THE IMPACT OF ADAPTIVE TEACHING ON UNDERGRADUATE LANGUAGE SKILL DEVELOPMENT

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ABSTRACT

Adaptive teaching offers personalized learning tailored to individual student needs, aiming for efficient and effective outcomes. At the university level, diverse student backgrounds–such as gender, age, language exposure, and academic experience–pose challenges for language skill development, particularly in writing. This quasi-experimental study was conducted with first-semester BS Management Sciences students at Khawaja Fareed University of Engineering and Information Technology. Sixty students were randomly assigned to control and experimental groups (30 each). The experimental group received instruction through adaptive teaching, while the control group followed a conventional approach. Findings showed that students in the experimental group significantly improved their writing skills–measured by the CUNY assessment test–in areas such as application, essay, letter, paragraph, dialogue, and composition writing. Their pedagogical skills also improved in the post-test. No significant differences were found between the groups in pre-tests, confirming baseline equivalence. However, post-test results demonstrated clear advantages of adaptive teaching for language development. Conclusion: Adaptive teaching positively influences undergraduate students' language skills. It is recommended that this approach be adopted more widely in higher education, especially for teaching English as a foreign language.

Key Words: -   *Adaptive Teaching, Conventional Teaching, Writing Skill*

INTRODUCTION

Adaptive teaching is widely regarded as the most effective approach to facilitate students' learning. According to Hardy et al. (2022), it highlights the several ways in which teachers adapt their teaching methods to meet the varied requirements and degrees of comprehension of their students. It has been asserted on multiple occasions that adaptive teaching is an essential component of successful classroom instruction and the learning of students. Adaptive teaching involves the use of prompts, instructional support, and feedback by teachers to address the diverse needs of students in classrooms that are becoming more varied (Gallagher et al., 2022). Typically, educational settings involve students who come from a wide range of social and linguistic backgrounds and possess a diversity of

cognitive, motivational, and self-regulatory resources. Adaptive teaching is a process where teachers engage in meta-cognitive reflection on students' needs before, during, and after instruction, resulting in a socially built approach. According to Hardy et al. (2019), adaptive teaching may be considered a form of social practice that is carried out by reflective teachers in classroom settings. This type of teaching allows for adjustments to be made to accommodate the unique learning requirements and variations of each student.

The basic objective of adaptive teaching is to guarantee high-quality instruction that maximizes the outcomes for both students and teachers. Adaptive teaching takes into account that everyone

is different in terms of readiness, hobbies, and learning styles in order to provide training that is responsive and focused. This method entails utilizing formative evaluation to comprehend student progress and adjust instructional tactics accordingly. According to Hardy et al. (2019), adaptive teaching is an inclusive method of instruction since it takes into account the various experiences, backgrounds, and capabilities of students. Proficiency in effectively instructing writing at the university level is a crucial aptitude for English educators. Writing plays a significant role in the instruction of the English language. A deficient foundation in writing can result in numerous consequences that could significantly impact students' academic performance. Writing is essential for enhancing both academic performance and social and emotional growth. Furthermore, in this fiercely competitive environment, the ability to write is also a crucial skill for achieving excellence. Lack of proficiency in writing may hinder their prospects of obtaining employment in the future. Hence, it is imperative to address this matter with utmost efficiency (Moses & Mohamad, 2019).

The typical strategy that has evolved over time due to broad acceptance and use in the field of education is known as the conventional teaching method. It places an emphasis on teachers imparting knowledge to pupils through the use of lectures, standardized classroom setting, and standardized examinations. One of the goals of the conventional way of teaching is to ensure that all pupils are exposed to the same information and that they develop the same interests. Scholars and researchers advocating for innovative educational methods have frequently criticized the traditional teaching style as ineffective, inflexible, and antiquated. The conventional approach denotes the classic pedagogical method predominantly characterized by the lecture format. This pedagogical approach is centered on textbooks, dominated by the instructor, and focused on examinations. This section has a primary emphasis on learning to retain and reproduce information, as well as learning ideas and theories. Conventional teaching methods, sometimes known as traditional teaching methods, continue to be extensively utilized in educational institutions. The students are forced to study and recite the teachings that they are taught in class,

and they are also required to repeat the lesson out loud when it is their turn to speak. This is in accordance with the conventional teaching methods. All students, save for those who are reciting, listen attentively and patiently await their turn. Students complete the full lesson using this method. Subsequently, educators administer projects, written examinations, or oral assessments that evaluate the students' ability to recall and retain the lecture material (McConnell, 2018). New teaching tactics that take a completely different perspective and approach are being adopted by the educational system, which is undergoing a fundamental transformation. Teachers employ an individualized teaching approach where they instruct each student at a unique level without taking into account the collective needs of the entire class. Each student is treated differently based on the belief that each student possesses unique qualities. They consider the individual needs of each student and deliver instruction accordingly. Progressive teaching methods, in contrast to traditional education, are dependent on activities that are offered by the teacher. On the other hand, adoption methods allow students to gain a global level of knowledge (Darling-Hammond et al., 2020).

