Comparative Analysis of Inquiry-Based Learning and Lecture Method on Academic Achievement at Higher Secondary Level

Muhammad Usman
Phd Scholar (Department of ELM), Faculty of Education International Islamic University Islamabad, Pakistan
Email: muhammad.phdedu218@student.iiu.edu.pk

Received on: 23-04-2024 Accepted on: 24-05-2024

Abstract

The main purpose of the present study is to find out the comparative analysis of Inquiry Based Learning and traditional lecture method on academic achievement of students at higher secondary school level in the subject of accounting. The objective of the study was: To find out the comparative analysis Inquiry-based learning and traditional lecture method on academic achievement of students at Higher Secondary school. On the basis of pre-test scores, control and experimental groups were formed randomly. Pre-test was used as post-test as well as for retention. Study comprised of eight weeks. Lesson plans were prepared on the basis of Inquiry Based Learning for experimental group while control group was taught by usual traditional method. T-test was used to compare the results. All the ethical considerations are kept in mind while conducting this research. It is concluded that the use of Inquiry Based Learning in teaching of accounting was more effective than traditional learning. It is recommended for higher Secondary School teachers to apply this method more frequently in the classroom for teaching of Accounting. It is recommended that teachers may be established high level of interaction through questioning as it promotes involvement, enhances learning and motivates students

Keywords: Inquiry-Based Learning, Lecture Method, Academic Achievement, Secondary Level

INTRODUCTION

Inquiry-based learning is a widely used and highly recommended teaching strategy within accounting curricula and across education (Aldahmash, 2016; Dunne, 2013; Wang, 2014). Inquiry-based learning engages students in the processes of scientific discovery and can make science relevant towards their real-world concerns (Darling-Hammond et al., 2020). However, in most science classrooms, teachers still use traditional learning or direct methods of instruction on scientific terminology and other types of discrete knowledge students need to master for standardized testing. Within this learning approach, scientific concepts and methods are presented to students in a learner-centered strategy.

Inquiry based learning enables students to research by conducting and experimenting, incorporate theories and hypotheses, and apply content material to understand and

assimilate solutions to an identified problem or concept. In contrast, traditional learning is a strategy developed and centered on the instructor. Information is typically taught by the instructor or from resources including textbooks and lectures (Khalaf, 2018). Through use of the traditional learning strategy, the monitoring of student achievement progress is an important aspect of education and curriculum. Traditional learning focuses on the students' ability to answer content knowledge questions through standardized testing and a multitude of assessment options, and mainly lacks the capability for students to make stronger, deeper, and personal connections to scientific material (Khalaf, 2018).

McIntyre and Munson (2018) discuss how traditional learning is not able to engage students and impedes their ability to process, recall, and retain information. Studies conducted shows in a traditional classroom setting scientific information can still be presented and taught, but there is a disconnect between the long term retention and application of accounts knowledge (Aligaen et al., 2016). Through traditional learning, there has been a lack of student motivation because students do not understand the relevance of learning the content material (Wilhelm & Wilhelm, 2017).

Within traditional learning, there is a development of non-active learning and engagement among students due to the formulation of the learning process from the students receiving it (Khalaf, 2018). Traditional learning classes do not support active learning or student engagement and motivation because the learning process focuses on the teacher's role as opposed to the students and how effectively teachers are presenting lesson material (Khalaf, 2018). Student motivation and engagement is not present within the TL method because students are not being given a relevant reason as to why they are learning the content material and how it can impact them as learners (Dorier & Maab, 2017).

Statement of the Problem

In most Accounts classrooms, teachers still use traditional learning, or direct methods of instruction on Accounting terminology and other types of discrete knowledge students need to master for standardized testing. In general, in Accounting and particularly in Financial Accounting, there are some misconceptions while teaching financial accounting by traditional method (Lecture method) that the score retention declines. This study is being done to check whether the score retains if Accounting is taught by Inquiry-based Learning method or not.

Objectives of the Study

The main objective of the study is:

1. To find out the comparative analysis of Inquiry-based learning with traditional lecture method on academic achievement of students at Higher Secondary school.

