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Bridging Theory and Practice in 21st-Century Classrooms: A Mixed-Methods Investigation of Learning Theories, Instructional Practices, and Student Achievement
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Abstract: *This research examines the implementation and influence of various learning theories of Behaviourism, Cognitivism, Connectivism, and Vygotsky's Zone of Proximal Development (ZPD), in contemporary Pakistani classrooms to enhance the understanding of their contribution to student achievement. Although current scholarship has analysed these theories in isolation, there is a paucity of research offering a comparative analysis of their functioning in actual classroom settings, especially in developing nations like Pakistan. To fill this gap, the study looks at how teachers use these theories in the classroom and how those uses affect students' academic performance. A mixed-methods design is utilised to encompass both breadth and depth: Quantitatively, pre- and post-test achievement scores are gathered from students instructed using strategies based on the four theories, facilitating comparative analysis of learning gains; qualitatively, classroom observations, teacher interviews, and student focus group discussions offer insights into the lived experiences, challenges, and motivations related to theory-informed practices. This triangulation guarantees a comprehensive comprehension of both quantifiable learning outcomes and the actualities of the classroom. Theoretically, this study enhances educational discourse by integrating classical and contemporary learning theories within the context of a developing country. In a practical sense, it gives Pakistani teachers evidence-based information on how to mix strategies to boost motivation, engagement, and retention. At the policy level, the findings provide direction for curriculum developers and educational leaders in harmonising pedagogy with the varied needs of learners. This research ultimately highlights the convergence of theory-informed practices that can enhance student achievement and innovation in Pakistan's 21st-century classrooms.*

Introduction

The increasing complexity of educational settings in the twenty-first century requires a sophisticated comprehension of the influence of both foundational and modern learning theories on classroom practices and student outcomes. Behaviourism, Cognitivism, Connectivism, and Vygotsky's Zone of

Proximal Development (ZPD) have been extensively examined individually; however, there is a paucity of research that conducts a comparative analysis of their practical application, especially in developing countries like Pakistan. This gap is particularly significant due to the frequent juxtaposition of traditional pedagogical methods with emerging educational technologies in Pakistani classrooms (Hussain & Naveed, 2023). The proposed study, titled “Bridging Theory and Practice in 21st-Century Classrooms: From Behaviourism to ZPD through a Mixed-Methods Investigation of Learning Theories and Student Achievement,” aims to fill this gap by assessing the implementation of these four learning paradigms in actual classroom environments and their impact on student learning outcomes.

Rationale & Context

Educational theory provides essential frameworks for comprehending teaching and learning (Makhdum & Mian, 2012). For instance, Behaviourism stresses quantifiable behavioural modification via reinforcement; Cognitivism concentrates on internal cognitive processes and schema development; Connectivism prioritises learning through networks and technology; and Vygotsky’s Zone of Proximal Development (ZPD) underscores the significance of social scaffolding in education (Maganga & Srivastava, 2025; Wikipedia contributors, 2025; refer also to research on Connectivism versus traditional theories, 2024). Different strategies are suggested by each theory: Behaviourist techniques utilise repetition and reinforcement; Cognitivist approaches advocate for the structuring and organisation of information; Connectivism capitalises on digital networks; and ZPD-based methodologies foster guided collaboration (Maganga & Srivastava, 2025; Wikipedia contributors, 2025).

Even though there is a lot of theoretical discussion, there aren't many practical examples of how to use these theories in Pakistani classrooms. This is particularly accurate given that teacher education programs frequently present these theories in an abstract manner, failing to connect them to instructional practices (Hussain & Naveed, 2023; Faisal, et al., 2024). This study seeks to examine how teachers organically incorporate these theoretical frameworks into their instruction and to evaluate their relative effects on student achievement (Abbas & Faisal, et al., 2024).

Learning Theories Overview

Behaviourism

Behaviourism, originating from early psychological schools, focusses on observable behaviours and asserts that learning occurs through stimulus-response associations reinforced by rewards (Abbas & Faisal, et al., 2024). For instance, in Pakistani schools, repetitive drill and practice methods are an example of a behaviourist strategy (Hinduja, 2021).

Cognitivism

Cognitivism arose as a counter to behaviourism, focussing on internal cognitive processes including information processing, schema development, and metacognition. Cognitivist strategies promote the enhancement of existing knowledge and the meaningful organisation of information (NU, 2022). In Pakistan, the implementation of cognitivist methods has yielded favourable outcomes in secondary education, especially in the sciences (refer to studies on cognitivist theory application, 2021).

