

RESEARCH ARTICLE

Design and evaluation of multimodal learning resources in blended teaching of college English

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ABSTRACT

Higher Education (HE) is transforming towards embracing global pedagogical standards, particularly emphasizing student-centered learning models. In conjunction with these progressive initiatives, the incorporation of the Internet is aimed at enhancing course flexibility for both university instructors and students. Blended Learning (BL), a synthesis of online and face-to-face instruction, emerges as a methodology capable of leveraging the advantages inherent in both traditional classroom learning and online learning environments. The research being examined discovers the HE sector's application of globally recognized educational ethics and student-focused teaching. Online access has better-quality course flexibility. This type of education, which participates in classroom teaching with Online Education (OE), is being verified for communication skills. The research uses Moodle and a predictable informative setting to deal with several modes of education. The 49 HE pupils shared in a pre and post-test. Combining teaching improves communication skills, increasing the relationship between students and educators for a more practical education practice.

Keywords: blended learning; pre-test; post-test; classroom; teaching; learning; mean; statistical analysis

1. Introduction

Higher Education (HE) is undergoing significant development, requiring institutions worldwide to assess their education methods^[1-2]. The growth has been motivated by responsiveness that predictable education methods could fail to accommodate today's learners' multiple learning methods^[2-3]. The current trend has been encouraged by a consideration that old-style education methods may not meet today's students' exclusive methods of knowledge^[4-5]. Thus, a learning atmosphere highlighting state-of-the-art intelligence, full participation, and real-world skills is becoming progressively common^[6-8]. Integrated learning, which includes online courses with face-to-face teaching, is a promising method for this pedagogical request. This system uses classical and up-to-date educational systems in order to develop a state-of-the-art and remote learning method^[9-12].

The motivation for a change originates from the evidence that structured education is not succeeding^[13-15]. Learners in HE have various experiences, approaches to learning, and the ability to use technology. The elderly teacher-focused paradigm may lack interest in many learners. Thus, tolerance, versatility, and attention to the requirements of students are molding education^[16-22].

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Embracing this pedagogical transformation involves teaching that is student-centered. By focusing learning on the student, such approaches promote innovative thinking and active involvement^[23-27]. They acknowledge that conventional education is unsuccessful and promote adapted learning beyond classrooms^[28-32].

The resultant paradigm transformation focuses on Blended Learning (BL). Online features have been integrated into standard educational institutions in order to develop an active and customized classroom^[33-38]. This teaching method emphasizes that the educational experience is not limited to one source and emphasizes modern technology to improve and differentiate learning. BL promotes independence for learners by allowing learners to feel in charge of their learning experience^[39-42].

Due to its versatility, ability to fulfill specific needs and schedules, and ability to create skills beyond studies, BL has risen in demand^[43-48]. Learners develop natural talents, collaborative behavior, and knowledge of technology, which are fundamental in today's networked educational environment^[49-54].

This paper examines the effectiveness of BL in improving communication skills in HE, concentrating on its impact on obtaining vital skills for success in a globalized, network society. The research discovers the effect of BL on communication skills and suggests understanding how HE can effectively train students for 21st-century demands^[55-60].

This paper discusses the integration of BL into old-style classrooms, data collection trials, and analysis of results. It highlights the transformative potential of BL in enhancing communication skills among undergraduate students, thereby supporting its validation for HE implementation.

1.1. Motivation

HE institutions are accepting a change toward enhancing students' practical skills, such as critical intelligence and communication, to succeed globally. This shift is driven by the recognition that outdated teaching methods may not be commonly valid to the various requirements of an up-to-date, multicultural student community, and instructors are discovering state-of-the-art methods to improve the knowledge experience.

1.2. Need for change

The need for reform in HE is emphasized due to the lack of a one-size-fits-all tactic for teaching. Students with diverse learning preferences and experiences face challenges in attaining success. It is key to evolution to adaptable, all-encompassing teaching approaches that cater to these unique requirements and align with global educational standards.

