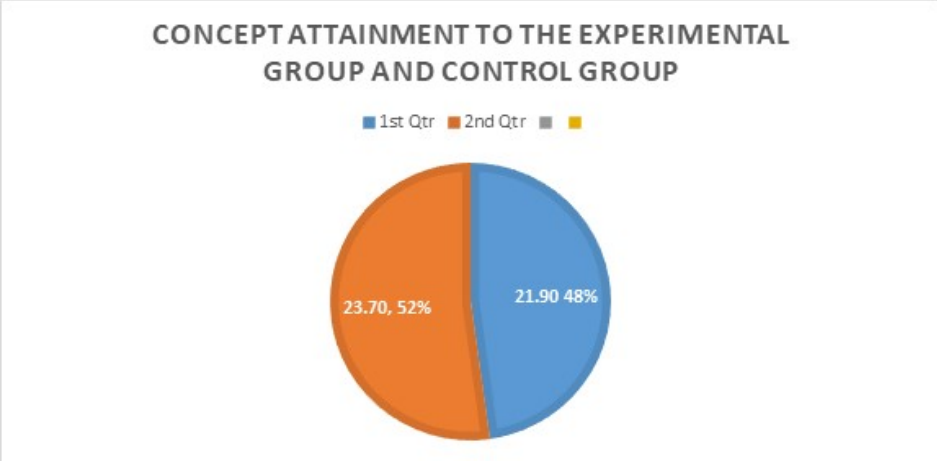
The data obtained from both groups were examined through descriptive and inferential statistical techniques such as mean, median, mode, standard deviation, Z-scores, and t-tests to identify differences between the groups. Data processing and statistical analysis were carried out using the **EXCELSTAT** feature in Microsoft Excel.

Hypothesis (Ho1)

To test the first hypothesis, a pre-test was administered to both the experimental and control groups to assess their concept attainment in chemistry before the instructional intervention. The results were then analyzed to identify any statistically significant differences in performance between the two groups.

Variable (Concept attainment Tests)	N	Mean	SD	Z score mean	DF	Observed T- value	Table T Value	Significant/ Non Significant
Experimental Group	40	21.90	6.15	-0.40	68	1.70	1.95	Non-Significant
Control Group	30	23.70	5.44	0.34				

*N= Number of students, SD= Standard Deviation, df= Degree of freedom Figure 1: Concept attainment (Pretest) of the experimental and control group in chemistry.



Interpretation:

According to Table 1, the experimental group obtained an average concept attainment score of 21.90, while the control group recorded a slightly higher mean score of 23.7. The experimental group showed a standard deviation of 6.15, with a median of 20 and a mode of 16. In comparison, the control group had a standard deviation of 4.44, a median of 22, and a mode of 21. Figure 2 indicates that the experimental group displayed marginally greater concept attainment than the control group, though the difference was negligible. As presented in Figure 1, the critical t-value is 1.95, whereas the computed t-value is 1.70 with 68 degrees of freedom. Since the calculated value falls below the critical threshold at the 0.05 level of

significance, the null hypothesis is accepted.This outcome indicates that, prior to the intervention in chemistry, there was no statistically significant difference in concept attainment between the experimental and control groups.

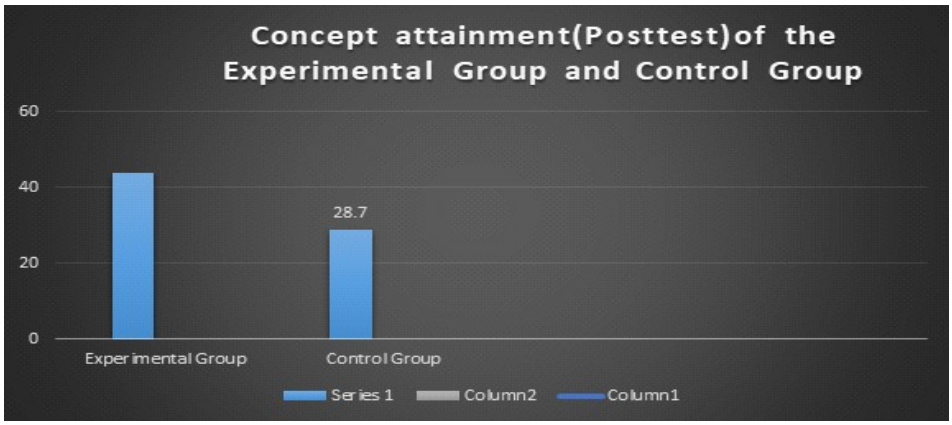
Hypothesis(H_0^2)

There is no significant difference between the concept attainment scores of both the group after the intervention in chemistry. To examine this hypothesis, a post-test measuring concept attainment in chemistry was conducted for both groups. The results were analyzed and presented in Table 2.