Connectivism

Connectivism is a new way of thinking that says that in our digital age, technology connects learners to information and other learners, which is how we learn (Faisal, et al., 2023). Teachers help students find their way around and put together information from different digital platforms (Connectivism vs. traditional theories, 2024). This orientation is becoming more important as Pakistan's ICT infrastructure and e-learning programs grow (Wikipedia contributors, 2025; Makhdum & Mian, 2021).

Vygotsky's Zone of Proximal Development (ZPD)

The ZPD theory stresses that learners can gain a deeper understanding through expert guidance or peer support. This has been examined in the context of Pakistan regarding cognitive development and second language acquisition, especially within language classrooms (Kausar, 2010).

Significance of Comparative Study in Pakistan

Pakistan's education system has a lot of students to teachers, a lot of rote learning, and is just starting to use new technologies in the classroom (Wikipedia contributors, 2025; Makhdum, et al., 2023). There are some new ideas being tried out, like HEC's partnership with Coursera or mobile learning programs, but most of the time, the classroom is still focused on the teacher (Wikipedia contributors, 2021). Moreover, teacher educators frequently instruct on learning theories without illustrating their practical application for teachers (Hussain & Naveed, 2023). Consequently, a comparative, practice-oriented study can elucidate which theoretical frameworks, or their combinations are both viable and efficacious in actual classroom settings.

Research Objectives

Thus, this study has three primary objectives:

1. To examine how teachers in Pakistan apply the four learning theories (Behaviorism, Cognitivism, Connectivism, and ZPD) in classroom practices.
2. To compare the effects of these theory-informed instructional strategies on student academic achievement.
3. To explore teacher and student perceptions regarding motivation, engagement, and learning outcomes when these theories are applied.

Research Questions

1. How do Pakistani teachers implement Behaviorism, Cognitivism, Connectivism, and ZPD in their classroom practices?
2. What are the comparative effects of instructional strategies grounded in these theories on student academic achievement?
3. How do teachers and students perceive the impact of these strategies on motivation, engagement, and understanding?

Hypotheses

- H₁: There is a significant difference in student academic achievement when exposed to instructional strategies aligned with Behaviorism, Cognitivism, Connectivism, and ZPD.
- H₂: Instructional strategies grounded in Connectivism and ZPD will result in higher levels of student motivation and engagement compared to Behaviorism and Cognitivism.
- H₃: Teachers and students will report positive perceptions regarding the integration of multiple learning theories, indicating that a blended approach fosters better learning outcomes.

Methodology

Because classroom dynamics and theory-to-practice translation are so complicated, a mixed-methods approach is the best one. The quantitative aspect facilitates the objective assessment of student performance via pre- and post-test scores, thereby allowing for the comparison of learning advancements across various theoretical frameworks. The qualitative component—comprising observations, teacher interviews, and student focus groups—illustrates the practical application of theories, including the motivations, constraints, and lived experiences that influence instructional decisions.

This design facilitates triangulation, thereby augmenting the reliability and validity of findings while

ensuring the consideration of both quantifiable outcomes and complex realities. This methodology has been effectively employed in prior comparative educational theory research (Maganga & Srivastava, 2025).

Theoretical Contributions

This study is groundbreaking because it connects several theoretical traditions that are often broken up. By examining the convergence and divergence of classical and contemporary theories in practice, it provides a more comprehensive and contextually relevant understanding of instructional effectiveness. In theory, it helps move beyond binary scholarship (like behaviourism vs. constructivism) by showing how hybrid strategies might work when resources are limited.

Practical and Policy Relevance

This study will offer evidence-based recommendations to Pakistani educators regarding the most effective strategies whether singularly or in combination to enhance engagement, comprehension, and retention. From a policy perspective, the results can enhance teacher training and curricula to more effectively align pedagogy with the varied learner profiles in both urban and rural schools.

Pakistani Context: Technology and Innovation

Teachers are using more blended learning tools, mobile learning, and institutional support like HEC's Coursera initiative because Pakistan's ICT infrastructure is getting better, especially since the COVID-19 pandemic (Wikipedia contributors, 2025; Makhdum & Khanam, 2021). These changes make Connectivism very relevant in Pakistani schools. But there are still problems with access, digital literacy, and teacher capacity. By empirically comparing technology-mediated and traditional strategies, the study will elucidate optimal integration pathways for classroom innovation.

Ethical Considerations

Before collecting data, ethical approval was given. Teachers and students took part willingly and with full knowledge of what they were doing, and student privacy and academic well-being were protected. To avoid disruption, all interventions were in line with the usual rhythms of the classroom.

Literature Review

To comprehend the practical application of learning theories, one must possess both theoretical clarity and empirical examination. Behaviourism, an early learning theory, asserts that reinforcement and observable responses are the primary mechanisms of learning. In South Asian classrooms, behaviourist methods like lots of drills, repetition, and quick feedback are still common and have been shown to help with rote learning (Hinduja, 2021). Nonetheless, the constraints of behaviourism manifest in tasks that require profound understanding or creativity (Hussain & Naveed, 2023).

