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EFFECTS OF INDUCTIVE AND DEDUCTIVE TEACHING METHODS ON ENGLISH GRAMMAR ACHIEVEMENT AT SECONDARY LEVEL: A CLASSROOM EXPERIMENT

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ABSTRACT

This research looked at how the teaching methods of inductive and deductive teaching approaches impact achievement of secondary students in English grammar. In particular, it compared gain scores of students who were taught the two strategies, measured their influence and adjusted it by pre-test performance, and found out whether inductive instruction improves grammar comprehension and retention better than deductive teaching. An experimental pre-test-post-test design using a quantitative methodology was used. The sample population was 10th-grade students of Rehman Girls High School, Ban Bajwa, District Sialkot (N = 132), and 60 engaged students were chosen randomly according to the matched-pair method. The respondents were categorized into experimental group (inductive method) and control group (deductive method). There was a six-week instructional period, followed by the administration of the Students' Academic Achievement Test (SAAT), which was a researcher-tested multiple-choice test. Data were reduced with descriptive statistics (mean, frequency, standard deviation) and inferential statistics (paired-samples t-test, independent-samples t-test and one-way ANCOVA). Findings indicated that the two methods enhanced grammar achievement, and the inductive method was much more effective, even following consideration of pre-test differences. It is determined that inductive instruction is more effective in promoting grammar learning and retention at the secondary level. It is suggested that teacher training programs should include applied training in inductive lesson design and that reading materials and online materials be reformulated to include inductive grammar activities that facilitate student-centered learning. Future research can investigate the long-term retention outcome of inductive and deductive methods using delayed post-tests.

Keywords: *Inductive teaching method, Deductive teaching method, English grammar achievement*

INTRODUCTION

One of the main aspects of learning the language at a secondary level is English grammar teaching among school-goers. Grammar has imperative role in the teaching in that it does not only result to good writing and speaking skills but also good general communication skills of the learners (Celce-Murcia and Larsen-Freeman, 1983). Among the numerous techniques they employ, inductive and deductive method of teaching are rather typical methods of teaching and they are studied in the sphere of language learning and teaching.

Deductive method provides the clear structure since the rules of grammar are explicitly taught to

students who then receive a chance to practice rules sequentially. Induction on the other hand mentors the learners to deduce the rules on the basis of example and trends with the more active learning and thinking (Schmidt, 1990). There is an advantage of one method over the other in one sense or another, deductive teaching is also regarded as a way of saving on time as compared to inductive teaching which may prove beneficial in the long run in terms of fostering memory and autonomy (Nassaji and Fotos, 2011).

Despite extensive theoretical discussion in connection to the relative effectiveness of such methods, empirical evidence, though inconclusive, can be found especially in secondary schools. According to some studies there is superior acquisition of the grammar with inductive teaching and in some other studies it is discovered that there is faster improvement of performance under deductive instructions (Sheen, 2007). Therefore, one has to speak about these methods through classroom experiments to recommend an intervention that would maximally contribute to student achievement in the sphere of learning English grammar.

The only means through which secondary level students can acquire the ability to communicate and ultimately achieve academic proficiency is an understanding of the English grammar (Anderson, 2005). Grammatical skill contributes to transparency in the written text, accuracy in speech and understanding in the read. However, the systematic presentation of grammar appears to be consistently difficult and teachers keep arguing about the merits of different methodological approaches, in particular, inductive and deductive methods.

The deductive method of teaching presupposes that the learners are introduced to the transparent grammatical rules and then get to practice. This approach is both elaborate and official and can prove useful in situations when the student will need highly structured learning or when he/she has very little exposure to the world beyond the English language. Discovery learning and cognitive learning is all about having students in the inductive method be expected to observe, recognize patterns and even formulate their own rules of grammar. Such a more learner friendly approach is available in constructivist theories of learning where the active interaction as well as the meaning-making are emphasized (Richards and Rodgers, 2014).

There have been studies in the modern empirical research on the difference of the effects of the methods of acquiring grammar. More specifically, a meta-analysis study by Hashemi and Rashvand (2021) found that the effectiveness of inductive instructions in the long-term retention and motivation among learners are significantly higher in comparison to the deductive instructions. Instead, Ajmal, (2019) reported that deductive instructions establish a faster initial academic relation with a grammar aspect in secondary school students. Such contrary findings demonstrate the multidimensionality of the process of language acquisition and the influence of situational variables of the proficiency, motivation, and classroom environment of the learner.