1.3. Research objective

This paper aims to discover the effectiveness of BL in enhancing communication skills in HE. BL combines in-person classroom training with online basics, combining the assistance of traditional and Online Education (OE). The goal is to create an educational setting that provides diverse student learning preferences, development dynamics, and fetching learning involvements.

2. Research methodology

A study was conducted using a Moodle platform in a classroom setting to create a BL environment for 49 undergraduate students. Data was collected through Pre-Test (Pr-T) and Post-Test (Po-T), examining the impact of BL on communication skills development by applying a novel approach.

2.1. Variable

The experimental design in semantics studies the correlation between factors like language skill, talent, and motivation. The independent variable in this study is the implementation of a BL mode, combining classroom and OE, to improve communication skills. The researcher possesses the autonomy to choose, control, and quantify these variables. The dependent variable is the variable that is influenced by the independent variable. The study focuses on measuring the improvement in communication abilities of undergraduate learners who receive a specific treatment. The dependent variables in this study are the Pt-T and Po-T scores.

2.2. Participants

Random selection and assignment of subjects are crucial prerequisites for claiming study results in an accurate experimental research approach. Nevertheless, in the context of classroom research, the implementation of random assignment is unfeasible since learners are already assigned based on variables such as their admission level or previous exam scores. Due to these limitations, the researcher is limited to working with a group of learners that has not been divided or altered. In order to evaluate the efficacy of the treatment, this study utilizes intact groups, acknowledging their constraints in establishing causal relationships but highlighting the supporting data for particular instances. The sample consists of undergraduate engineering students from China's Technological University. Among the 49 participants, 21 chose to specialize in electrical engineering, while the remaining 28 opted for mechanical engineering. The participants were picked using a random cluster sampling method. The controlled sample possesses comparable language and educational backgrounds, hence augmenting the internal validity of the investigation.

2.3. Instruments for data collection and materials for BL

The study utilizes experimental control by effectively regulating three crucial elements: participants, intervention, and assessment instruments. Subject participants engage in a language enhancement program that combines traditional classroom instruction with OE. The efficacy of the treatment is evaluated by conducting Pt-T and Po-T. The triangulation process is used to improve the internal and external validity. The research instruments encompass several components: the treatment, Pt-T, Po-T, self-evaluation checklists administered before and after the treatment, and end-of-treatment Pt-T and Po-T. The objective of this comprehensive strategy is to meticulously assess the efficacy of BL in augmenting the communication abilities of undergraduate students.

An extensive 18-hour multimedia package for BL was created and provided following the testing of a sample unit. The multimedia content consisted of six modules, each lasting five hours, and focused on developing listening, speaking, and reading skills. Every lesson included Pt-T and Po-T activities, encompassing group collaborations and online assignments. The courses were designed to incorporate computer and non-computer activities, organized around particular themes, and included detailed instruction for teachers. In order to evaluate its influence, the study utilized Pt-T and Po-T. In addition, semi-structured interviews were experimented with to obtain comprehensive insights into the efficacy of the BL program. The methodology of the research is given in **Figure 1**.

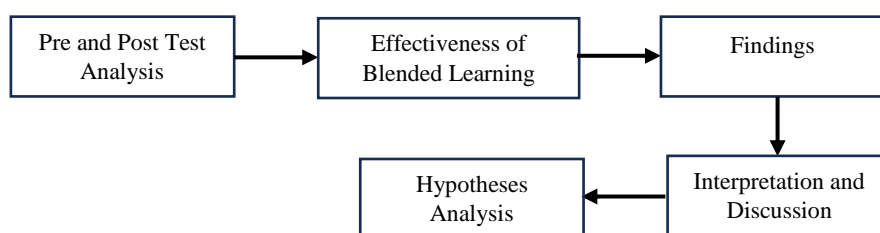


Figure 1. Research methodology.