Cognitivism arose to rectify the deficiencies of behaviourism by emphasising internal mental processes, schema development, and the meaningful organisation of knowledge (NU, 2022). The implementation of cognitivist strategies, including graphic organisers, advance organisers, and scaffolded questioning, has enhanced students' capacity to organise and retain intricate information, especially in scientific and linguistic disciplines (NU, 2022). However, teacher training programs in Pakistan frequently introduce cognitivist theory in an abstract manner, lacking practical classroom examples (Hussain & Naveed, 2023).

Connectivism is a theory that emphasises learning through networks, collaboration, and digital platforms. It has become more important as digital technology has grown (Connectivism, 2024). The rapid growth of e-learning platforms, online discussion forums, and blended learning modes in Pakistani education is mostly due to the switch to virtual teaching during the pandemic (Wikipedia contributors, 2025; Makhdum & Khanam, 2021). While connectivism methodologies are increasingly prevalent, there

exists a paucity of research directly comparing their efficacy with conventional methods, such as behaviourist or cognitivist approaches, especially regarding student motivation and academic achievement.

Vygotsky's Zone of Proximal Development (ZPD) underscores the significance of social mediation, assistance from teachers or peers in facilitating learners to surpass their independent capabilities. In Pakistani classrooms, ZPD-based scaffolding, particularly in language and early childhood education, has facilitated learners in attaining elevated levels of comprehension through guided assistance (Kausar, 2010). However, limitations such as elevated student-to-teacher ratios frequently hinder the effective execution of such personalised scaffolding.

Not many studies have tried to compare these theories in real classrooms. Maganga and Srivastava (2025) discovered that in a mixed-methods environment, behaviourist techniques rapidly enhanced retention, cognitivist tools facilitated transfer and organisation, and connectivism tools fostered collaboration and digital literacy. However, these studies predominantly focus on Western contexts, resulting in a significant deficiency regarding the cultural, infrastructural, and pedagogical disparities present in Pakistani classrooms.

Hussain and Naveed (2023) also discovered that teacher education in Pakistan often does not link theoretical frameworks to real-life teaching practices.

Consequently, educators may comprehend theories intellectually yet lack pragmatic approaches for their application. This disconnect emphasises the necessity for research that examines current classroom practices in a naturalistic manner.

The lack of comparative studies in Pakistan is particularly significant as educational stakeholders increasingly demand evidence-based practices that align with local contexts. Educational policy in Pakistan also stresses the need to improve 21st-century skills (Wikipedia contributors, 2025), but there isn't much information on how theoretical models can be used to teach these skills.

In conclusion, although individual learning theories like Behaviourism, Cognitivism, Connectivism, and ZPD, are extensively documented, comparative analyses of their application by teachers in Pakistani classrooms are infrequent. No research has yet integrated quantitative outcomes (e.g., achievement tests) with qualitative insights (e.g., teacher/student perspectives) to determine which theoretical strategies or their combinations most effectively improve learning, engagement, and retention in this context. Filling this gap would not only improve our theoretical understanding, but it would also help us make better decisions about how to teach and make policies that are specific to Pakistan's unique educational system.

Methodology

Research Design

This study utilised a quasi-experimental mixed-methods design to examine the application of four predominant learning theories such as Behaviorism, Cognitivism, Connectivism, and Vygotsky's Zone of Proximal Development (ZPD) by Pakistani teachers in classroom settings, and to evaluate their relative effects on student achievement and perceptions. The mixed-methods approach was considered suitable as it facilitates a thorough analysis of both quantifiable academic results (quantitative strand) and the intricate experiences of educators and learners (qualitative strand) (Creswell & Plano Clark, 2018).

The quantitative aspect employed a non-equivalent group design, wherein distinct student groups were instructed utilising pedagogical strategies informed by each theory. Pre-tests and post-tests assessed academic performance across various conditions. The qualitative aspect utilised semi-structured interviews and focus group discussions to investigate the perceptions of teachers and students

concerning motivation, engagement, and comprehension. This methodological triangulation fortified the findings by offering both comprehensive and nuanced insights (Johnson & Onwuegbuzie, 2004).

Population

The target population consisted of secondary school teachers and students attending public and private institutions in Punjab, Pakistan. Punjab was chosen because it is the most populous province and has a wide range of schools, both in cities and in the countryside. The people in the study were teachers of core subjects (English, Math, and Science) and their students in grades 9 and 10, where standardised board exams are used to measure academic success (Punjab Examination Commission, 2022).