In addition, grammar teaching has also acquired some new flavor due to the application of technology in language classrooms. Inductive and deductive approaches can be facilitated with the help of the interactive software and electronic resources because of high input and immediate feedback (Godwin-Jones, 2018). The effectiveness of the methods above in conjunction with technology is, however, being investigated, and the above methods are likely to yield new research findings in terms of the possibility of conducting the procedure under resource-limited circumstances (high-secondary schools).

1.3 Statement of the Problem

Grammar is a very fundamental part of the English proficiency but still the ideas of how grammar should be taught are controversial. Deductive method is easy to apply because it provides rules and then thereafter it provides examples and exercises. On the other hand, the inductive approach engages the learners in the rule discovery process through examples, a factor that promotes better cognition and memory. The efficiency of

these techniques is not studied unanimously: some researchers prove the benefits of the deductive learning to learn the rule quicker and others refer to the benefits of the inductive learning to be able to participate in the meaning. Such a contradiction leaves the teachers puzzled as to the method that may be the most effective to facilitate the learning of grammar. Trying to cover this gap, the present study will examine the implications of inductive and deductive instruction of grammar as it is applied to the performance of students in a controlled classroom setting.

1.4 Objectives of the Study

Following were the objectives of the study to:

1. compare the gain scores in English grammar achievement between students taught through the inductive method and those taught through the deductive method at the secondary level.
2. compare the effects of inductive and deductive teaching methods on students' English grammar achievement, controlling for pre-test performance.
3. determine whether the inductive method significantly improves grammar understanding and retention among secondary-level learners compared to the deductive method.
4.

1.5 Research Questions of the Study

Researcher tested following research questions to investigate the objectives of the study.

1. Is there a significant difference in the gain scores of English grammar achievement between students taught through the inductive method and those taught through the deductive method?
2. Is there a significant difference in post-test English grammar achievement scores between students taught through inductive and deductive methods when pre-test scores are statistically controlled?

3. Does the inductive method result in higher grammar understanding and retention compared to the deductive method among secondary-level learners?

Review of Literature

Grammar has always been a focal point in English language pedagogy and there are still discussions on the issue of how it should be taught. Two of the most outstanding and most studied approaches are the inductive and deductive approaches. Each of the two approaches is characterized by unique theoretical bases, advantages, and disadvantages, and the results of research comparing the two have been varied. These section covers the literature in these approaches, their pros and cons and how they relate to academic performance in grammar.

The inductive approach allows learners to be given examples of how language is being used and then makes them deduce grammatical rules themselves. It is representative of the constructivist learning, whereby learners are not passively informed on things but rather, they are active participants in the exploration of knowledge. This exercise stimulates the learners to observe regular trends and make generalizations, which aligns with the consciousness-raising model of second language acquisition, proposed by Ellis (2002).

Among the vital strengths of inductive grammar teaching, one can note the fact that it was able to encourage extensive learning and permanent memory. According to Harmer (2014), it is more probable that students internalize grammatical structures when they come up with rules on their own because this process involves active involvement and critical thinking. On the same note, Nunan (2015) notes that inductive instruction gives students a sense of achievement in learning since the students have a sense of ownership of learning since they are the ones who build the rules.

Induction has also been found to have cognitive merits of research. Inductive strategies were discovered to lead to the higher-order thinking processes, including the skill of analysis, inference, and problem-solving (Alfieri et al. 2011). These assertions are further empirically supported: Shaffer (1989) demonstrated that inductive teaching had a positive impact on grammar

acquisition where the lessons were properly structured, and Erlam (2003) demonstrated that students taught inductively performed better on delayed post-tests, indicating better long-term performance than did students taught deductively. Nevertheless, the inductive approach has its problems as well. It is time consuming and it might involve excessive thinking on the part of the learner, especially those who have no previous background knowledge of the language or are less assured about their ability. Ellis (2006) notes that inductive processes can cause confusion or misunderstanding whereby the examples are not selected carefully, or the students fail to extrapolate the supposed rules. In turn, the success of inductive grammar teaching depends frequently upon the ability of the teacher to organize the lesson, arrange the examples and lead to the discovery process.