Variable (Concept attainment Tests)	N	Mean	SD	Z score mean	DF	Observed T- value	Table T Value	Significant/ Non Significant
Experimental Group	40	44..90	9.87	-0.0025	68	9.70	1.99	Significant
Control Group	30	29.70	6.86	5.36				

*N= Number of students, SD= Standard Deviation, df= Degree of freedom

Figure 3: Concept attainment (Post test) of the experimental and control group in chemistry.



Interpretation: Table 2 shows that the experimental group achieved a mean concept attainment score of 43.90, while the control group recorded a notably lower mean of 28.70. The experimental group reported a standard deviation of 9.87, with a median of 47 and a mode of 50. In contrast, the control group had a standard deviation of 7.86, with both the median and mode at 28. The findings reveal a distinct and statistically significant variation in concept attainment between the experimental and control groups following the chemistry intervention.

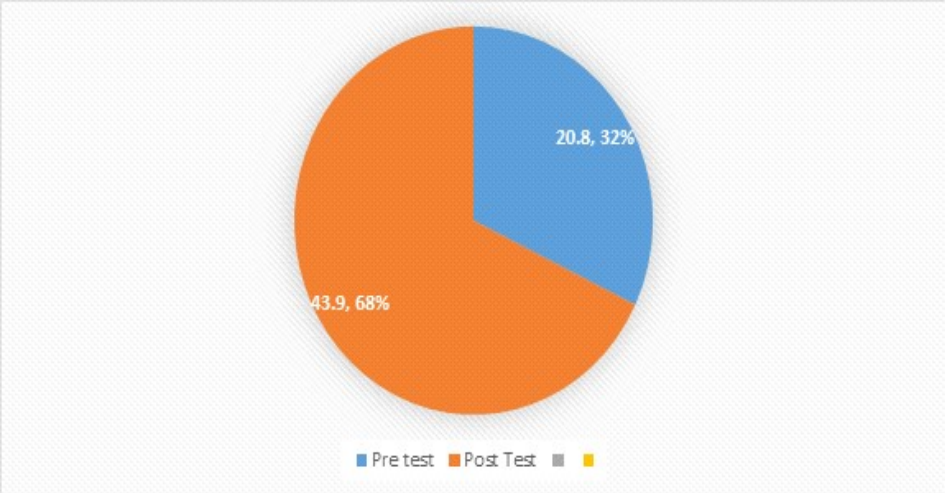
Hypothesis H_0 [3]

There is no significant difference in concept attainment within the experimental group before and after the intervention in chemistry. For this pre-test and post-test scores were collected from the experimental group. The data was analyzed and is presented in Table 3

Table 3: Concept attainment (Pretest & Posttest) of the experimental group in chemistry.

Variable (Concept attainment Tests)	N	Mean	SD	Z score mean	DF	Observed T- value	Table T Value	Significant/ Non Significant
Pre Test	40	20.80	5.15	-0.40	68	13.98	1.99	Significant
Post Test	40	43.90	9.87	0.0025				

*N= Number of students, SD= Standard Deviation, df= Degree of freedom Figure 5: Concept attainment (Pretest & Post-test) of the experimental group in chemistry.



Interpretation:

Table 3 illustrates that the experimental group's mean concept attainment score rose from 20.80 before the intervention to 43.90 afterward, indicating notable progress. Before the intervention, the group had a standard deviation of 5.15, with a median of 20 and a mode of 16. After the intervention, the standard deviation increased to 8.97, while the median reached 47 and the mode 50.

Figure 6 illustrates this marked improvement in concept attainment after the treatment. Furthermore, Figure 5 shows that the calculated *t*-value is 14.04, compared to the critical *t*-value of 1.99 at the 0.05 significance level with 78 degrees of freedom. As the calculated value exceeds the critical threshold, the null hypothesis is rejected, and the alternative hypothesis is accepted. These results demonstrate a statistically significant improvement in the concept attainment of the experimental group following the chemistry intervention.