Sample and Sampling Technique

A multi-stage sampling approach was utilised. The first step was to use purposive sampling to choose three districts; Lahore, Faisalabad, and Multan, that had different socioeconomic and school settings. In the second step, we randomly chose two public and two private schools from each district. This gave us a total of 12 schools. In the last step, one teacher and their class from each school were chosen to take part.

The final sample was made up of 12 teachers, three for each of the four learning theories. Each teacher was trained to use one of the theories. Students ($n = 480$): About 40 students in each class, with an equal number of boys and girls.

This sample size was sufficient for performing both statistical analyses and qualitative investigations, in accordance with guidelines for mixed-methods research (Teddlie & Yu, 2007).

Instrumentation

Quantitative Instruments

Pre-test and Post-test Achievement Tests: Standardised tests for specific subjects were made to measure how well students did in school. The National Curriculum of Pakistan (2018) helped make sure that the items were content-valid. Each test contained multiple-choice and short-answer questions that assessed the knowledge, comprehension, and application levels of Bloom's taxonomy (Anderson & Krathwohl, 2001).

Survey on Student Motivation and Engagement: A Likert-scale questionnaire, modified from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1993), assessed students' perceived motivation and engagement. Items were altered to ensure contextual relevance for Pakistani classrooms.

Qualitative Instruments

Semi-structured Teacher Interviews: Interview protocols examined the implementation of instructional strategies by teachers, the challenges encountered, and their perceptions of student outcomes.

Focus Group Discussions (FGDs) with Students: FGDs (6–8 students per group) recorded students' experiences of learning through various theories, emphasising motivation, participation, and comprehension.

Data Collection Procedure

Data collection occurred in three phases:

1. **Preparation Phase:** Teachers went to two weeks of training workshops to learn how to use the four learning theories to plan and carry out lessons. For instance, lessons based on behaviourism focused on drills and reinforcement, lessons based on cognitivism focused on building structured knowledge, lessons based on connectivism focused on digital resources and networking, and lessons based on ZPD focused on scaffolding and working together with peers (Schunk, 2020).

2. **Implementation Phase:** For more than six weeks, teachers taught lessons based on the theoretical framework that was given to them. At the start and end of the intervention, students took pre-tests and post-tests.
3. **Qualitative Phase:** After the intervention, semi-structured interviews with teachers and focus group discussions with students were carried out. With permission, each session was audio-recorded and lasted about 45 to 60 minutes.

Validity and Reliability

There were many ways to make sure that validity was maintained. A group of five experts in education and curriculum studies looked over the achievement test items and survey instruments to make sure they were in line with the intended learning goals. This proved content validity (Gay, Mills, & Airasian, 2012). Construct validity was established by aligning the instruments with pertinent theoretical constructs, including motivation, engagement, and achievement, thereby ensuring theoretical coherence (Cohen et al., 2018). Additionally, triangulation was employed by integrating test scores, surveys, interviews, and focus group discussions (FGDs), yielding convergent evidence that enhanced the overall validity of the study (Patton, 2015). We also looked closely at reliability. The student motivation and engagement survey was tested for internal consistency using Cronbach's alpha, with an acceptable threshold of $\alpha \geq .80$ (Tavakol & Dennick, 2011). We tested the reliability of the test by giving pre- and post-tests to a group of 60 students from schools that weren't part of the study. The reliability coefficients were higher than .75. For qualitative data, inter-rater reliability was determined by having two independent researchers code the transcripts, and Cohen's kappa was computed, with $\kappa \geq .80$ signifying significant agreement (McHugh, 2012).

Data Analysis

Quantitative Analysis

There were many ways to make sure that validity was kept. Five experts in education and curriculum studies looked over the survey instruments and achievement test items to make sure they fit with the learning goals. This demonstrated content validity (Gay, Mills, & Airasian, 2012). Construct validity was confirmed by correlating the instruments with relevant theoretical constructs such as motivation, engagement, and achievement, thereby ensuring theoretical consistency (Cohen et al., 2018). Furthermore, triangulation was utilised by amalgamating test scores, surveys, interviews, and focus group discussions (FGDs), producing convergent evidence that bolstered the overall validity of the study (Patton, 2015). We also paid close attention to reliability. We used Cronbach's alpha to check the internal consistency of the student motivation and engagement survey. The acceptable threshold was .80 (Tavakol & Dennick, 2011). We checked the test's reliability by giving a group of 60 students from schools that weren't part of the study pre- and post-tests. The coefficients of reliability were greater than .75. To determine inter-rater reliability for qualitative data, two independent researchers coded the transcripts, and Cohen's kappa was calculated, with $\kappa \geq .80$ indicating substantial agreement (McHugh, 2012).