Research Hypotheses

Ho1: There is no significant difference in mean scores of the experimental group and control group on academic achievement of secondary school.

Ho2: There is no significant difference in mean scores of the experimental group and control group on their score retention.

Significance of the Study

Multiple research studies (Baker & Robinson, 2018; Schmid & Bogner, 2015; Johnson & Cuevas, 2016) have shown the positive impacts of implementing inquiry-based learning into the educational classroom. Research suggests with the incorporation of inquiry-based learning within the classroom, Inquiry-based learning can lead to strong increases in student engagement, student motivation, and student academic achievement with long-term knowledge retention.

Operational Definitions

Inquiry-Based Learning

Inquiry-Based Learning an educational practice and method which puts the responsibility of the learning process onto the student. This form of active learning and teaching allows students to ask questions, form solutions to problems, explore and discover content material, and reflect upon learning processes to have deeper understandings of content material.

Academic Achievement

Academic Achievement is the extent to which a student or institution has achieved either short or long term educational goals. Achievement may be measured through students' grade point average, whereas for institutions, achievement may be measured through graduation rates.

Score

Score is a number that expresses accomplishment (as in a game or test) or excellence (as in quality) either absolutely in points gained or by comparison to a standard.

LITERATURE REVIEW

The term 'inquiry' is defined as questioning in the Current Turkish Dictionary (TDK, 2020), and scholars like Kartal (2014) consider it a versatile activity that involves questioning, observation, and pre-evaluation. Güneş (2014) views inquiry as a catalyst for changes in mental skills, fostering critical thinking and decision-making abilities in students.

This study delves into the impact of Inquiry-Based Learning (IBL) on academic achievement at the higher secondary school level, synthesizing existing research in Turkey (Abdi, 2014; Bailey, 2018; Bilir & Özkan, 2018; Çalışkan, 2008; Çelik, 2012; Çelik & Çavaş, 2012; Duban, 2008; Ebren Ozan, 2018; Kaçar, 2020; Kaya & Yılmaz, 2016; Keçeci & Yıldırım, 2017). Employing a meta-analysis approach, this study aims to discern the effect size of IBL on academic achievement, categorizing results by educational levels and publication types (articles-dissertations) between 2000 and 2020.

The review suggests that inquiry competence is essential across educational levels. IBL, aligned with the constructivist learning approach (Güneş, 2014), proves instrumental in enhancing students' cognitive abilities, promoting critical thinking, and nurturing information literacy (Kurudayıoğlu & Tüzel, 2010). Furthermore, the literature highlights IBL's applicability beyond science classes, influencing areas such as arts, foreign languages, social studies, and mathematics (İlter, 2013).

IBL is characterized by its emphasis on asking scientifically oriented questions, providing

evidence for explanations, evaluating alternative explanations, and communicating proposed explanations and justifications (Cairns & Areepattamannil, 2019). This strategy aligns with the shift away from traditional, teacher-centered methods, known for promoting rote learning (Novak, 1998). Reforms advocate for student-centered approaches, and numerous studies demonstrate the effectiveness of IBL in improving student performance, laboratory skills, content retention, and attitudes towards science (Celik & Cavas, 2012; Ozdemir & Isık, 2015; Turkmen, 2009; Arslan et al., 2014).

While the literature provides varied conclusions on the effects of IBL, the growing body of research necessitates a meta-analysis to comprehensively understand its impact on science education (Hedges & Olkin, 1985; Borenstein et al., 2009). This study aims to fill the gap by systematically analyzing existing studies, providing valuable insights for educators and policymakers in Turkey.

Utilizing Inquiry-Based Learning (IBL) to Enhance Student Achievement

Recent research emphasizes the superiority of IBL over Traditional Learning (TL) in boosting student achievement (Baker & Robinson, 2018). Saunders-Stewart et al. (2012) identified 23 learning aspects and outcomes facilitated by IBL, demonstrating its effectiveness in knowledge recall and retention. For instance, Abdi (2014) conducted a study in a fifth-grade primary school in Kermanshah, Iran, comparing IBL and TL classrooms. The experimental group, exposed to IBL using the 5E Learning Cycle Model, outperformed the control group taught through traditional methods, revealing a significant relationship between IBL and enhanced student achievement.