Nowadays students in classrooms have diversity. Diversities mean religion, family background, culture and region of the students in universities. Diversity in the classroom is growing. A challenge to meet the needs of students, it is essential to look for effective teaching approaches. These diverse needs can be fulfilled only by applying the innovative strategies and methods of delivering knowledge by the teachers to students (Taylor, 2022). Functional English subject is the essential part of educational curricula at university level by. In public universities, English subject was taught through traditional approach of teaching that was considered inappropriate method. Adaptive approach of teaching improves students' academic and linguistic skills at university level (Arghode et al., 2017). In academic environment adaptive approach of teaching is nebulous. Implementation of adaptive approach of teaching in higher education is not clear (Cavanagh et al., 2020). Adaptive approach empowers students' skills and knowledge by delivering information according to the mental approach through innovative teaching (Taylor, 2022). Adaptive approach predisposes

individual teaching paths according to his or her strengths and weaknesses in education by using adaptive approach tools (Cavanagh et al., 2020). Teaching through adaptive approach empowers the students' when they are evaluating on their meta-cognitive level and they monitor properly for their progress in lessons. Testing to learn is the method of adaptive leaning and important part of adaptive teaching and it plays a vital role in developing course formation (Bae et al., 2019). Adaptive teaching is considered as effective approach of initiative of use of innovative educational activities through students by him at university level. Performance assessment, flexible teaching environment and individualize path all providing by the utilization of adaptive teaching platforms (Mavroudi et al., 2018).

A study was conducted to investigate the effectiveness of adaptive approach in classroom. It was found that exposure of adaptive approach of teaching increases language skill of students. Findings of study reveal that use of adaptive teaching approach improves students' academic achievement (Wu et al., 2017). A study was conducted on adaptive approach in educational teachings. Findings of the study reveal that problems related to teaching process was overcome and improves language ability among the students (Anindyaputri et al., 2020). Previous study was designed to uncover the use of adaptive approach to evaluate the efficiency of students in study. Results indicate that use of adaptive approach was positively correlated with students' efficiency in writing skills (Hubalovsky et al., 2019). A previous study revealed that the use of adaptive approach is continuously increasing to enhance the quality of education. The findings show that students actively participate in classroom activities when they experience the adaptive approach by their instructors (Martin et al., 2020). A study was designed to investigate the effectiveness of adaptive approach on performance of the students at higher education. It was found academic performance was significantly predicted by adaptive approach teaching (Normadhi et al., 2019).

The rationale of the Study

Proficiency in writing is a reliable indicator of academic achievement and an essential prerequisite for engaging in civic affairs and the international society. Possessing proficient writing skills is crucial, particularly for individuals pursuing higher education (Moses & Mohamad, 2019). In order to achieve effective communication, teachers must possess a diverse range of communication abilities within their instructional methodology (Gallagher et al., 2022). The acquisition of writing skills is important for adult learners of English for a variety of reasons. The primary objective of language instruction is to give students the ability to comprehend, use, and produce the target language in order for them to be able to learn, study, or work in a variety of sociocultural settings. Writing skill is the dire need of the student to achieve academic success. For university students it is essential to improve their language skills because they needed to survive in life. Adaptive teaching can be effective to improve students' writing skills. Teachers must practice adaptive approach of teaching at university level. The significance of adaptive education has grown in both research and practice. Therefor this study was conducted to investigate role of adaptive teaching in improving language skills of undergraduate students.

Statement of the Problem

In Pakistan, education system is improving gradually. Students' diversity in universities has become a challenge for teachers. Classroom comprises on diversity of students such as gender family background, age, exposure, and languages. It is impossible to facilitate all sorts of students with personal differences. At the present time, English is a language that is in demand all over the world. Students have various problems in writing, including limited vocabulary, deficient grammar, inadequate spelling, unpreparedness, and insufficient access to books and reading materials. Writing, on the other hand, has traditionally been one of the most challenging aspects of learning English, particularly for students who are enrolled in higher education. In addition, teachers are encountering several difficulties when it comes to instructing children in writing proficiency. For students who are studying English as a second language, writing in English has always been a challenging part of the learning process. Developing students' writing abilities is one of the most difficult issues that teachers confront today. Writing, on the other hand, has always been a substantial obstacle for students who are getting

their English language studies underway. In education, adaptive approach of teaching is commonly viewed as the effective way of teaching. In the light of this approach every student can improve his or her academic performance at different level of education. At university level students face difficulties in developing language skills so, the adaptive approach is highly effective method to enhance writing skills. Whenever, conventional approach of teaching is commonly used in developing countries especially in Pakistan but the learning outcomes are not satisfactory. Comparatively, the adaptive approach of teaching is perceived as an effective way of delivering with the use of innovative approach of teaching in higher education. Therefore, the study is aimed at investigating the effect of adaptive approach of teaching for improving language skills of undergraduate students

Objectives of the Study

Objectives of the study were;

1. To investigate the effect of adaptive approach of teaching on writing skills of under-graduate students.
2. To compare the mean score of CUNY assessment in writing test and pedagogical skills in pre-test and post-test of experiment group.
3. To analyze the mean score difference of CUNY assessment in writing test and pedagogical skills between the experimental group and control group.
4. To examine the retention rate of writing skills through adaptive approach of teaching in experimental group.