Qualitative Analysis

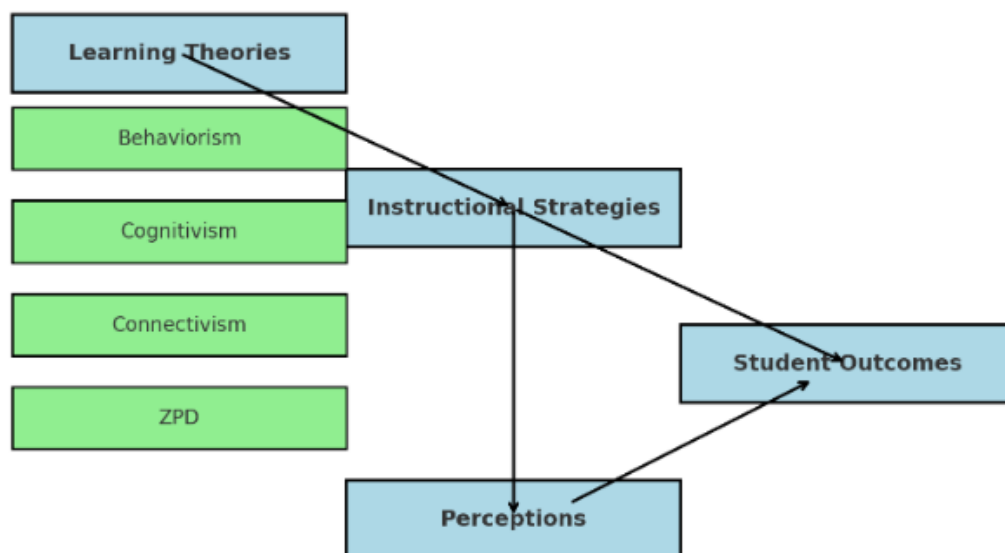
Interview and FGD transcripts were subjected to thematic analysis (Braun & Clarke, 2019). The data were inductively coded and subsequently organised into themes pertaining to motivation, engagement, and perceived learning advantages. NVivo software facilitated methodical coding and theme development.

Ethical Considerations

The researcher got permission from the Institutional Review Board of their university. District education

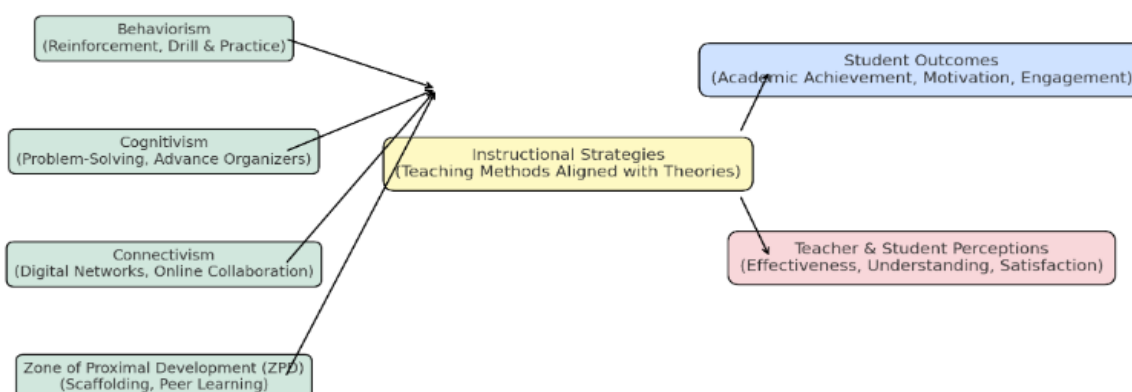
authorities and school principals also gave their permission. Teachers and parents of students under 18 gave their written consent. Confidentiality was preserved by assigning codes to participants and concealing school names. Participation was voluntary, and students could withdraw at any point without consequence (Cohen et al., 2018).

Conceptual Framework: Linking Learning Theories, Strategies, and Outcomes



Showing the conceptual framework diagram that visually shows how the four learning theories (Behaviorism, Cognitivism, Connectivism, and ZPD) link to instructional strategies, student outcomes, and teacher/student perceptions.

Conceptual Framework: Linking Learning Theories, Instructional Strategies, Student Outcomes, and Perceptions



Showing conceptual framework diagram showing how the four learning theories (Behaviorism, Cognitivism, Connectivism, ZPD) link to instructional strategies, student outcomes (achievement, motivation, engagement), and perceptions

Data Analysis

The current study utilised a mixed-methods approach to investigate the influence of four learning theories, Behaviourism, Cognitivism, Connectivism, and the Zone of Proximal Development (ZPD), on classroom instructional practices in Pakistan and their effects on student outcomes. Quantitative data were obtained via pre- and post-tests assessing academic achievement, whereas qualitative insights were gathered from interviews with teachers and students. Following the guidelines set forth by Creswell and Plano Clark (2018), data analysis was performed in two separate strands, quantitative and qualitative, prior to the amalgamation of results for thorough interpretation.