The deductive method on the other hand, starts with teachings of the grammatical rules specifically, and then gives examples and exercises. It is based on the behaviorist theories of learning whereby knowledge is passed on by the teacher to the student and reinforced by repetition and feedback. This instructional model is typical not only in the teaching of grammar but also in such subjects as mathematics and science where the organized explanation is regarded as a crucial aspect (Thornbury, 2018).

A deductive approach has a number of merits. It is very time saving and teachers are able to deliver far much material within a short duration of time. This is why it is especially applicable in exam-based or rather curriculum-intensive setting where speed and accuracy matter. It also applies to the learners who appreciate structure and accuracy like adult learners or learners in the educational cultures that take authority of teachers (Larsen-Freeman, 2000).

Its effectiveness over short-term is backed by research evidence. According to Haight, Herron, and Cole (2007), deductively taught students have been found to perform better on immediate post-tests than inductive ones, and Erlam (2003) also reported that learners who learn the object pronouns of the French language by deduction learned the rules more quickly than those who learned by inductive methods. Besides, according to DeKeyser (2003), deductive instruction is especially effective when it comes to teaching complex or irregular grammar formations that might be hard to learn without the help of the teacher.

Nevertheless, critics of the deductive method note its limitations. Since rules are introduced at the face of it, learners can take a passive stance, with memorizing as the primary activity, instead of being active. The practice is also about the form over the meaning that can be detrimental to the communication competence development. Not only that, deductive teaching leads to short-term benefits, and studies have shown that the benefits might not be long-term as learners forget rules in the long term when they stop using the technique (Haight et al., 2007). Rule-first instruction can be abstract and disengaging to younger learners and those students who prefer hands-on discovery, resulting in decreased motivation.

The literature reveals that inductive and deductive approaches are valuable but they perform better depending on the context. Deductive learning seems to be better in the short term in terms of accuracy, efficiency, and complex rules, whereas inductive learning leads to deep learning, long term retention and learner autonomy. These complementary advantages imply that too rigid following one or another approach might not be the best.

Most of the scholars, therefore, propose an eclectic or moderate solution and integrate inductive and deductive features based on the needs of learners, on the complexity of the grammar point, and on the instructional environment. According to Spada and Tomita (2010) the most effective way of teaching grammar is when teachers are able to choose strategies that are flexible to suit the linguistic target, cognitive demands and learner profiles. This kind of integration allows the teacher to enjoy the effectiveness of the deductive approach to instruction and also provides the critical thinking and independence of inductive learning.

Grammar proficiency is a significant aspect of the total language competence where writing, understanding reading and fluency oral heavily rely on the grammar proficiency. Grammar is thus an important measure of language development, which is usually quantified by tests, grades and school standards (Richardson et al., 2012). The learning of grammar however does not only depend on cognitive ability to be successful but also depends on the means of instructions and classroom environment.

Research Methodology

This research design was a true experiment (quantitative) study to investigate the importance of inductive and deductive methods in learning English grammar in secondary school. The study population was 132 tenth grade students of Rehman Girls High School, Ban Bajwa, District Sialkot, a sample of 60 students of which was taken by means of two-stage random sampling. In a pretest-post-test control group study, the Students' Academic Achievement Test (SAAT) was initially used in which students were tested and after that, according to the matched-pair technique, students of equal ability were evenly distributed into two groups of 30. The inductive method was used to teach the experimental group and the deductive method used to teach the control group. The two groups were identical in that; English subject teachers were instructed by experts of the same academic and professional qualifications in order to ensure instructional consistency. The teaching method (inductive/deductive) was the independent variable and the academic achievement in grammar among students measured by use of SAAT was the dependent variable. The research applied the positivist paradigm where numerical data were gathered and examined to establish the relative efficiency of the two methods (Creswell, 2002; Fraenkel, Wallen, and Hyun, 2012).