Hypotheses of the Study

Ho_1: There is no significant effect of adaptive approach of teaching on writing skills of undergraduate students.

Ho_2: There is no significant mean score difference of CUNY assessment in writing test and pedagogical skill test in pre-test and post-test of experimental group.

Ho_3: There is no significant mean score difference of CUNY assessment in writing test and pedagogical skills test between experimental group and control group in post-test.

Ho_4: There is no significant difference on retention rate of writing skills through adaptive approach of teaching in experimental group.

Significance of the Study

This study will provide an opportunity to utilize adaptive approach of teaching in higher education. This study will be significant for the policy makers and stakeholders. The basic significance of the study will address the application of Baker's steps (2020) of Adaptive teaching approach in developing writing ability and pedagogical skills among a sample of under-graduate students at the university level. In addition this study will be helpful to know the effectiveness of adaptive teaching as compared to other strategies. Previous studies didn't explore the effect of the Adaptive teaching approach on the under-graduate students at university level and neither has been compared with another teaching approach. In future, the findings of the study will provide a remarkable literature review for the researchers to conduct a study on adaptive teaching at university level. Findings will contribute an empirical evidence in previous literature on adaptive teaching and communication skills. Researchers and stakeholders can get valuable literature from this study to work on adaptive learning in future in improving their academic performance. Research indicates that adaptive teaching is an efficacious, student-centered methodology designed to address the varied requirements of learners while fostering high-quality instruction. It acknowledges that each learner is distinct and necessitates customized teaching to achieve their maximum potential. So, this approach needs to be used in the education sector to make sure that the quality of education goes up. Studies indicate that when educators are flexible, they can customize their instruction to address the distinct needs of each student. By means of this tailored method, students can interact more closely with the content, create meaningful connections, and attain improved learning results. A study found that being flexible in the classroom is helpful in many ways. As students watch their teacher be flexible, it makes them more resilient and helps them learn how to solve problems. Adaptability cultivates a positive and supportive classroom environment, enabling students to feel at ease when taking risks and

making errors. The findings of this study offered evidence that adaptive learning technology should be introduced into educational institutions in order to conduct skill level assessments on each individual student and to design personalized learning routes for those students. Public and private educational sectors can get the benefits from the outcomes of the current study to implement adaptive teaching. Teachers can also get benefit from the findings of the study by planning effective classroom activities to equip under-graduate students with writing and pedagogical skills and practices. In addition, this study will provide the roadmap to practice adaptive teaching approach and may also guide further research in this educationally important area.

Research Methodology
The nature of the study was quantitative. A quasi-experimental study design was adopted. Both the experimental and control groups underwent pre- and post-testing. Adaptive teaching was taken as independent variable and language skills was taken as dependent variable. The population of the study were the students of Khawaja Fareed University of Engineering and Information Technology. The course of Functional English of BS students of first semester of Department of Management Sciences was allocated by Khawaja Fareed University of Engineering and Information Technology. The sample of study was taken from the Department of Management Sciences. The total numbers of students enrolled in first semester section-A and Section-B were 120. The 60 students were selected for experimental group and control group through random sampling. The sample of the study consisted of undergraduate students from the BS program of Management Sciences semester 1st studying language course "Functional English Subject".

Research Instruments
Cunny Assessment Test of Language Skills (Writing)
The CUNY Assessment Test in Writing (CATW) is a standardized examination that evaluates students' writing proficiency in English. An instrument that was utilized in the research was the CUNY Assessment Test in Writing (CATW), which was designed to evaluate the level of language proficiency possessed by undergraduate students. This test was made at City University of New York in 2012. For the purpose of evaluating the writing abilities, the CUNY Assessment Test in Writing (Audant, 2016) was utilized is designed to assess students writing skills. The test measure student's ability to apply different aspects including solving problems, making predictions, and analyzing situations. The CUNY consists of open-ended questions that are suitable to measure the writing abilities of under-graduate students at university level. There was no need to obtain permission in order to utilize this instrument for the research project because it is freely accessible on the internet. The purpose of the CATW is to evaluate students' capacity to think and write in English. The test aims to assess students' ability to utilize various language skills, including critical analysis of writing tasks and texts, development of the writer's ideas, response structure, language use in terms of sentence construction and word selection, as well as grammar, usage, and mechanics.

