

**ADVANCE SOCIAL SCIENCE ARCHIVE JOURNAL**

Available Online: <https://assajournal.com>

Vol. 04 No. 02. October-December 2025. Page# 3951-3962

Print ISSN: [3006-2497](https://doi.org/10.5281/zenodo.18522751) Online ISSN: [3006-2500](https://doi.org/10.5281/zenodo.18522751)

Platform & Workflow by: [Open Journal Systems](https://doi.org/10.5281/zenodo.18522751)

<https://doi.org/10.5281/zenodo.18522751>



**Impact of Integrated Curriculum on Students' Learning Outcomes: Experimental Evidence from District Peshawar, Pakistan**

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**ABSTRACT**

*Despite the overlapping topics in different subjects, the old approach of maintaining each discipline separately generally leads to repetition, a compressed schedule, and unclear concepts, particularly in the concept-based board exam system. The current study investigated the effectiveness of an integrated and interdisciplinary curriculum relative to a conventional one, targeting ninth-grade students of District Peshawar, Khyber Pakhtunkhwa, Pakistan. This research adopted an experimental pre-test post-test design, where the participants included 40 ninth-grade students, who were separated equally into the control group and the experimental group. While the control group adopted the conventional method, the experimental group adopted an interdisciplinary-integrated approach. Descriptive statistics, the paired-samples t-test, and regression techniques were used for analysis. The paired-samples t-test revealed that the post-test scores of the experimental group significantly differed from the pre-test scores ( $t = -6.65, p < 0.001$ ), which made way for effective inference about the significant amount of learning achieved by the participants of the experimental group. Regression results also indicated that group membership significantly predicted post-test scores after accounting for students' pretest performances. The study concludes that the integrated curriculum approaches make a difference in the students' conceptual understanding as well as in their achievement, and recommends that such approaches be implemented at the secondary level in an organized way through the training of teachers, collaborative planning, and alignment of assessment.*

**Keywords:** *Integrated curriculum, Experimental Design, Paired t-test, Students Learning Outcomes, Pakistan*

## 1. INTRODUCTION

The curriculum is being taught in schools whether related to sciences, language or ethics/ social studies there is similarities in content and these subjects are taught as an individual subjects (Kreijkes & Greatorex, 2024). Furthermore, the teachers are hired for each subject separately However, teachers face the challenge of covering extensive syllabi within limited timeframes, leaving little room for personalized instruction. There is a challenging situation for teacher to manage students' timing to communicate, reading comprehension and correct writing in old learning methods (De Ocampo, 2024). Repetition of content in subjects loses the interest of studies among students. This situation underscores the need for innovative educational strategies that can address these limitations and better prepare students for the demands of the modern world (Mujahid., Fayyaz and Zafar, 2024). An educational approach that emphasizes the interconnection of knowledge and skills across different subjects, as well as their relevance to the real world is integrated curriculum. However, there is a lack of consensus in the terminology used to describe integration which is likely to cause confusion (Applebee et al., 2007; Harrell, 2010). The integrated curriculum has become a globally discussed issue and a challenge for all higher education institutions and schools (Khan & Law, 2015). For this purpose, in 1987, the National Association of the Education of Young Children (NAEYC) published numerous resources to facilitate educational reforms. Fraser (2000) asserts that teachers have considerable knowledge of the curriculum and pedagogical skills that ensures that curriculum integration provides a challenging and learning environment. However, Yvonne (2015) endorsed the integration of themes closer to real-life events which enables the learner to incorporate the subject blends such as language, mathematics, science, social studies, arts, etc.

### 1.1 Statement of Problem

In the context of the new board examination system, students require conceptual clarity and a deep understanding of topics. The integrated curriculum offers a potential solution to these challenges. By focusing on holistic learning experiences rather than rote memorization, integrated curricula aim to develop students' conceptual understanding and critical thinking skills. This approach aligns with the educational needs of the 21st century, fostering an environment where students can thrive academically and personally. Therefore, the purpose of the study is to investigate the difference in the students' learning outcomes between traditional curriculum and integrated curriculum approaches at secondary level in district Peshawar Khyber-Pakhtunkhwa.