Abdi (2014) found a substantial increase in mean scores from pre-test to post-test for the experimental group (4.15 points), indicating a deeper understanding of the material compared to the control group (3.4 points). This supports the notion that IBL enables students to engage with scientific material, fostering long-term knowledge and retention (Cakir, 2008). Building on this, Schmid and Bogner (2015) conducted a study in Germany, revealing that IBL contributes to long-term knowledge retention and a more profound understanding of content material.

Schmid and Bogner's (2015) study involved 138 ninth graders, presenting a structured inquiry-based science unit on air and sonic waves to both experimental and control groups. The experimental group, engaged in IBL projects, demonstrated a significant increase in content knowledge, as evidenced by diagnostic and post-tests. The control group, devoid of IBL exposure, showed no significant improvement in knowledge scores across assessments. These findings underscore the effectiveness of IBL in promoting sustained learning and recall of scientific concepts.

2.2. Theoretical Framework: Inquiry-Based Learning (IBL) in a Constructivist Context

IBL is an 'inductive' teaching approach, initiating with observations or real-world problems. Key characteristics include a learner-centered focus, active learning through problem-solving, the development of self-directed learning skills, and a constructivist basis where students actively construct knowledge (Gormally, 2019).

Theoretical support for IBL aligns with constructivism, emphasizing active knowledge construction by individuals. Drawing from research on motivation, intellectual development,

and learning approaches, IBL shares similarities with learning cycle-based teaching. Constructivism posits that learners actively construct knowledge and skills, filtering new experiences through mental structures (schemata) that incorporate prior knowledge (Gormally, 2019).

Incorporating insights from Dewey, Vygotsky, and Piaget's developmental psychology, the constructivist theory highlights effective teaching strategies:

- Building on existing knowledge for meaningful connections.
- Encouraging active, self-directed learning.
- Providing authentic learning opportunities.
- Involving collaborative or cooperative learning in small groups.

IBL's advocacy stems from its perceived ability to strongly motivate learners. Motivation studies by McIntyre (2018) indicate that tasks challenging at an appropriate level sustain motivation, fostering engagement. IBL leverages perplexity to prompt students to seek solutions, making tasks personally relevant.

Adesoji and Idika (2017) outline stages of intellectual development in college students, emphasizing the transition from certainty to relativism. IBL facilitates this transition by involving students in questioning knowledge and developing critical thinking skills, contrasting traditional didactic approaches (Adesoji & Idika, 2017).

RESEARCH METHODOLOGY

Research Design

The research was quantitative, Pre-test post-test equivalent groups design was used. On the basis of pre test scores, control and experimental groups were formed randomly. The teachers of Financial Accounting taught the subject and guidelines were given to the teacher who was to teach Inquiry Based Learning for teaching Accounting at Higher Secondary Level. Pre-test was used as post-test as well as for retention. Study was comprised of eight weeks. Lesson plans were prepared on the basis of Inquiry Based Learning for experimental group while control group was taught by usual traditional method. Four chapters were covered in this study.

Population

1st year class was selected for this study as the study is based on Higher Secondary Level. The institution from which the class was selected, is Government Higher Secondary School, Jhelum. Two groups (control and experimental) were formulated equally on the basis of pre-test scores. Thirty students from the class were selected for each group.

Sample and Sampling

The study was conducted with 30 experimental and 30 control group students at higher secondary school schools in Jhelum. It was made sure that experimental group is equal to control group.

Instruments

The test included multiple-choice items to measure the students' academic achievement. Each question has one correct answer and three 'distracters'. The chapters from which the

questionnaire was made are Accounting Cycle, Bank Reconciliation Statement and Bills of Exchange.

3.5 Procedure (Data Collection)

The researcher used the following two treatments in the present study:

i. Teach by using Inquiry Based Learning (experimental group)
ii. Teach by using Lecture method (control group).

Data were collected by using Pre Test and Post Test techniques.

3.6 Data Analysis

T-test was used to compare the results and check the difference.