Pedagogical Skills Test
To measure the writing ability of undergraduate students a writing skills test was constructed by the researcher focusing on the research objectives of the study. After the careful and in-depth review of "Functional English" content a writing skills test was developed. The writing skills test was consisted of MCQs and short question answers. Content of writing skills was consists of concepts taught from the given outline of Functional English subject. The validity of the writing skills test was also tested through expert opinion. The language of writing skills test was simple and easy to understand for undergraduate students.

Self- Reported Protocol
To report the writing practices of undergraduate students of the experimental group and control group, a self-developed writing protocol was used by researcher. Self-reported protocol was consisted of 21 statements. Writing skills practices of the undergraduate students were observed on five points rating as; 5. Always or almost always true to me. 4. Usually true to me. 3. Somewhat true to me. 2. Usually not true to me. 1. Never or almost never true to me. After the careful construction of self-developed protocol, it was validated by experts'

opinion by selecting the students of undergraduate students.

Perception Scale

A self-developed perception scale was used to find out the under-graduate students' perception about a different perspectives of the experiment. This perception scale was used only for the experimental group. Statements of the perception scale were about different activities, contents and task performed by undergraduate students and researcher during the experiment. A seven-point rating scale was used to rank the perception of undergraduate students. The rating scale was as1.Totally disagree, 2. Disagree, 3. Disagree more than agree, 4. Neither disagree nor agree, 5. Agree more than disagree, 6. Agree, 7.Totally agree. The perception scale was consisted of 37 statements

and all were related to experiment tasks and activities.

Reliability of Instruments

The reliability of an instrument represents whether the instrument is reliable to collect the data from the sample or not. Reliability is also known as a quantification for constructing a good test. If all items of a test are correlated with each other and have balance item difficulty that test is considered a reliable test. Before data collection reliability of pedagogical writing skills test was computed. Test was based on MCQs, so for MCQs item analysis was done by calculating difficulty index and item discrimination for each MCQs. Detail of calculated item discrimination and difficulty index (pedagogical writing test) is as followed.

Table 3.1: Reliability Analysis of CUNY Assessment in Writing Test
Reliability Statistics

Factors	No. of Items	Cronbach's Alpha
Letter writing	1, 2, 3, 4, 5	.702
Paragraph writing	6, 7, 8, 9, 10	.528
Application writing	11, 12, 13, 14, 15	.615
Essay writing	16, 17, 18, 19, 20	.861
Shot dialogue	21, 22 , 23, 24, 25	.857
Composition passage	26, 27, 28, 29, 30, 31, 32, 33	.837
Total	33	.947

Results of the table indicate that CUNY assessment in writing test is reliable for using to measure writing skill of undergraduate students at university level. All the factors of CUNY assessment in writing test were found with significant reliability; letter writing (.702), paragraph writing (.528), application writing (.615), essay writing (.861), shot dialogue (.857) and composition passage (.837). Overall, Cronbach's alpha value was .947 that is highly reliable and significant for the use of CUNY.

Table 3.2: Perception of Under-graduate Students about Their Learning Experience with Adaptive Approach Teaching Method
Reliability Statistics

Cronbach's Alpha	No of Items
.915	37

The overall Cronbach's alpha reliability is .915 which is considered significant to use in the study.

Experimental Procedure

Two groups; the experimental and control group were formulated simple random sampling technique for experiment. Groups were formulated on the basis of pre-test scores. The control group was formulated based on pre-test scores through the simple random sampling techniques. The ''Functional English ''subject was taught to the control group by the traditional teaching methods. The traditional teaching

method for this study was on only focusing on the lectures but was comprised of students' assignments, presentations and quizzes.

Experimental Group

The experimental group for this study was also formulated based on pre-test scores through simple random sampling techniques. The ''Functional English'' subject was taught to the experimental group by Adaptive teaching approach. The adaptive teaching approach was comprised of activities, discussions, and presentations of material following pedagogical writing skills concepts.

Pre-Test

The pre-test was consisted of two tests; Cunny and the pedagogical skills test. To check the writing ability of undergraduate students (Cunny Assessment Test) was used, whereas pedagogical skills test was used to assess the pedagogical skills of undergraduate students. A pedagogical skills test was consisted of MCQs and short question answers. Items of the pedagogical skills test were consisting of the content from the given outline of the "Functional English" subject.

Treatment

Treatment for the study was formally started after the pretest and formation of the control group and experimental group. The treatment duration for the experimental group was four month (whole semester). The experiment was conducted February 2024 to May 2024. Details of treatment for the control group and experimental group are as follows.

