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BEYOND THE CLASSROOM: EXPLORING THE INTERPLAY OF COGNITIVE, EMOTIONAL, AND SOCIAL FACTORS IN HUMAN LEARNING

Dr. Nighat Yasmin[1], Saadia Tabassum[2], Dr. Shazia Ejaz[3]

[1]Lecturer, Department of Social Work, Government Graduate College, Township, Lahore.
Email: nighatyasmeen08@gmail.com

[2]Assistant Professor, Department of Transportation Engineering and Management, University of Engineering and Technology Lahore. Email: saadia@uet.edu.pk

[3]Teaching Assistant, Department of Secondary Education Lahore College for Women University, Lahore.
Email: shaziaejaz777@hotmail.com

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ABSTRACT

This study explored the psychological, effective and cognitive processes that affects individuals' acquisition, processing, and retention. It discussed the basic psychological concepts such as constructivism, behaviorism, Cognitive Load theory, and metacognition and how their related concepts apply to the present world of teaching and learning. The study also examined how the social context, cultural background and individual differences such as neurodiversity affects the learning outcome. Key chemical processes in the learning process were mentioned: attention, memory and executive functioning. This study was based on the theories from the field of educational psychology, developmental studies and neuroscience, thus taking a multidisciplinary approach to learning throughout the lifecycle. It also discussed the technology, peer interaction and self-directed learning as a way to construct knowledge in formal and informal education. The design was mixed methods research taking quantitative and qualitative data: questionnaires, standardized psychological assessment and semi-structured interviews, classroom observation. Both quantitative and qualitative data were analyzed to explore the linkage between various cognitive, contextual and motivational characteristics and to evaluate the effectiveness of instruction, and further, to gain insights into the experiences of the learners and the educators. The study encompassed a broad view of what worked and what didn't in the learning process as well as evidence-based, learner-centered strategies that engendered engagement and resilience, curiosity and lifelong learning. The findings provided guidelines for education practitioners, psychologists and education policymakers interested in enhancing teaching and learning

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Correspondence	**Dr. Nighat Yasmin**
Email:	nighatyasmeen08@gmail.com
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Introduction

Developing knowledge represents the crux of learning where individuals learn how to acquire and organize and remember, which is a key factor that plays a vital role in social, cognitive and educational development. Constructivist and sociocultural views focus on the way learners construct knowledge and are interconnected with prior knowledge, peers, teachers and cultural tools, while behaviorist perspectives are on stimulus responses contingencies, and reinforcement ; cognitive approaches involve processing in mind such as working memory and schema formation, encoding, retrieval, and metacognitive control. Empirical studies are now studying the interactions between cognitive constraints and motivational and affective factors in addition to the influence of individual differences in working memory capacity, prior knowledge, self-efficacy, and cultural background on the learning paths . There are a lot of studies on the laboratory or quasi-experimental approach which confirms the principles; however, the adherence to these principles or adaptation in various educational environments is inconsistent . The problem of "implementation gap" between knowledge of the psychology and the standard design of education still remains a challenge to the field (Younas, Khan & Taj, 2023).

Significance

Understanding and exploring the psychology of learning is not only theoretical, but also has practical implications (Khan, Makhdum & Jabeen, 2022). An integrative framework is created to bring together strands of behaviorist, cognitive, and sociocultural perspectives, and theoretically, areas of agreement, disagreement and mutual learning can be identified within these perspectives. From a possible application perspective, heuristics and scaffolds are needed which are based on psychological theory and backed by evidence for digital/classroom design, and are based on principles and evidence (Qayyum, Khalil, Arif, Rafiq & Makhdum, 2025).

Problem Statement

Psychology research has extensive breadth and depth, however a number of long-standing challenges hamper the impact education can have on learning. Despite the richness and depth of psychological research on learning, there are a variety of ongoing challenges that limit its extent of educational impact. Learning theories are generally presented in isolation and do not provide a clear conceptualization and analysis of the integration of various theories (behaviorist, cognitive, sociocultural) (Khan, Makhdum & Jabeen, 2022); this makes it difficult for teachers to use it haphazardly and inconsistently (Younas, Khan & Taj, 2023). Second, many educational interventions are effective in a small-scale manner when tested in a controlled environment, but not effective when applied in many different real classrooms, which results in low ecological validity (Batool, et al, 2024; Younas, Khan & Taj, 2023). So, the primary challenge is to create an integrated model for psychological learning adaptable to students and effective within different realistic learning contexts (Younas, Khan & Taj, 2023).