## 2. REVIEW OF LITERATURE

### 2.1 Integrated Curriculum

When a curriculum is designed and constructed the most significant part of it is setting of objectives and its implementation. There is significant benefit of integrated curriculum to the teachers as well students (Costley, 2015). Implementation of this approach involves students in lessons and enhances their critical thinking; the learning process constantly effects positively in deepen their understanding of the content. When the curriculum is design with approach of integration by the talented teachers who engage their students in developing their views of the world and help to explore their own capabilities, (Fraser & Paraha ,2017). Education is a holistic approach that considers the Know, Do, and Be (KDB) approach, an imperative for a learner. A study by Drake and Reid (2018) considers that traditional learning expectations are largely associated with the cognitive “know of the curriculum, whereas the international shift focuses more on conceptual thinking of Know rather than memorizing facts. Nevertheless, teachers’ good understanding and insight is needed to implement the integration of the subjects within a lesson. This type of curriculum supports the schools to develop abilities and skills that will be needed for the twenty-first century. The main concept of integrated curriculum is to organize learning experiences in order to build up a valid link between disciplines (Murdoch ,2015). Similarly, Rennie et al. (2012) defines integrated curriculum as a thematic combination of various subjects through inquiry-based method. As a result, there is a strong case for basing curriculum integration on two fundamental concepts. First of all, it requires merging conventional knowledge disciplines to address significant and essential problems. Second, it is consistent with Deweyan constructivism, which integrates a learner's past knowledge into the creation of new understandings.

### 2.2 Approaches of Integration of Curriculum

Curriculum integration can be approached from different perspectives, such as epistemology, pedagogical methods, or overarching principles. Regardless of its foundation, the goal of curriculum integration is to structure human knowledge and understanding, along with the necessary skills and competencies, to foster thriving societies, economies, and cultures (Drake & Reid, 2018). Integration has many forms. The interdisciplinary approach of some topics makes integration necessary, as they can't be fully understood separately. Some topics have natural interdisciplinary approach, they overlap each other. Drake (2012) in his book *Creating Standards-Based Integrated Curriculum* has given three approaches of integrated curriculum:

- i) Multidisciplinary paradigm is the oldest one which deals with the multiple disciplines in order to increase connectivity and appropriateness during basic learning either goal remain embedded in the individual discipline.
- ii) Interdisciplinary paradigm, bridge the gaps between disciplines by identifying shared themes and concepts to nurture high order thinking.

iii) Tran's disciplinary paradigm is the last category, which used to nurture the ability to tackle complex and real-life issues by dissolving the boundaries among disciplines and fostering deeper understanding of the real world.

Basically, it is a of thinking process about the purpose of schools, about the medium of curriculum, and as well as for the effectiveness of knowledge. Rather Curriculum integration is revolving around the concept that the school curriculum should be problems, issues, of life itself. Research indicates that integrated curricula are effective in various educational contexts. Drake and Reid (2010) noted that integrated approaches lead to deeper understanding and retention of knowledge. Furthermore, Beane (1997) suggested that integrating subjects around themes relevant to students' lives increases engagement and motivation. Studies have shown that integrated curricula improve students' conceptual understanding. Wall and Leckie (2017) emphasized that integrated approaches help students make authentic connections between different subjects, enhancing their overall comprehension and retention of knowledge. This is particularly important in the context of modern board examinations, which require deep understanding rather than rote memorization. Curriculum integration research typically emphasizes on integrating two or three content areas, rather than all of them. Applebee, Adler, & Flihan (2007) and Authors (2016) suggest that language arts and social studies are often connected.

The benefits of an integrated curriculum are numerous, and its effectiveness relies on careful planning and development. To achieve this, educators must consider several key steps. First, they should establish clear, achievable learning outcomes for students. Next, they should identify the most effective service experiences that will help students achieve these outcomes. This involves approaching potential community partners, planning the experience in detail, preparing students for the experience, and selecting activities that are meaningful and relevant to students. Additionally, educators should integrate critical reflection into the experience, address logistical issues, and develop a plan to measure the success of both students and community partners. Finally, it's essential to recognize and celebrate achievements as a way to close out the experience (Jacoby and Howard, 2015).

## 2.2 Research Hypothesis

H<sub>0</sub> : There is no significant difference in the Student Learning Outcomes between traditional curriculum and integrated curriculum approaches

H<sub>1</sub> : There is a significant difference in the Student Learning Outcomes between traditional curriculum and integrated curriculum approaches.

H<sub>0</sub> : Integrated Curriculum approaches have no impact on Student Learning Outcomes.

H<sub>2</sub> : Integrated Curriculum approaches have a significant impact on Student Learning Outcomes.

### **3. RESEARCH METHODOLOGY**

#### **3.1 Research Design**

This study uses the simplest possible experimental design-one-group pre-test/post-test design-described by Brogan and Kutner (1980). In such a design, one group of students is tested first before the administration of the treatment-that is, the independent variable-and then again after the treatment has been administered. More specifically, participants are initially pre-tested to determine their beginning performance. Following administration of the treatment, participants are post-tested to determine changes in performance.

#### **3.2 Population of the Study**

The population of interest in the present study was 9th-grade students studying in Government Girls High Schools Peshawar, Khyber-Pakhtunkhwa. Only those studying Science as one of the compulsory subjects were included. Such focus is warranted because of the crucial role of science education at the secondary school level in fostering critical thinking and deep conceptual understanding (Cohen, Manion, & Morrison, 2017).