Instrumentation

The research tool of this study was the Students' Academic Achievement Test (SAAT), which is an MCQs based test and which was formed on the concepts of Bloom taxonomy to measure the various levels of knowledge (factual, conceptual, procedural and metacognitive) in English grammar. The contents were borrowed using the English 10th Grade Textbook as prescribed by the Punjab Textbook Board (2006), and the material included in seven chapters (without poems) of the textbook, representing approximately 50 per cent of the syllabus, which produced 41 student learning outcomes (SLOs) to meet the National Curriculum of English Grades IX10 (2006). Moreover, the researcher created an Inductive and Deductive Teaching Strategies Module that was approved by six subject experts and developed in three steps: alignment of SLOs with curriculum, instructional modules development, and formulation of 30 lesson plans. Data were collected using a pretest-posttest experimental design with the SAAT given pre- and post-treatment; out of a sample population of 132 students, 60 were selected randomly and allocated to control and experimental groups through the matched-pair randomization technique.

3.7 Data Analysis Techniques

Researcher utilized the two categories of the statistics to attain the goals besides evaluation of the hypotheses of the research. In the descriptive statistics, mean and standard deviation was estimated to test the hypothesis of the study, Paired sample t-test, independent sample t-test and ANCOVA as the types of inferential statistics. Relevancy table is provided below to make a reader comprehend more about it. In order to determine the gap between experimental group and control group, the independent sample t-test was used. The true impact of the strategies of the flipped classroom was also disclosed by the ANCOVA where the covariate is the pre-test score.

Table 1: Difference between Gain scores within control group and Experimental Groups regarding Academic Achievement of Students in English Grammer

Group	N	M	SD	t-value	Df	Sig.

Experimental Group	30	16.47	3.15	7.81	58	.000
Control Group	30	10.77	2.46			

* p< .05

A t-test was used to determine the difference in the achievement of English grammar among students taught with the inductive method (M = 16.47, SD = 3.15) and the deductive method (M = 10.77, SD = 2.46), t (58) = 7.81, p < .001. The fact that the experimental group had higher gain scores means that the inductive method worked better in enhancing grammar achievement among students in the secondary level.

Table 2: Difference between Pre Test and Post Test scores within Control group regarding Academic Achievement of Students in English Grammer

Group	N	M	SD	t-value	Df	Sig.
Pre Test	30	6.27	1.57	-23.98	29	.000
Post Test	30	17.03	2.30			

* p< .05

A paired-samples t-test was also intended to compare the pre- and post-test scores of the control group trained by means of the deductive method. The findings indicated that there was a great significant improvement in English grammar performance because the mean of the pre-test English grammar performance (M = 6.27, SD = 1.57) was lower than the mean of the post-test performance (M = 17.03, SD = 2.30), t (29) = -23.98, p =.001. These results demonstrate that deductive approach contributed significantly to grammar performance of students. Nevertheless, comparing the results with the experimental group, the findings indicate that the inductive approach can also produce even higher improvements.

Table 3: Difference between Pre Test and Post Test scores within Experimental group regarding Academic Achievement of Students in English Grammer

Group	N	M	SD	t-value	Df	Sig.
Pre Test	30	7.50	2.25	-28.65	29	.000
Post Test	**30**	**23.97**	**2.52**			

* p< .05

A paired-samples t-test was done to compare the pretest and post test score of the experimental group that was taught using the inductive method. Results indicated that grammar performance significantly improved, and pre-test result (M = 7.50, SD = 2.25) increased to post-test result (M = 23.97, SD = 2.52), t (29) = -28.65, p < .001. These results confirm that the inductive method resulted in significant improvement of grammar performance among students. The high difference in mean between the pre-test and post-test scores demonstrate the efficiency of inductive teaching, which also contributes to the superiority of inductive instruction over the deductive one in grammar acquisition at the secondary school level.

Table 4: Difference between mean score of control group and experimental group on post-test regarding Academic Achievement of Students in English Grammer

Group	N	M	SD	t-value	Df	Sig.
Experimental	30	23.97	2.51	11.16	58	.000
Control	**30**	**17.03**	**2.30**			

* p< .05

Independent-samples t-test was used to compare the post-test results of the students who were taught using an inductive approach (experimental group) and the deductive approach (control group). The findings indicated that the experimental group (M = 23.97, SD = 2.51) scored much higher than the control group (M = 17.03, SD = 2.30), t (58) = 11.16, p <.001. These results imply that the inductive method worked better than the deductive method in improving the achievement of students in English grammar because the discovery-based teaching method enhanced the ability and memory of grammar rules better than teaching grammar rules directly through conventional instruction.