3. Results and implications

The research investigation discovered that the VBL program greatly enhanced the ability of students with bachelor's degrees to communicate. Online features boosted learners' and educators' communication and engagement, strengthening knowledge. The findings demonstrate that BL, which identifies and responds to numerous types of learning, may more effectively prepare pupils for a multinational and interconnected society.

The following three tables present an in-depth statistical overview of those who participated in the study. Table 1, titled “Demographic Details”, is expected to contain various participant data, including age, gender, and potentially other pertinent variables. **Table 2**, under “Distribution of Gender”, provides a detailed analysis of the gender composition of the sample, emphasizing the participation of both male and female participants. **Table 3**, titled “Learners Age Distribution”, likely displays a distribution of ages among the participants, offering information about the age demographics inside the study. The tables in this section give an exhaustive summary of the study's participants, helping to understand their backgrounds and different perspectives.

Table 1. Demographic details.

Variable	Course	Number	Percentage
Discipline Major	Mechanical Engineering	28	57.14%
	Electrical Engineering	21	42.85%
Gender	Male	45	91.83%
	Female	4	8.16%
Age	26 years above	3	93.87%
	Between 20 to 25 years	46	6.12%
Father's annual income	Between 100001 and 150000	8	16.32%
	Between 60000 and 100000	39	79.59%
	above 150001	2	4.08%

The data table displays the respondent's selection by variable. In the “Discipline Major” factor, 57.14% of those surveyed studied mechanical engineering as a discipline, whereas 42.85% studied electrical engineering as a major. The “Gender” statistic indicates that 91.83% of the respondents are male and 8.16% are female. The parameter “Age” demonstrates that 93.87% of the survey respondents are 26 or more senior; however, 6.12% are 20 to 25. Regarding “Father's yearly revenue”, 16.32% of those surveyed have an annual household budget between 100001 and 150000, while 79.59% have 60000 to 100000. Only 4.08% earn more than 150001. This in-depth examination of this research's statistics includes the educational field of study, sex, age, and parent's yearly revenue.

Table 2. Distribution of gender.

Gender	Number	Percentage
Female	4	8.16%
Male	45	91.83%

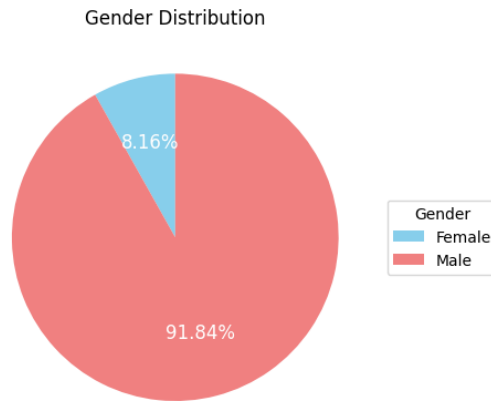


Figure 2. Distribution of gender.

The data offered in the “Gender” category provides a detailed analysis of the participants' distribution according to their gender. The table shows that 8.16% of the participants are female, corresponding to four individuals. Conversely, the male population comprises the majority, accounting for 91.83% of the total, which amounts to 45 individuals. The gender distribution in the study cohort shows a substantial predominance of males, with a comparatively smaller but notable number of female participants. Understanding the gender makeup of the sample is essential for comprehending the demographic aspects of the study population. This knowledge can influence data analysis from a gender-specific perspective in future research findings or debates.

Table 3. Learners age distribution.

Age	Percentage	Number
26 years above	6.12%	3
Between 20 to 25 years	93.87%	46

The data supplied in the “Age” category illustrates the distribution of participants among various age groups. Of the total participants, 93.87% (46 persons) are between 20 and 25. In contrast, a lower but still considerable amount, 6.12%, representing three persons, are aged “26 years above”. The distribution provides insight into the prevailing age group in the study, highlighting a notable clustering of participants in the younger segment, notably between the ages of 20 and 25. Gaining a comprehensive understanding of the age demographics is essential for placing the study results in the appropriate context and identifying any age-related patterns or influences on the examined variables.