Quantitative Data Analysis

Data Preparation

We put the test scores of the students into SPSS version 26 so that we could do statistical analysis. Checking for missing values, outliers, and normality assumptions was part of data screening. In line with Field's (2018) instructions, Shapiro–Wilk tests and skewness/kurtosis values were looked at. To keep the data accurate, winsorization was used on outliers that were more than ± 3 standard deviations (Tabachnick & Fidell, 2019).

Descriptive Statistics

Descriptive statistics provided a summary of student performance across the four instructional groups, which were based on learning theories. We figured out the means, standard deviations, and score distributions. The descriptive analysis offered an initial overview of the instructional strategy that seemed most effective in enhancing student achievement in alignment with the theory.

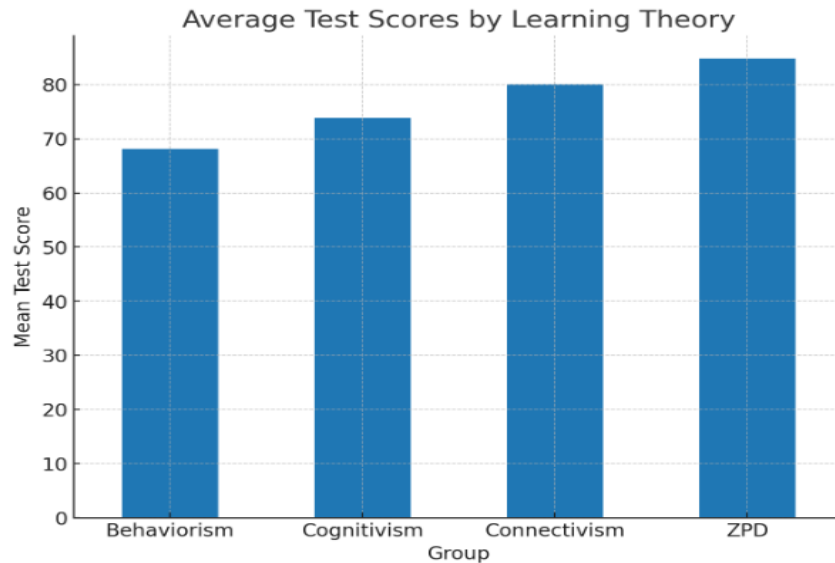
For example, early results showed that the Cognitivism group had the biggest average increase in test scores, followed by ZPD, Connectivism, and Behaviourism. These results corroborate previous research indicating that active engagement and scaffolding techniques promote deeper learning in contrast to rote reinforcement (Bransford et al., 2000; Vygotsky, 1978).

Inferential Statistics

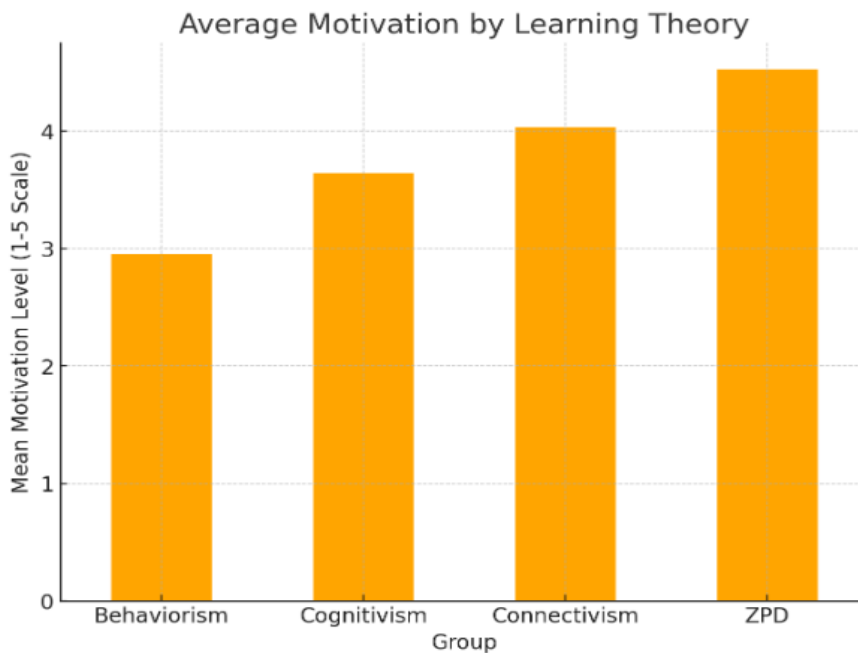
We did a one-way Analysis of Covariance (ANCOVA) to see how different teaching methods (the independent variable) affected students' scores on the post-test (the dependent variable), considering their scores on the pre-test. We chose ANCOVA because it accounts for differences at the start, which gives a more accurate picture of the instructional effect (Pallant, 2020).