Hypothesis(H_0^4)

There is no significant difference in the concept attainment of the control group before and after the treatment in chemistry. To evaluate this hypothesis, a pre-test and post-test were conducted on the control group, and the results are presented in Table 4.

Variable (Concept attainment Tests)	N	Mean	SD	Z score mean	DF	Observed T- value	Table T Value	Significant/ Non Significant
Pre Test	30	22.80	4.96	0.0006	58	5.22	1.95	Significant
Post Test	30	29.0	7.87	8.97				

N= Number of students, SD= Standard Deviation, df= Degree of freedom

Figure 7: Concept attainment (Pretest & Post-test) of the control group in chemistry

Interpretation:

Table 4 indicates that the mean concept attainment score for the control group is 22.80 prior to the treatment, which increased to 29.40 afterward. Before the intervention, the group's standard deviation was 4.96, with both the median and mode at 24. After the treatment, the standard deviation rose to 7.87, while the median and mode increased to 33.

In Figure 8, control group students exhibited a moderate improvement in concept attainment after the treatment; however, this progress was less substantial than that observed in the experimental group. Figure 7 further revealed that the calculated *t*-value which is 5.22 exceeds the critical *t*-value of 3.00 at the 0.05 significance level with degrees of freedom58.

The analysis leads to the rejection of the null hypothesis and acceptance of the alternative hypothesis, indicating a statistically significant change in the control group's concept attainment before and after the intervention.

Conclusion

Findings indicated that blended teaching in elementary education is a more effective alternative to traditional instructional methods. Although it was initially adopted as a way to reduce educational costs and improve efficiency, its benefits extend far beyond these purposes. Blended teaching has been shown to enhance learning outcomes, facilitate better information sharing, and provide stronger support in selecting appropriate learning resources. Collectively, these advantages underscore its effectiveness in creating a more engaging and impactful learning environment.

References

1. **Almasaeid, T. F. (2014).** "The effect of using blended learning strategy on Concept attainment and attitude in teaching science among 9th grade students", European Scientific Journal, Vol 10.
2. **Ceylan, V. K. & Kesici, A. E. (2017),"** Effect of blended learning on academic Concept attainment", Journal of Human Sciences, Vol. 14, Issue # 1.
3. **Chang, C., Shu, K., Liang, C., Tseng, J. & Hsu, Y.S. (2014).** "Is blended e-learning better than traditional classroom learning for vocational high school students?", International Review of Research in Open & Distance Learning, Volume. 15. 22.73 29.37Pretest Posttest 0 5 10 15 20 25 30 35Concept attainment (Pretest & Posttest) of the Control group.
4. **Cracraft, L. (2015).** "Effect of blending learning on students' percent increase in assessment scores". **5. Fakhir, Z. (2015).** "The Impact of Blended Learning on the Concept attainment of the English Language Students and their Attitudes towards it".
6. **Kazua, I. Y. & Demirkolb, M. (2014**). Effect of blended learning environment model on high school students' academic Concept attainment", Turkish Online Journal of Educational Technology, Vol. 13.
7. **Keengwe, J., & Agamba. J. J. (2015).** 'Models for improving and optimizing online and blended learning in higher education'.
8. **Lin, Y. W., Tseng, C. & Chiang, P. (2015). "**The Effect of Blended Learning in Mathematics Course"
9. **Yapici, I. U. & Akbayin, H. (2012).** "The effect of blended learning model on high school students' Biology Concept attainment and on their attitude towards internet", The Turkish Online Journal of Educational Technology, Vol. 11 Issue 2.

10. **Educational Study 'Blended** learning' as an effective teaching and learning strategy in clinical medicine: a comparative cross-sectional university-based study Production and hosting by Elsevier. Availablefrom: https:/ www.researchgate.net/publication/255786489_Educational_ Study_'Blended_learning'_s_an_effective_teaching_and_learning_strategy_in_clinical_ medicine_a_comparative_cross sectional_university-based _study_ Production_and_hosting_by_Elsevier
11. **Ford PJ, Foxley N, Green W.** Developing information literacy with first-year oral health students. Eur J Dent Educ 2009; 13(1): Pg. **46–5.**