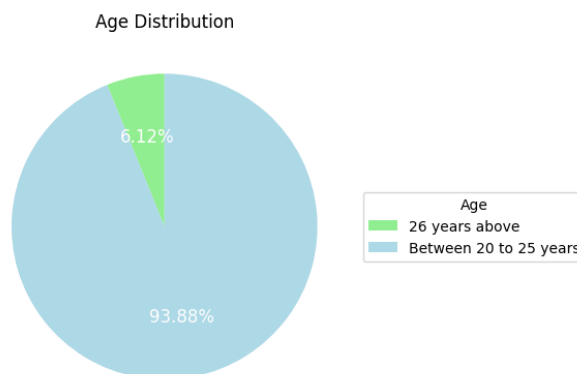


Figure 3. Learners age distribution.

Table 4 displays extensive statistical data on test scores, providing information on central patterns and variability, including many statistical measures. **Table 5** presents a correlation analysis of test results, which examines the magnitude and direction of correlations between various variables. This analysis helps identify patterns or associations among the test scores. A matching sample assessment, which analyses results before and after an activity, is demonstrated in **Table 6**. The table mentioned above assists in identifying the statistical importance of reported improvements, indicating the study's efficacy.

Table 4. Test score statistics.

Test	Mean	N	Standard Deviation	Standard Mean Error
Pt-T	20.7969	49	4.07316	0.58374
Po-T	27.8173	49	2.48895	0.35656

Table 4 shows test results for Pt-T and Po-T valuations, with a mean value of 20.7969 for the Pr-T and a standard deviation of 4.07316 for the Po-T. The standard mean error, which measures the accuracy of the mean approximation, is considered to be 0.58374. Regarding the post-test, the average score rises to 27.8173, indicating an enhancement in participants' performance following the intervention. The Po-T standard deviation is 2.48895, implying a decrease in the range of scores compared to the Pr-T. The Po-T has a standard mean error of 0.35656. These statistics provide a thorough summary of the average, spread, and accuracy of the test scores in both assessments.

Table 5. Test score correlation analysis.

	N	Correlation	Sig*
Pre and Post Test	49	0.645	0.000

The correlation analysis conducted on the test scores is summarized in **Table 5**. This study primarily focuses on the link between the Pt-T and Po-T scores for the 49 individuals. The column labeled “N” represents the total number of individuals included in the analysis. The “Correlation” column displays a correlation coefficient 0.645, indicating a positive correlation between Pt-T and Po-T results. A correlation value nearing 1 indicates a robust positive association. The “Sig*” column denotes the level of significance, and in this instance, the p-value is documented as 0.000, which is commonly understood as highly significant. This outcome suggests that the observed correlation is improbable to be a product of random occurrence, hence strengthening the considerable connection between Pt-T and Po-T scores.

In the context of statistical significance, the asterisks (*) in the table are used to denote the level of significance associated with the correlation analysis results. When the p-value (Sig*) is less than 0.05, represented as *P<0.05, it indicates a significant difference between the groups. In the table, the p-value associated with the correlation between Pt-T and Po-T scores is reported as 0.000, which is less than 0.05. Therefore, the correlation observed is considered highly significant. Conversely, if the p-value were between 0.05 and 0.01, denoted as **P<0.01, it would indicate a highly significant difference. If the p-value were more outstanding than 0.05, denoted as P>0.05, it would suggest no significant difference between the groups.

- **Null Hypothesis (H0):** There is no significant difference in the overall mean scores of the students between the Pt-T and Po-T.
- **Alternative Hypothesis (H1):** There is a significant difference in the overall mean scores between the students' Pt-T and Po-T.

Table 6. Test score of paired sample test.