Table 3.6 *Treatment details of experimental group and control group*

Experimental Group	Control Group
The Adaptive teaching approach was Treatment for the control group was used to teach the experimental group.	Treatment for the control group was followed with the traditional approach of teaching.
Lesson planning according to Adaptive lesson plan steps was done for each lecture.	Different teaching method like grammar translation method, direct approach and communicative approach will be used as traditional method.
Activities related to writing and selecting Pedagogical skills were also included in the experiment.	The teaching was not only focusing upon the lecture but students' assignments, lecture but students' assignments, presentations, quizzes and class participations also included in the traditional approach.
The lesson plan of Adaptive Teaching Approach was based on the following steps; 1. Align 2. Engage 3. Motivate 4. Analyze 5. Support The procedure for the implementation of steps the adaptive teaching lesson plan for the experimental group was an under; **Align** proposed that learning objectives should be aligned with a consistent set of activities, content and evaluation in course. Adaptive learning frequently reveals misalignment in courses to knowledgeable instructors who are too close to subject matter. **Engage** makes the structure of the course that students go through learning modules, practice, exercises and examination while expanding their knowledge and abilities. **Motivate** that focused on by prompt feedback and adaptive learning offers several	The lesson plan for each control group lecture was prepared following the traditional lesson plan for format. Steps for control group lesson plan were; 1. P.K. Testing 2.Announcement of the topic 3. Presentation 4.Association /Application 5.Recapitulation 6. Homework Traditional lesson plans were implemented with the following procedure; A variety of activities, including those for individuals, pairs, small groups, and the entire class, were utilized. Provide opportunities for a range of skills such as discussion, writing, and viewing.

options for this. **Analyze** learn analytic data can help you understand individual and class progress and adjust your training. **Support** will provided the appropriate support to the students while doing writing activities.

Explore methods to engage, elucidate, and expand existing knowledge, facilitating students' linkages between their prior understanding and forthcoming learning material.

Focusing the students to ask questions to enhance their thinking process and to clarify their queries to interpret their thinking and control them.

Allow students to use computer tools (e.g., M.S. word, power-point)

Strategies including Instructional model, Learner model, and Content model were used to implement the adaptive teaching approach.

The 23 lectures for both the control and experimental group were delivered according to the selected approaches (Adaptive Approach for experimental and Traditional for Control group). After 23 lectures participants of both groups were assessed and compared by the presentations on the selected teaching method. An excel sheet for assessing pedagogical practices of the control and experimental group developed by the researcher was used. This sheet was also used to compare the pedagogical practices of the control and experimental group to check the effect of the Adaptive teaching approach.

Post-Test
After the completion of the experiment, a post-test was conducted for both the experimental group and control group to evaluate the results of the experiment. Post-test was conducted after the completion of lesson plans presentation by experimental group and control group. This time was given to participants to clear their writing skills concepts before attempting the post-tests. The post-test was also consisted of two tests CUNNY (Class room Test of language skills) for writing ability and pedagogical skills for pedagogical skills. The order of both test items was changed in the post-test to avoid the repetition of same answers from students.

Lesson Presentations
To assess the pedagogical practices of undergraduate students in practical form, lesson plan presentations were taken from experimental group and control group. Undergraduate students from the control group and experimental group were asked to select a topic of their own choice and prepare a lesson plan following a teaching method with suitable A.V. Aids and present it in class.

Presentations of the control group and experimental group undergraduate students were assessed through a researcher made word self-reported sheet. Later on, pedagogical practices of both groups were compare to find out the effect of Adaptive teaching approach on undergraduate students writing skills and practices. Lesson presentations were planned after 23 lectures delivered through Adaptive teaching approach and traditional approach of teaching.

Perception of undergraduate Students about Experiment
To explore the perception of experimental group undergraduate students about different aspects of the experiment, a researcher-made perception scale was used. This was the last step of experimental procedure and perceptions were collected after post-test and lesson presentations by both the control group and experimental group. Undergraduate students were asked to rate the different tasks and activities performed by them and teacher during the experiment.

Selection of Instructor for Experimental and Control Group
The researcher herself taught both the control group and experimental group. The researcher's her- self teaching was selected to avoid the personality and teaching experience effects during the experiment but the researcher also makes sure to avoid biases throughout the experiment.

Teaching Material for Experimental Group and Control Group
HEC approved for Teaching of Functional English subject was used to teach control group and experimental group during experiment. The main

objectives of teaching this subject are to enable students to;

1. Describe the importance of Functional English
2. Understand aims and objectives of teaching of Functional English
3. Apply effectively the various methods & techniques of teaching Functional English
4. Develop lesson plans for teaching different concepts in Functional English
5. Prepare and use inexpensive audio-visual aids for the teaching of Functional English

The outline contains eight chapters and the whole outline to teach the control group and experimental group of the study.