Table 5: One-Way ANCOVA Comparing Control and Experimental Groups on Academic Achievement of Students in English Grammer

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	730.811[a]	2	365.405	63.853	.000	.691
Intercept	1559.724	1	1559.724	272.554	.000	.827

Pre-Test Score	9.744	1	9.744	1.703	.197	.029
Group	605.078	1	605.078	105.735	.000	.650
Error	326.189	57	5.723			
Total	26272.000	60				
Corrected Total	1057.000	59				

a. R Squared = .691 (Adjusted R Squared = .681)

One-way ANCOVA test was used to determine the effect of the teaching methods and

achievement in the English grammar among students with the control of previous knowledge. A covariate was pre-test scores and an independent variable was teaching method and the dependent variable was post-test scores. Findings indicated that there was significant teaching method influence on post-test performance even after controlling on pre-test performance, $F(1, 57) = 105.74$, $p < .001$ with a large effect size (partial η) $= .650$ and this implied that approximately 65 percent of post-test performance variance was attributable to teaching method. The covariate (pre-test scores) was not significant $F(1, 57) = 1.70$, $p > .05$, which indicated that prior knowledge had no strong effect on post-tests. The total model was meaningful, $F(2, 57) = 63.85$, $p < .001$, which accounted about 69 percent of the variance in grammar achievement ($R^2 = .691$, Adjusted $R^2 = .681$). These findings also support the finding that the inductive approach proved to be significantly more efficient than the deductive approach when it comes to the enhancement of grammar performance among students, irrespective of the levels of their prior knowledge.

Conclusions

This research study concludes that both inductive and deductive approaches enhanced grammar performance of students in the secondary level but the inductive one was more effective. With a pre-test control, students with the inductive condition obtained higher gain score and post-test scores, which display deeper understanding, better retention, and more significant learning of grammar concepts than the deductive taught group. The ANCOVA verified that inductive instruction was the best mode of teaching because the outcome improvement could be attributed to the teaching method and not the knowledge. In this way, the research gives good empirical evidence as to why the utilization of inductive, learner-centered and discovery-based teaching methods should be considered as a more effective and influential means of improving the performance of students in English grammar in secondary schools.

Discussion

Findings of this research show that there is a substantial difference between grammar achievement of students instructed in inductive and deductive strategies, where the experimental (inductive) group demonstrates much greater improvement ($M = 16.47$) than the control group ($M = 10.77$). Although the deductive method was equally efficient in delivering positive results, supporting the idea that the rule-based instruction can promote the basic grammar knowledge (Nunan, 2015; Larsen-Freeman, 2000), the inductive approach was more productive, as it was associated with better learning and deeper insight (Prince and Felder, 2006). The fact that the experimental group has significantly improved also evidences constructivist views (Ellis, 2002; Widodo, 2006) which tend to stress guided discovery and autonomy of learners. The

differences in inductive (M = 23.97) and deductive (M = 17.03) teaching proved the superiority of the former over the latter, which is consistent with the previous results (Harmer, 2014; Richards and Rodgers, 2014; Nazari and Allahyar, 2012): the inductive approaches to teaching proved to be more effective in mastering the complex rules of grammar. The finding of the ANCOVA with high effect size (η^2 = .650) was further evidence that the gains in achievement could be attributed to the method of teaching and not to a prior knowledge as indicated by Spada and Tomita (2010). All in all, these results give powerful evidence that the inductive method of grammar teaching is a more effective approach to the improvement of grammar acquisition at secondary level.

Recommendations

It is suggested that secondary school teachers could pay more attention to inductive approaches to teaching grammar because they facilitate active learning, discovery, and better retention. Teachers should also have the capacity to plan and deliver inductive lessons which should be taught through teacher education programs and professional development workshops. Inductive methods should be given primary place in a blended approach, complemented by deductive explanation where necessary to allow balanced learning opportunities. Lastly, induction strategies need to be incorporated in textbooks, online materials, and syllabi by curriculum developers and policymakers, and further research should examine the impact of inductive teaching in the long term and apply inductive teaching to other English skills.

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