	Pair Difference					df	t	Sig
	Mean	Standard Error Mean	Standard Deviation	95% Confidence Interval of the Difference				
				Upper	Lower			
Pt-T and Po-T	7.02141	.44658	3.11919	6.13550	7.91742	48	15.8	.000

The results of a paired sample t-test, focusing on the discrepancies between the Pt-T and Po-T scores of the students, are displayed in **Table 6**. The “Pair Difference” column represents the average disparity between the scores. The column labeled “df” denotes the degrees of freedom linked to the t-test. The “t” column exhibits the computed t-value, quantifying the standardized difference by the standard error. The “Sig” column displays the p-value linked to the t-test.

The mean difference between the Pt-T and Po-T scores is consistently recorded as 7.02141 in both cases, with a standard error mean of 0.44658. The t-value is computed as 3.11919, and the corresponding p-value (Sig) is stated as .000, which is lower than the standard significance level of 0.05. This suggests that the average discrepancy is statistically significant. Furthermore, the 95% confidence interval for the disparity between the Pt-T and Po-T scores ranges from 6.13550 to 7.91742. The findings indicate a notable score enhancement between the Pt-T and Po-T.

Table 6 displays the outcomes of a paired sample t-test, explicitly analyzing the disparities between the Pt-T and Po-T scores of the students. The “Pair Difference” column represents the average disparity between the scores. The column labeled “df” denotes the degrees of freedom linked to the t-test. The “t” column presents the computed t-value, quantifying the standardized difference adjusted for the standard error. The “Sig” column displays the p-value linked to the t-test.

The mean difference between the Pt-T and Po-T scores is consistently recorded as 7.02141 in both cases, with a standard error mean of 0.44658. The t-value is computed as 3.11919, and the corresponding p-value (Sig) is stated as .000, which is lower than the standard significance level of 0.05. This suggests that the average discrepancy is statistically significant. Furthermore, the 95% confidence interval for the disparity between the Pt-T and Po-T scores ranges from 6.13550 to 7.91742. The findings indicate a noteworthy score enhancement between the Pt-T and Po-T.

The hypotheses are framed based on the assumption that there will be no significant difference in the overall mean scores of the students' Pt-T and Po-T. However, the paired sample t-test results presented in Table 6 reveal a significant mean difference between the two scores.

3.1. Hypotheses

- **Null Hypothesis (H0):** There will be no significant difference in the overall mean scores of the students' Pt-T and Po-T.
- **Alternative Hypothesis (H1):** There will be a significant difference in the overall mean scores of the students' Pt-T and Po-T.

3.2. Interpretation

Since the p-value (Sig) associated with the t-test is reported as .000 (which is less than the conventional significance level of 0.05), we reject the null hypothesis. This means there is a significant difference between the Pt-T and Po-T scores. The positive mean difference of 7.02141 indicates improved scores from the Pt-T and Po-T.

3.3. Acceptance/rejection decision

- **Null Hypothesis (H0):** Rejected
- **Alternative Hypothesis (H1):** Accepted

The findings support the assertion that there is a statistically significant improvement in the scores, rejecting the initial assumption of no significant difference.

5. Conclusion

The shift towards international standards in pedagogy is a transforming journey for Higher Education (HE) institutions. The paper showcases Blended Learning (BL) as an effective technique to meet the changing requirements of students and the dynamic educational environment. This study investigated the efficacy of BL in improving communication skills among undergraduate students in light of the changing HE environment and the need to adhere to global pedagogical norms. The paradigm change towards student-centered learning models led to the development of creative techniques, and BL, a mix of traditional classroom and OE emerged as a potential strategy. The work deployed a Moodle platform and performed the Pt-T and Po-T on 49 students. The results presented that BL significantly improved communication skills and created dynamic learning atmospheres based on diverse student choices. The study highlighted the importance of adapting to various learning choices in HE to develop effective and comprehensive learning atmospheres.

It emphasized the need for novel methods like BL to create future leaders and contribute to society.

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