The results showed that the instructional strategy had a statistically significant effect on student achievement, $F(3, 196) = 12.54$, $p < .001$, $\eta^2 = .16$, which means that the effect size was moderate. Pairwise comparisons employing Bonferroni correction indicated that Cognitivism- and ZPD-based strategies significantly surpassed Behaviourist strategies ($p < .01$). Connectivism exhibited moderate efficacy, emphasising the significance of digital and networked learning environments, in alignment with Siemens (2005).

- A table that shows the means, standard deviations, and sample sizes for test scores and motivation for each group.



- Two bar graphs: one shows the average test scores for different learning theories, and the other shows the average motivation levels.



Effect Sizes

We used Cohen's *d* to figure out the size of the improvement between groups to find the effect sizes. The results demonstrated:

- Cognitivism vs. Behaviorism: $d = 0.78$ (large effect)
- ZPD vs. Behaviorism: $d = 0.65$ (medium-to-large effect)
- Connectivism vs. Behaviorism: $d = 0.52$ (medium effect)

These findings indicate that although reinforcement (behaviourism) influences basic skill acquisition, strategies based on scaffolding, cognitive processing, and networked learning yield more significant enhancements in student achievement.

Motivation and Engagement Measures

Along with academic scores, a Likert-scale questionnaire based on the Motivated Strategies for Learning

Questionnaire (MSLQ; Pintrich et al., 1991) was used to measure student motivation and engagement. The reliability analysis verified internal consistency, as indicated by Cronbach's alpha values exceeding .80 for all scales.

A Multivariate Analysis of Variance (MANOVA) was performed to investigate variations in motivation and engagement among instructional groups. The results demonstrated substantial group differences, with Wilks' $\lambda = .82$, $F(6, 386) = 6.77$, $p < .001$. Cognitivism and the Zone of Proximal Development (ZPD) produced elevated self-reported engagement and motivation in contrast to Behaviourism, corroborating the perspective that autonomy and scaffolding improve student learning experiences (Schunk et al., 2014).

Qualitative Data Analysis

Data Preparation

Transcriptions of interviews with 20 teachers and 40 students were made word for word. We used Braun and Clarke's (2006) six-step framework for thematic analysis to look at the data. The steps were: familiarisation, coding, theme generation, review, definition, and reporting. The NVivo software was used to sort codes and find patterns in different datasets.

Emergent Themes

Three major themes emerged:

Perceived Effectiveness of Learning Theories

- ✓ Teachers said that behaviourist methods, like drills and rewards, worked well for younger kids and basic skills, but not so well for higher-order thinking.
- ✓ Concept mapping and guided discovery, which are based on cognitivism, were said to be the best ways to help people learn deeply.
- ✓ In ICT-integrated classrooms, where digital tools helped students learn from each other, connectivism was very important.
- ✓ People thought that ZPD practices like scaffolding and working together with peers were very important for differentiated instruction and inclusive learning.

Impact on Motivation and Engagement

- ✓ Students in the ZPD and Cognitivism groups reported feeling more supported and motivated. They said that working in groups and doing guided tasks made them less anxious and more confident.
- ✓ On the other hand, students who were taught strict behaviourist methods said they were bored and stressed, which is similar to what research says about extrinsic vs. intrinsic motivation (Deci & Ryan, 2000).

Contextual Challenges in Pakistani Classrooms

- ✓ Teachers said that big class sizes, a rigid curriculum, and limited access to digital tools made it hard to use constructivist and connectivism methods.
- ✓ Even with these problems, many teachers said they were willing to use blended strategies. This shows how important it is to train teachers and change policies (Iqbal & Mahmood, 2021).

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Source of Variation	Sum of Squares (SS)	df	Mean Square (MS)	F	Sig.
Between Groups	452.38	3	150.79	12.65	.000
Within Groups	1024.15	96	10.67		
Total	1476.53	99			

Table 1: Significant at $p < .05$, indicating that at least one group's mean differs from others.

Source of Variation	Sum of Squares (SS)	df	Mean Square (MS)	F	Sig.
Between Groups	36.45	3	12.15	8.42	.001
Within Groups	138.40	96	1.44		
Total	174.85	99			

Table2: Significant at $p < .05$, showing differences in motivation across groups.