Development of Lesson Plans

Lesson planning has always been considered an essential component of teaching. Lesson planning gives direction, organization, and consistency in teaching and makes the teaching more confident to deliver information. The lesson plan is also proof of efforts made by teaching during his/her teaching. The study was conducted to find out the effect of the Adaptive teaching approach on the language (writing) skills of undergraduate students. As the study was experimental and was focusing on a teaching approach so keeping in mind the main objective of the study lesson plans for the experimental group according to Adaptive teaching approach were made. Lesson plans were made according to the ''Teaching of Functional English'' subject outline and all topics were covered in lesson plans. 23lesson plans of the Adaptive teaching approach were made. All lesson plans were made before starting the experiment and all activities for the experimental group according to the cunny and pedagogical skills were selected before the experiment. Slight changes according to the situation during experiment duration were made in activities. Under the supervision of the supervisor, all lesson plans and learning activities were prepared and were validated by experts having

experience in teaching this subject. Detailed of course outline topics are given below in table farm. And detailed of all lesson plans attached as APPENDIX VII.

3.12. Data Collection

The effect of Adaptive teaching approach was checked by;

- Applying the CUNY before and after the completion of the experiment.
- Applying the pedagogical skills test before and after the completion of the experiment.
- Using self- reported protocol to assess the pedagogical practices of undergraduate students of the control group and experimental group.
- Using perception scale to explore the experiment group perception about different aspects of the experiment including tasks and activities.

Data Analysis

Collected data were analyzed through descriptive and inferential statistics using SPSS software. The mean score was calculated using descriptive statistics and the t-test was calculated using inferential statistics. The effect size was also calculated by Cohen's d effect size formula.

Ethical Considerations

Following ethical consideration were kept in mind during the study;

- All participants of the study were informed before the pre-test and were brief about the purpose of the pre-test
- The confidentiality of participants was kept sustained throughout the study
- The classroom environment was kept the same for both the control group and experimental group

Results
Table 4.1

Mean scores analysis of CUNY pre-test and post-test of Experimental group

	Pre-test	Post-test
Type of Test	CUNY	CUNY

Total number of participants	30	30
Mean score	62.16	81.66

The p-value<.001.

Findings of the study reveal that the mean score (62.16) for CUNY pre-test and (81.66) for the post-test is statistically significant. Results suggest that adaptive teaching improved students' language skill. Students achieved higher score in application writing, essay writing, letter writing, paragraph writing, dialogue writing and composition writing in post-test.

Table 4.2

Mean scores analysis of Pedagogical skills pre-test post-test of Experimental group

	Pre-test	Post-test
Type of Test	Pedagogical skills test	Pedagogical skills test
Total number of participants	30	30
Mean score	24.60	37.03

The p-value<.001.

Findings of the study reveal that mean scores (24.60) for pre-test and (37.03) for post-test depict that the pedagogical skills of the experimental group were much developed through experiment.

Table 4.3

Analysis of CUNY pre-test of the control group and experimental group

Type of Test	Group	N	Mean	df	t-value	p-value
CUNY pre-test	Experimental	30	62.16	58	-1.984	.052
	Control	30	57.46			

Findings of the study reported that p-value is .052 and t-value is -1.984 that suggest there is no significant mean score difference on CUNY assessment in writing test between the students of control group and experimental group.

Table 4.4

Analysis of CUNY post-test of the control group and experimental group

Type of Test	Group	N	Mean	df	t-value	p-value
CUNY post-test	Experimental	30	81.66	58	7.484	.001
	Control	30	62.10	54		

According to the p-value that is <.001 and t-value is 7.484, suggested that mean score difference is statistically significant between the students of experimental and control group in post-test performance on CUNY. Results of study rejected the null hypothesis.

Table 4.5

Analysis of pedagogical skills test pre-test of experimental group and control group

Type of Test	Group	N	Mean	Df	t-value	p-value
Pedagogical skills pre-test	Experimental	30	25.75	58	-1.279	.206
	Control	30	25.97			

P-value (.206) and t-value (-1.279) show that there was no significant difference on pedagogical skills pre-test mean scores of the control group and experimental group. The results of the comparative

analysis indicate that the control group and the experimental group both performed at the same level during the pre-test.

Table 4.6

Analysis of pedagogical skills test post-test of experimental group and control group

Type of Test	Group	N	Mean	Df	t-value	p-value
Pedagogical Skill post-test	Experimental	30	37.03	58	11.693	.001
	Control	30	26.36			

The p-value (.001) and t-value (11.693) indicates that the mean score difference of pedagogical skill is statistically significant between the students of experimental group and control group. Findings of the study rejected the null hypothesis. According to comparison, it has been analyzed that the students of experimental group increased their performance in pedagogical skills in post-test as compared to control group.

Table 4.7

Analysis of retention rate of CUNY through adaptive approach of teaching in experimental group

	Post-test	Post-test
Type of Test	CUNY	CUNY
Total number of participants	30	30
Mean score	65.30	81.66

The mean score of CUNY was greater in post-test-2 measurement. Mean score in post-test-1 (M=65.30) and post-test -2 (M=81.66), t (29) =-7.905, p<.001.Outcomes of the study rejected the null hypothesis, because students showed their keen interest in experiment by improving their retention rate. Positive improvement was noticed among students on CUNY through adaptive approach of teaching in experiment. Students showed higher level of performance in post-test-2 as compared to post-test-1. This improvement of students indicate that adaptive teaching leaning environment predicts their academic skills.