3.7 Ethical Consideration

All the ethical considerations are kept in mind while conducting this research project. Proper permissions were sought from the management (Principal) of the institution, where the research has to be conducted.

4. DATA ANALYSIS AND INTERPRETATION

Intention of study was to evaluate comparative analysis of inquiry based learning with traditional lecture method on academic achievement of high secondary school students in Accounting Cycle, Bank Reconciliation Statement and Bills of Exchange. Data were obtained through teacher made tests to draw inferences. Pre-test scores in subject of Accounting Cycle, Bank Reconciliation Statement and Bills of Exchange were used to equate the groups. Significance of difference between the mean scores of treatment and control groups on pre-test, post-test and retention test were determined through application of t-test, analysis of variance and factorial design (2 x 3) analysis of variance.

Table 1

Significations of difference between means scores on post-test of experimental and control group

Groups	N	D.F	Mean	S.D	S.E	T. Value	
						Calculated Value	Table Value
Experimental	30	29	52.80	14.88	3.59	3.59	2.02
Control	30	29	49.42	7.11			

The critical region is $|t| \geq t$ to $0.025(40) = 3.02$

It is obvious from the table that the computed t (3.59) value was found greater than table value at 0.05. Therefore null hypothesis, "significant difference does not exist between mean scores of experimental and control groups on post-test" was rejected. It means that the significant difference was there between mean scores on post-test of both groups after being treated by comparative analysis inquiry based learning method and traditional learning method respectively.

Table 2

Significance of difference between the scores on post-test of higher achievers of experimental and control groups

Groups	N	D.F	Mean	S.D	S.E	T. Value	
						Calculated Value	Table Value
Experimental	30	29	65.81	16.40	4.00	2.70	2.08
Control	30	29	55.00	4.04			

The critical region is |t| ≥ t to 0.025(20) = 3.08

It is apparent from the above table that computed t (2.70) value was found greater than table value at 0.05. Therefore null hypothesis, "significant difference does not exist between mean scores of high achievers of treatment and control groups on post-test" was rejected, and researcher may conclude that high achievers of treatment group performed better than control group.

Table 3

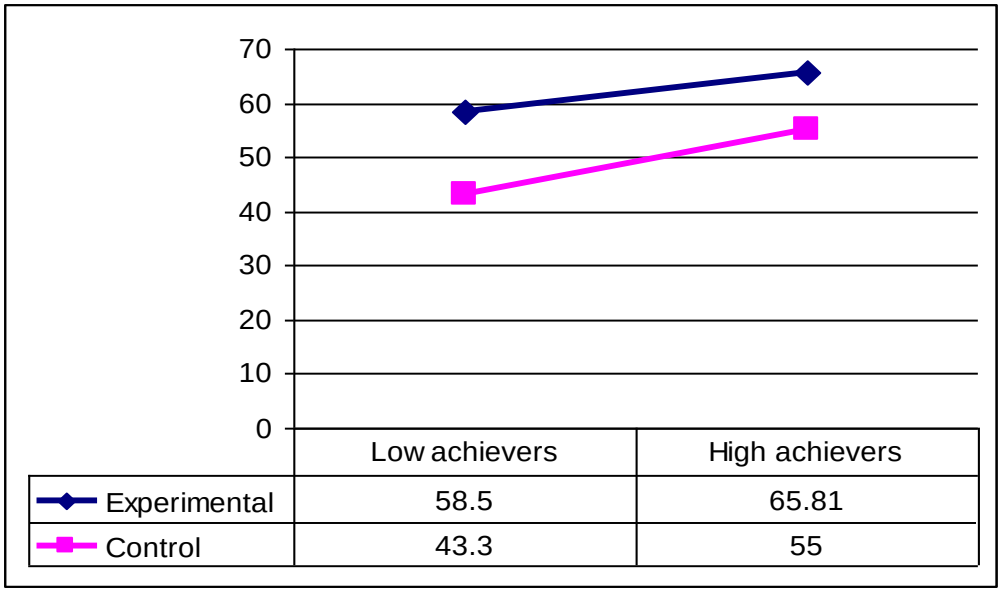
Significance of difference between mean scores on post-test of low achievers of experimental and control groups

Groups	N	D.F	Mean	S.D	S.E	T. Value	
						Calculated Value	Table Value
Experimental	30	29	58.50	12.73	4.20	3.61	2.10
Control	30	29	43.30	3.83			

The critical region is |t| ≥ t to 0.025(18) = 3.10

It is visible from the table that computed t (3.61) value was found greater than table value at 0.05. Therefore null hypothesis, "significant difference does not exist between mean scores of low achievers of experimental and control groups on post-test" was not accepted, and researcher may conclude that the difference between mean scores on post-test of low achievers of treatment and control groups was significant in the favour of experimental group.