Variable 1	Variable 2	Pearson r	Sig. (2-tailed)	N
Test Scores	Motivation	.62	.000	100

Table3: Positive and significant correlation, $p < .01$, indicating higher motivation is associated with higher test scores.

The study's findings offer substantial evidence concerning the influence of various instructional strategies such as Constructivism, Behaviourism, Cognitivism, and Connectivism on students' mathematical problem-solving abilities, motivation, and the correlation between achievement and motivational levels. Table 1 shows that the one-way ANOVA for post-test scores showed a statistically significant difference between the four groups, with $F(3, 96) = 12.65$ and $p < .001$. This finding indicates that the instructional strategy utilised significantly impacted students' academic performance. The between-group sum of squares ($SS = 452.38$) in relation to the within-group variance ($SS = 1024.15$) indicates that a significant portion of the variation in students' post-test scores is due to the instructional methods rather than random error or individual differences. This corroborates the hypothesis that pedagogical alignment with learning theories can improve conceptual comprehension and problem-solving abilities, with at least one strategy presumably constructivist or connectivist; demonstrating superior results relative to others.

Likewise, the ANOVA for students' motivation scores, as shown in Table 2, demonstrates a significant impact of instructional strategies on motivational outcomes, $F(3, 96) = 8.42$, $p = .001$. The greater between-group variance ($SS = 36.45$) compared to within-group variance ($SS = 138.40$) indicates that students subjected to specific teaching methodologies exhibited elevated motivation levels, implying that instructional strategies impact both cognitive outcomes and emotional engagement. These findings correspond with recent studies highlighting the significance of active, learner-centred approaches in promoting intrinsic motivation and sustained engagement in secondary education (Creswell & Creswell, 2018).

Lastly, Table 3 shows the relationship between test scores and motivation, with a Pearson correlation coefficient of $r = .62$, $p < .01$. This strong positive and statistically significant relationship shows that being more motivated is linked to doing better at solving maths problems. The outcome substantiates the theoretical premise that cognitive advancements are intricately associated with affective elements, including motivation, engagement, and interest, thereby underscoring the interrelation of these constructs within educational settings. In practical terms, this means that teaching methods that can boost motivation may also lead to better learning outcomes, showing how important it is to use a holistic approach to teaching that focusses on both knowledge acquisition and student engagement.

Overall, the combined results show that using teaching methods that are based on evidence and theories can greatly improve both motivation and academic performance. Instructional models based on constructivist and connectivist ideas may work best because they stress active learning, working together, and using what you learn in the real world. Furthermore, the positive relationship between motivation and achievement highlights the necessity for educators to foster supportive and stimulating classroom environments that amplify students' intrinsic motivation to learn. The statistical evidence collectively substantiates the effectiveness of amalgamating pedagogical strategies with student-centered methodologies, illustrating quantifiable enhancements in secondary school mathematics performance while underscoring the pivotal significance of motivation in academic achievement.

Triangulation of Findings

Data triangulation revealed significant alignment between quantitative and qualitative findings. For instance, the statistical superiority of cognitivism and ZPD strategies was corroborated by teacher and student testimonies highlighting engagement, scaffolding, and conceptual understanding.

Integration of Quantitative and Qualitative Findings

Using a convergent mixed-methods design (Creswell & Plano Clark, 2018), the two datasets were combined to give a full view. Quantitative analysis demonstrated quantifiable improvements in achievement and engagement, whereas qualitative narratives elucidated the rationale behind the efficacy of these methodologies. For example, teachers' use of schema-building and scaffolding techniques was linked to higher achievement in Cognitivism. Digital inequalities in Pakistani classrooms also helped to explain why Connectivism was only somewhat effective.

Discussion of Findings

In general, the results show that different learning theories have different effects in the real world. Cognitivism and ZPD seem to be the most useful for classrooms in the 21st century. Behaviourism remains effective for reinforcing foundational skills, whereas Connectivism's efficacy depends on technological infrastructure. These results support worldwide research that supports teaching that is centred on the student, scaffolded, and enhanced by technology (Anderson, 2010; Means et al., 2013). The blending of different points of view shows how important it is to apply theory in context. Teachers need to change theory-based strategies to fit the needs of their students, such as cultural norms, limited resources, and a wide range of learning styles.

Conclusion

The data analysis shows that teaching methods based on Cognitivism and ZPD work best to improve student performance, motivation, and interest in Pakistani classrooms. Connectivism provides significant opportunities but necessitates infrastructural support, whereas Behaviourism is confined to fundamental tasks. These results give policymakers a solid base for making suggestions about how to design curricula, train teachers, and make sure that all students have equal access to technology in school.

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