#### **3.3 Sample Size and Sampling Technique**

A sample of 40 students was selected using simple random sampling to ensure that every student had an equal opportunity to be selected, minimizing selection biases and increasing the chances of making the sample representative of the population. Following a pretest on the students in the ninth grade, the participants were assigned to two groups: the Conventional Group and the Experimental Group. Further, an integrated curriculum was adopted with the Experimental Group. Subsequently, a post-test was prepared that would serve to measure the achievements of students and the effectiveness of the treatment on the Experimental Group. This pretest-posttest experimental design is generally recommended in educational research to determine the effectiveness of instructional interventions (Creswell & Creswell, 2018).

#### **3.4 Procedures**

One week training program was undertaken by the researcher to train those teachers who were selected to teach experimental group. A training program was formulated and after getting the permission of the sample school one week training was given to the teacher of experimental group only. The intervention is based on best practices outlined (Smith & Johnson, 2015; Brown et al., 2022). The experimental group implements curriculum integration strategies. By using the strategy of interdisciplinary approach, the researcher implemented on experimental group. This approach enhanced reading comprehension and writing scores by providing students with rich, contextual experiences that they can draw upon in their literacy tasks (Barry, 2001). The researcher used the same interdisciplinary approach by integrating science with literacy; students may find more relevance in their reading and writing assignments, potentially leading to improved test scores. After

a predetermined period (6-weeks) post-test was administered to assess teaching/learning outcomes and measure teaching effectiveness of students. The teachers that taught almost have same qualification and job experience. Post-testing measures were selected based on their reliability and validity as demonstrated in prior research (Jones & Williams, 2018; Clark et al., 2021).

### 3.5 Analytical Tools

Descriptive statistics were performed using the mean and standard deviation to summarize students' performance in both groups. The mean describes the average performance, while the standard deviation indicates the dispersion of the scores around the average performance (Gujarati & Porter, 2009). Besides, the participants' pre- and post-test scores were compared using a paired-samples t-test, since their mean difference should achieve significance at a certain point in time, according to Talikan et al. (2025).

$$t = \frac{\bar{d}_1}{S_d/\sqrt{n}} \dots\dots\dots 1$$

Where  $d_i = X_{1i} - X_{2i}$

$$\bar{d}_1 = \frac{1}{n} \sum_{i=1}^n d_i$$

$$S_d = \sqrt{\frac{\sum (d_i - \bar{d})^2}{n - 1}}$$

Moreover, the following regression model has been applied to investigate the impact of integrated curriculum on students learning Outcomes.

$$Y_i = \beta_0 + \beta_1 D_i + \beta_2 X_i + \epsilon_i \dots\dots 2$$

Where

$Y_i$  represent Post-test score of students "i",  $D_i$  , a dummy variable indicates 1 for integrated curriculum/experimental group and 0 for control groups of students "i" ,  $X_i$  represents pre-test marks of students "i"  $\beta_1$  represents the effect of the integrated curriculum on post-test performance and  $\beta_2$  indicates how much the post-test score is expected to change for a one-unit increase in the pre-test score, holding the group (control vs experimental) constant.

## 4. FINDINGS AND DISCUSSION

### 4.1 Descriptive Statistics (Pre-test Marks)

The total post-test score of the entire cohort of 40 students averaged 39.27 points, exceeding the average pre-test mean score of 26.54 points as shown in table 4.1. These differences suggest an

overall improvement in student outcomes after the instructional treatment. In educational pre-post designs, mean increases in score post-treatment are usually considered as indications of learning gains attributed to the intervention, which corroborates the results from similar studies that have reported higher post-intervention means than pre-intervention means (Celis et al., 2025).

**Table-4.1: Descriptive Statistics (all students)**

Test Marks	Mean	Std. Deviation	N
Post-test Marks	39.2703	8.65271	40
Pre-test marks	26.5405	9.98776	40

Source: SPSS results

#### 4.2 Descriptive Statistics (Experimental Group)

The table 4.2 presents descriptive statistics for the experimental group of students comprising 20. The average score in the pre-test was 28.75 with SD=10.53, while the average score increased a lot to 45.30 with SD=2.60 in the post-test. From this huge increase in the mean, it seems that students performed much better after the integrated curriculum was employed. A study by Gyan et al. (2021) has also shown that the average post-test score was much higher than the average pre-test score following an educational intervention, which therefore indicates better academic performance due to the teaching method.