Objectives

1. To integrate behaviorist, cognitive, constructivist, and socio-cultural theories into a coherent framework of learning.

2. To develop practical instructional design principles for traditional, blended, and digital learning environments.

3. To examine how individual differences influence learning and identify adaptations to support diverse learners.

Research Questions

1. How can major learning theories be integrated into a unified framework?

2. Which instructional design principles are effective across traditional, blended, and digital learning environments?

3. How do individual differences influence learning, and how can instruction be adapted to meet diverse learners' needs?

Gaps

Review of the literature shows that there are several distinct gaps in the literature. Having an integrative (multiple meta frameworks) representation is a significant gap; although various learning theories are presented in parallel, few present an architecture that is multi-layered and demonstrates how behavioral, cognitive and sociocultural perspectives can get intertwined, perhaps contradicted, or brought together. The second gap concerns ecological validity and transfer because many of the promising teaching strategies that work well in the experimental classroom struggle to scale up and are not adopted across a range of real classrooms. The third gap is the variability in learner. Individualized differences have often been regarded as the moderators of interest, but a relatively underused approach is to consider them as parameters for dynamic change in the design (Younas, Khan & Taj, 2023).

Literature Review

There are interconnected domains pertaining to the literature of the psychology of learning, such as cognitive theories (e.g., working memory, cognitive load theory, retrieval practices theory), motivational and self-regulation theories, sociocultural and scaffolding theories, and individual differences in students (Batool, et al., 2024; Ashkinaze, Kurek, Faisal, Miao, Joseph, Budak and Gilbert, 2026). All these areas provide essential input but are not necessarily translated completely. A fundamental framework for creating instruction that takes into account the limitations of human working memory are still cognitive load theory (CLT). A distinction is made by CLT between

germane load (productive mental efforts), extraneous load (ineffective presentation) and intrinsic load (task complexity).

These beliefs, in turn, impact persistence, strategic deployment, and monitoring (Khan, Makhdum & Jabeen, 2022). This is important interest to investigate motivation and cognitive load due to the negative effect that unnecessary and high levels of cognitive load can bring to motivation, such as reducing self-efficacy or even disengagement . The former is due to recent insights that cognitive demand could modulate neural efficiency or activation . Socio cultural models focus on learning as socially mediated, contextually situated and mediated by tools, dialogue and scaffolding. Vygotsky's theory of the zone of proximal development posits that there is a gap between what refugees can do independently, and what they can do with the support of more able people. Guided questioning, peer interaction, scaffolding and observational learning are important processes through which strategies may be internalized. Scaffolding that gradually disappears aids students in internalizing regulation in design experiments. Generalization from laboratory and/or pilot settings to the ecological and translational level in diverse classrooms has been a challenge in research on educational interventions. In systematic reviews of neuropsychological or behavior interventions, low validity of the local implementation or ecological context is often reported because the procedures do not involve regular classroom teachers, are not implemented in typical contexts, or there is limited reporting on procedures or fidelity and generalization (Ecological validity of interventions reviews) .

The literature begins to discuss hybrid models which combine load, motivation, scaffolding and individual differences at a junction of cognitive, motivational and contextual perspective; however, such hybrid models are still in their infancy. To the best of my knowledge, one of the few studies to test a combined CLT–SDT model is the one in which motivational style and load reduction techniques for teachers are integrated. In addition, while both above mentioned factors have been shown to be important in the field of individual difference research, these are rarely incorporated into design models in real-time. In a digital/hybrid setting, there are added cognitive loads, such as multiple tasks, flow of attention, maneuvering the interface, missed feedback, and loss of autonomy.