The interaction effect between treatment and achievement level on post test scores



Graph shows that both high and low achievers of treatment groups outscored the high and low achievers of control groups.

5. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Findings

1. It is obvious from table1 that the computed t (3.59) value was found greater than table value at 0.05. Therefore null hypothesis, "significant difference does not exist between mean scores of experimental and control groups on post-test" was rejected. It means that the significant difference was there between mean scores on post-test of both groups after being treated by comparative analysis inquiry based learning method and traditional learning method respectively.
2. It is apparent from table 2 that computed t (2.70) value was found greater than table value at 0.05. Therefore null hypothesis, "significant difference does not exist between mean scores of high achievers of treatment and control groups on post-test" was rejected, and researcher may conclude that high achievers of treatment group performed better than control group.
3. It is visible from table 3 that computed t (3.61) value was found greater than table value at 0.05. Therefore null hypothesis, "significant difference does not exist between mean scores of low achievers of experimental and control groups on post-test" was not accepted, and researcher may conclude that the difference between mean scores on post-test of low achievers of treatment and control groups was significant in the favour of experimental group.

5.2 Conclusions

The conclusions based on analysis and findings of the study are following.

1. The use of Inquiry Based Learning in teaching of accounting was more effective than

traditional learning.

2. Inquiry Based Learning was found to be more useful approach of teaching students. Both (teachers and students) of them benefited equally from this style of learning.

3. Inquiry Based Learning was proved to be more effectual learning means for both high achievers and low achievers. Low achievers benefited more from Inquiry Based Learning than high achievers in traditional setting.

5.3 Recommendations

1. Inquiry Based Learning has proved to be effective for learning accounting at higher secondary school level. Therefore it is recommended for higher Secondary School teacher to apply this method more frequently in the classroom for teaching of accounting.

2. It is recommended that teachers who are teaching accounting at higher secondary school level may be trained to teach accounting by applying Inquiry Based Learning.

3. It is recommended that teachers may be established high level of interaction through questioning as it promotes involvement, enhances learning and motivates students.

5.4 Future Researches

1. Further research can open doors to investigate whether Inquiry Based Learning plays a purposeful role in the traditional classroom setting to upgrade students' understanding and inspiration towards the accounting subject.

2. This study was conducted in boys of higher secondary school in Pakistan. Furthermore, conducting similar study in girls higher secondary school would be worth presenting.

REFERENCES

1. Abdi, A. (2018). The comparative analysis inquiry-based learning method on students' academic achievement in education. *Universal Journal of Educational Research, 2*(1), 37-41. https://doi.org/10.13189/ujer.2014.020104
2. Adesoji, F. A., & Idika, M. I. (2017). Effects of 7E learning cycle model and case-based learning strategy on secondary school students' learning outcomes in education. *Journal of the International Society for Teacher Education, 19*(1), 7-17.
3. Aldahmash A. H., Mansour N. S., Alshamrani S. M., & Almohi S. (2018). An analysis of activities in Saudi Arabian middle school science textbooks and workbooks for the inclusion of essential features of inquiry. *Research in Science Education, 46*(6), 879– 900.
4. Aligaen, J. C., & Capaciete, M. E. C. (2016). Sustainability science as a neo-normal: A case study. *Universal Journal of Educational Research, 4(*10), 2229–2235.
5. Anderson, R. (1997). *The research on teaching as inquiry*. Paper presented for the Center for Science, Mathematics and Engineering Education. National Research Council, Washington D.C.
6. Bransford, J. D., Sherwood, R. D., Hasselbring, T. S., Kinzer, C. K., & Williams, S. M. (2012). *Anchored instruction: Why we need it and how technology can help*. In Cognition, education, and multimedia (pp. 129-156). Rutledge.
7. Baker, M., & Robinson, J. S. (2018). The comparative analysis two different pedagogical delivery methods on students' retention of knowledge over time. *Journal of Agricultural Education, 59*(1), 100–118. https://doi.org10.5032/jae.2018.01100
8. Barron, B., & Darling-Hammond, L. (2018). Teaching for Meaningful Learning: A review of research on inquiry-based and cooperative learning.