**Table-4.2: Descriptive Statistics(Experimental Group)**

Test Score	Std. Deviation	N	Std. Error Mean
Pre-test marks	28.7500	20	10.53253
Post-test Marks	45.3000	20	2.59757

Source: SPSS results

#### 4.3 Paired t-test Results

The paired samples t-test in Table-4.3 yields a mean difference of  $-16.55$ , which indicates that the post-test scores were on average 16.55 points higher than the pre test scores in the experimental group. The t-value is  $-6.65$  with 19 degrees of freedom, and the significance value is  $.000$  ( $p < .001$ ). This shows the improvement is statistically significant, so the score increase after the intervention is very unlikely due to chance. These results replicate findings from recent studies in education utilizing paired samples t-tests to reveal actual learning gains from pre-test to post-test (Celis et al., 2025) and other findings in research on instructional interventions (Bouknify & Meryem, 2025).

**Table-4.3: Paired Samples Test (Experimental group)**

	Paired Differences						t-stat	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference					
				Lower	Upper				
Before exp									
After exp	-16.55	11.118	2.48	-21.75	-11.34	-6.65	19	.000	

Source: SPSS results

### 4.3 Regression Results

#### Model Summary

The model demonstrates a strong relationship between the predictors and post-test scores, with  $R = 0.772$ . It accounts for 59.5% of the variation, based on group and pre-test scores, as determined by  $R^2 = 0.595$  and Adjusted  $R^2 = 0.572$ . Having a standard error of 5.66 means the predictions are reasonably accurate. The Durbin-Watson value of 1.628 implies that there is not a serious problem of autocorrelation in the residuals.

**Table-4.4: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.772 <sup>a</sup>	.595	.572	5.66282	1.628

a. Predictors: (Constant), group, pre-test marks

b. Dependent Variable: Post-test marks

#### ANOVA Results

Table-4.5 presents the ANOVA results of the regression model predicting post-test marks. This model is significant,  $F = 25.025$ ,  $df = 2, 37$ ,  $Sig. = .000$ , indicating that taken as a whole, the two predictors, namely group (experimental vs. control) and pre-test score, explain an important portion of the variance of students' post-test results.

**Table-4.5: ANOVA**

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	1605.00	2	802.501	25.025	.000 <sup>b</sup>
Residual	1090.29	37	32.067		
Total	2695.29	39			

a. Predictors: (Constant), group, pre-test marks

b. Dependent Variable: Post-test marks

**Regression Coefficients**

Table-4.6 shows the regression results for predicting post-test scores from group (experimental versus control) and pre-test scores. The intercept (B = 60.135, p < .001) is the expected post-test score for someone in the reference group when the pre-test score is zero. The pre-test coefficient is non-significant (B = -0.080, p = .409), which means once group was accounted for, pre-test score doesn't predict post-test performance very well. The group coefficient is significant ( $\beta = -0.750$ , p < .001) showing a strong effect of group on post-test results after adjusting for pre-test, with one group scoring notably differently from the other. Collinearity statistics (Tolerance  $\approx 0.967$ ; VIF  $\approx 1.034$ ) suggest no multicollinearity, meaning each predictor brings unique information to the model. Using pre-test as a covariate this way is common when running pre-post designs to control for baseline differences and focus on the treatment effect.

**Table-4.6: Coefficients**

Model	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	60.135	3.535		17.009	.000		
Pre-test	-.080	.096	-.093	-.835	.409	.967	1.034
groups	-12.837	1.899	-.750	-6.759	.000	.967	1.034

a. Dependent Variable: Post-test marks

**5. CONCLUSION AND RECOMENDATIONS**

**5.1 Conclusion**

The findings indicated that the integrated curriculum significantly improves learning outcomes compared to conventional methods of teaching. Descriptive statistics showed a higher post-test result among students after the treatment, indicating more consistent and effective learning. Paired-samples t-tests confirm that this difference for the experimental group is statistically significant. Regression analyses also find that the primary predictor of post-test achievement is group assignment, with pre-test scores controlled. Pre-test scores contribute no significant power to post-test scores once effects due to groups are accounted for. Taken together, findings suggest that carefully developed integrated curricula, informed by innovative teaching methods, supported by targeted teacher training, result in enhanced conceptual understanding, student engagement, and academic performance. It concludes that wider utilization of integrated curriculum methods deserves emphasis with regard to collaborative planning, interdisciplinary content, and continuous assessment to realize maximal learning benefits.

## 5.2 Recommendations

- i) The provincial and national departments of education need to promote the implementation of integrated programs in schools, particularly in secondary schooling, in order to develop a deeper conceptual understanding and enhance critical thinking.
- ii) There is a need for schools to promote collaborative planning of subject specialists on designing lessons that integrate science, language arts, social studies, among other fields of study, resulting in a well-rounded learning experience for students.
- iii) One of the keys to good curriculum design is ensuring that the curriculum is compatible with the framework of assessments whether it is board exams or otherwise and that assessments of understanding as well as application are made.
- iv) The provision of technological inputs such as digital materials that make learning interesting and meaningful.

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