Table 4.8

Analysis of retention rate of pedagogical skill through adaptive approach of teaching in experimental group

	Post-test	Post-test
Type of Test	Pedagogical Skill	Pedagogical Skill
Total number of participants	30	30
Mean score	28.90	37.03

The mean score is increased in post-test-2 compared to post-test-1 in experimental group. Students' retention rate improved on learning about pedagogical skill in post-test-1 (M=28.90) to post-test-2 (M=37.03), t (29) =-15.568, p<.001. Findings of the study rejected the null hypothesis, because there is significant difference of pedagogical skills was observed among students of experiment group from post-test-1 to post-test-2. In post-test-2 retention rate was increased on pedagogical skills among students as compared to pos-test-1. So, it was assessed that adaptive teaching is influential for the students at university to improve their communication skills.

Table 4.9

Analysis of effect size of intervention on the experimental group

Type of Test	Cohen'sd Value

CUNY	1.48
Pedagogical Skill Test	3.66

Results suggest that there is strong effect on experimental group with respect to CUNY and pedagogical skill test. Adaptive strategy significantly affect the students learning toward language development in a positive way.

Discussion

In Pakistan, education system is improving gradually. Students' diverse background at universities become a challenge for teachers. Classroom comprises of diverse students based on gender, family background, age, exposure, and language. It is very difficult to facilitate all sorts of students with individual differences. Students have challenges in writing due to limited vocabulary, inadequate grammar, poor spelling, insufficient preparation, and a lack of exposure to books and reading resources. Writing, on the other hand, has traditionally been one of the most challenging aspects of learning English, particularly for students who are enrolled in higher education. At university level students face difficulties in developing language skills especially in writing skills. It has been analyzed that the adaptive teaching approach had a large effect on both the CUNY (writing abilities) and pedagogical skills of under-graduate students. So, the results suggest that there is strong effect on experimental group with respect to CUNY and pedagogical skill test.

Moreover, in post-test comparison of mean score of CUNY assessment in writing among students of experimental group improved their writing skill as compared to students of control group. It means that adaptive teaching is a significant positive predictor of language development. Results of the current study connected with the findings of the previous study that suggest use of adaptive approach in higher education improves the efficiency of writing skill among students (Hubalovsky et al., 2019). In addition, the level of pedagogical skill of students of experimental group was greater as compared to the students of control group in post-test. It show that students who were learning with adaptive teaching of experimental group in post-test perform better on language skill as compared the control group. Moreover, results of the current study are line up with findings of the previous research that depicts practice of adaptive approach is continuously increasing the quality of education. The findings show that students actively participate in classroom activities when they experience the adaptive approach by their instructors (Martin et al., 2020). Furthermore, previous study supported the outcomes of the current study by revealing that academic performance was significantly predicted by adaptive approach teaching (Normadhi et al., 2019).

Undergraduate students of BS program of management sciences improve their writing skill after leaning through adaptive approach of teaching. Findings of the previous study reveal that adaptive teaching facilitates the students in education according to their strengths (Cavanagh et al., 2020). A previous study was conducted to assess the use of adaptive teaching techniques in classroom discussions and its impact on students' academic progress in elementary scientific education. The previous evidence that adaptive classroom discourse affects students' learning. The experiment of study revealed that for an effective teaching-learning process a relationship between content knowledge and pedagogical skills is important which is also supported by (Hardy et al., 2022). So undergraduate students must be treated in a way they can build a relationship between their content knowledge and pedagogical skills. Academic activities can be arranged in a way that can depict the best use of content knowledge and pedagogical skills. Reported analysis of the study highlights that undergraduate students who have learned through adaptive teaching approach are more successful in performing the writing activities as compared to undergraduate students learned through traditional teaching approach. These findings are in the support of adaptive teaching approach principles which bring about the development of writing capabilities.

Spruel (2020), conducted a study to examine the influence of personalized educational technologies on academic achievement. This quantitative study compared the academic performance, retention, and success rates of students who received adaptive learning training with those who received standard education. The students that utilised adaptive learning technologies did significantly better than