9. Cavallo, A. M., Miller, R. B., & Saunders, G. (2002). Motivation and affect toward learning science among pre-service elementary school teachers: Implications for classroom teaching. *Journal of Elementary Science Education, 14(*2), 25-38.
10. Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science, 24*(2), 97-140.
11. Dorier, J., & Maab, K. (2017). The PRIMAS project: Promoting inquiry-based learning (IBL) in mathematics and science education across Europe PRIMAS context analysis for the implementation of IBL. *International Synthesis Report PRIMAS– Promoting Inquiry- Based Learning in Mathemati, 23*(1), 54-67.
12. Gormally, C., Brickman, P., Hallar, B., & Armstrong, N. (2009). Effects of inquiry-based learning on students' science literacy skills and confidence. *International Journal for the Scholarship of Teaching and Learning, 3*(2), Article 16.
13. Jensen, M., Mattheis, A., & Johnson, B. (2018). Using student learning and development outcomes to evaluate a first-year undergraduate group video project. *CBE Life Science Education, 11*(1), 68-80.
14. Johnson, S. A., & Cuevas, J. (2016). The effects of inquiry project-based learning on student reading motivation and student perceptions of inquiry learning processes. *Georgia Educational Researcher, 13*(1), Article 2.
15. Khalaf, B. K. (2018). Traditional and inquiry-based learning pedagogy: A systematic critical review. *International Journal of Instruction, 11*(4), 545–564. https://doi.org10.12973/iji.2018.11434a
16. Kuhlthau, C. C., Caspari, A. K., & Maniotes, L. K. (2007). Guided inquiry: Learning in the 21st century. Westport, Conn: Libraries Unlimited.
17. McIntyre, S. H., & Munson, J. M. (2018). Exploring cramming: Student behaviors, beliefs, and learning retention in the principles of marketing course. *Journal of Marketing Education, 30*(3), 226-243.
18. McMillan, J. H. (2004). Educational research: Fundamentals for the consumer (4th ed). Boston: Allyn & Bacon.
19. McIntyre, S. H., & Munson, J. M. (2008). Exploring cramming: Student behaviors, beliefs, and learning retention in the principles of marketing course. *Journal of Marketing Education, 30*(3), 226-243.
20. Pappas, C. (2014). Instructional design models and theories: Inquiry-based learning model. ELearning Industry.
21. Saunders-Stewart, K. S., Gyles, P. T., & Shore, B. M. (2017). Student outcomes in inquiry instruction: A literature-derived inventory. *Journal of Advanced Academics, 23*(1), 5-31.
22. Savery, J.R. (2006). Overview of problem-based learning: Definitions and distinctions. Interdisciplinary Journal of Problem-based Learning, 1(1), 8-20.
23. Schmid, S., & Bogner, F. (2015). Does inquiry-learning support long-term retention of knowledge? *International Journal of Learning, Teaching and Educational Research, 10(*4). 51-70.
24. Ssempala, F. (2017). Teachers' understanding and practice of inquiry-based instruction in Uganda. [Doctoral dissertation, Syracuse University]
25. Wilhelm, J. D., & Wilhelm, P. (2017). Inquiring minds learn to read, write, and think: Reaching all learners through inquiry. *Middle School Journal, 41*(5), 39-46.
26. Vygotsky, L. S. (1980). *Mind in society: The development of higher psychological processes*. Harvard university press.
27. Yager, R., & Simmons, P. (2013). Results of the Salish projects: Summary and implications for science teacher education. *International Journal of Education in Mathematics Science and Technology, 1*(4), 259-269