the other group when compared to their overall performance. Students in adaptive learning programs were satisfied with adaptive learning technology. Adaptive learning demonstrated superior performance compared to standard methods in the classroom. White (2020), assessed the efficacy of adaptive learning technology in comparison to traditional teaching methods in an undergraduate management information course. Evidence indicates that students achieve higher performance levels when using adaptive learning technology compared to standard teaching methodologies. Adaptive teaching improves the writing skill among students at university level. It describes teachers' practices of adjusting their instruction to students' diverse needs and levels of understanding (Hardy et al., 2022). Findings of the study suggest that CUNY assessment in writing test score was increased among students after learning through the adaptive approach of teaching. In post-test students improved their language skill; application writing, essay writing, letter writing, paragraph writing, dialogue writing and composition writing. Results of the current study suggest that pedagogical skill of students was also enhanced in post-test of experimental group, it means adaptive teaching enables the learner to improve language skill. Functional English subject is the essential part of educational curricula at university level. A previous study was conducted to investigate the effect of adaptive learning in developing communication skills. The scores of the experimental group compared to the control group on the post-test communication skills scale showed differences that were statistically significant in favor of the experimental group. The evidence of current study is associated with this recent research (Al-Sarayrah, 2023). Findings of the current study were associated with the results of the previous study that was suggested that adaptive approach of teaching empowers students' languages skill and knowledge by delivering information according to their needs (Taylor, 2022). Moreover, another study supported the findings of the current study by revealing that adaptive approach of teaching improves students' academic and linguistic skills at university level (Arghode et al., 2017). Analysis of retention rate of CUNY through adaptive approach of teaching in experimental group reported that positive improvement was observed among students on CUNY assessment in writing

test through adaptive approach of teaching in experiment. Students showed higher level of performance in post-test-2 as compared to post-test-1. This improvement of students indicate that adaptive teaching leaning environment predicts their academic skills. Moreover, there is significant difference of pedagogical skills was analyzed among students of experiment group from post-test-1 to post-test-2. In post-test-2 retention rate was increased on pedagogical skills among students as compared to pos-test-1. So, it was examined that adaptive teaching is influential for the students at university to improve their communication skills. Students of experimental group show the greater level of pedagogical practices as compared to students of control group, it means adaptive approach plays an important role in predicting the academic performance of the students on pedagogical practices. The overall analysis of pedagogical practices between the control group and experimental group highlights that under-graduate students from the experimental group were able to perform pedagogical practices more effectively as compared to under-graduate students from the control group.

Conclusion

Based on findings it was concluded that; it has been analyzed that the adaptive teaching approach had a positive effect on both the CUNY (writing skill) test and pedagogical skills of under-graduate students. Adaptive approach improved students' writing skill. CUNY post-test analysis showed that most of the undergraduate students from the experimental group were able to perform better in language (writing skill) statements. Pedagogical skills post-test analysis showed that the majority of undergraduate students from the experimental group were able to effectively organize the content while answering pedagogical questions. The Adaptive teaching approach has a significant effect on the development of the writing ability of undergraduate students at the university level. The Adaptive teaching approach has a significant effect on the development of pedagogical skills of undergraduate students at the university level. A statistically significant mean score difference was found between the post-test mean scores on the writing ability of students of the control group and the experimental group. A statistically significant positive difference was found between the post-test

mean scores on pedagogical skills of the control group and the experimental group. Retention rate of CUNY through adaptive approach of teaching in experimental group reported that positive improvement was observed among students on CUNY assessment in writing test through adaptive approach of teaching in experiment. Adaptive approach was found an effective strategy of teaching as compared to conventional method.

Recommendations

Following are some recommendations made by the researcher in light of the findings of the research:

- The effect of adaptive teaching on students' writing skill is significant. Adaptive learning technologies enable students to obtain knowledge tailored to their training needs and cognitive characteristics, facilitating personalized learning. So, these technologies should be implemented in education sector.
- Students' score of CUNY assessment in writing test and pedagogical skills was improved in pre-test to post-test of experimental group due to adaptive teaching. Teachers must utilize the adaptive approaches to allow students to practice and think in their preferred ways, so improving their communication skills and facilitating the learning process.
- Adaptive teaching empower the students' communication skill (writing) as compared the conventional method of teaching. So, the implementation of adaptive teaching should be ensured in higher education.
- Students' retention rate was increased in post-test of experimental group so, teachers must utilize adaptive teaching because the writing skill is the fundamental part to the educational process to meet the diverse demand, needs, interest and learning preference of students, needed to be implemented by Higher Education Commission (HEC) of Pakistan.

- By implementing this strategy, education sector may establish a learning environment that is more captivating, adaptable, and accommodating, effectively catering to the varied requirements of university students.

Recommendations for Future Researchers

Findings of the study reveal that adapting approach of teaching at the university level improved language skill of undergraduate students so, here are some recommendations for future researchers:

- By conducting case studies on the development and adoption of adaptive learning systems on a larger scale, it would be possible to demonstrate support for their utilization in education sectors.
- This study was conducted in the management science department of Khwaja Fareed University of Engineering and Information Technology Rahim Yar Khan, whereas a future study by selecting under-graduate students from any other university can also be conducted
- A lack of leadership support, concerns regarding integration, questions regarding student privacy and ethical issues, and concerns regarding the commitment of time and money are all examples of institutional concerns. These are the kinds of issues that are more difficult to address, and they are the kinds of areas that require additional research and work.
- This study was conducted by choosing the "Functional English" subject, a future study by choosing any other pedagogical subject can also be conducted.

Under-graduate students for this study were selected from the BS English program; a future study by choosing under-graduate students from history of English literature program can also be conducted.

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