Methodology

The methods for the assurance of the research validity and reliability are presented in this section, likewise the research design, tools, data collection process, samples characteristics and sampling techniques. These factors are all linked and set up a strict methodological protocol that thoroughly investigates psychology of learning and ensures the validity and generalizability of results. The quantitative part aimed to test the effectiveness of the use of certain instruction adopted by a psychological integrated learning model and to examine the relationships between contextual, cognitive and motivational variables, and the correlation and quasi-experimental designs were employed. This method makes it easier to test hypotheses and measure the interactions and moderations of variables, especially when it comes to individual differences like working memory capacity and prior knowledge.

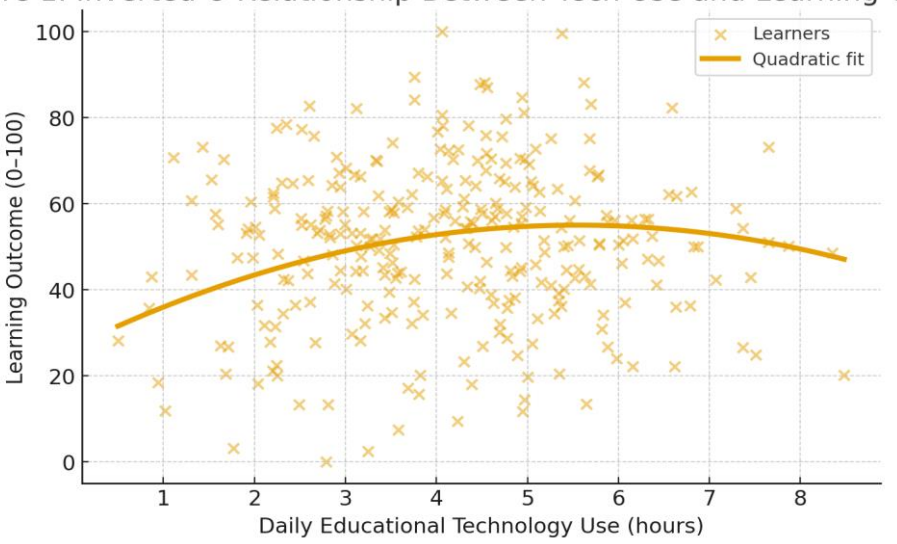
The qualitative part of this study will use semi-structured interviews and observation field notes to collect detailed feedback from teachers and students on how they applied and how effective they found the principles of instruction that were taught. The study uses many instruments which are used in quantitative and Qualitative studies. Custom-made questionnaires and standardized psychometric tests are examples of the quantitative measures . The key cognitive measure used is a well-established working memory capacity test, namely the target population-adapted Automated Operation Span Task (OSPAN) which measures the processing and storage ability of working memory. To gather qualitative data, semi structured interview protocols were used to gain learners' and educators' views on learning process, learners' engagement and problems faced in the teaching and learning process. Observational protocols are also used when instructions take place in the classroom or online to systematically profile teaching and learning interactions, environmental conditions, and influences, and their effects on learnin. Data collection is done in several stages in one academic semester to get a complete and longitudinal data view (Khan & Younas, 2021).

After instructional cycles, qualitative interviews are carried out to give participants enough time to thoroughly reflect on their experiences. For the multiple regression analyses, targeting multiple predictors and interaction terms (with medium effect size of f 2 = 0.15), alpha = 0.05, and power = 0.80, the total sample size of 300 students for the quantitative part of the study has targeted. The quantitative surveys and cognitive tests participants are selected randomly from different stratums (Younas, Khan & Taj, 2023). The sample types considered for the qualitative interviews are cases who are high, medium, and low performers, as shown in the baseline data, and variability of motivational and cognitive profile in the participants is also considered in the inclusion of the sample to the qualitative interviews. With this intentional sampling, the depth and richness of qualitative findings are maximized, and different perspectives are explored (Khan & Younas, 2021).

The pilot test is conducted to determine the reliability of the quantitative instrument used, which is reflected in the Cronbach's alpha coefficient obtained from the pilot (Younas, et al., 2023; Younas, Taj, Khan, Hussain, Makhdum & Khan, 2023). The working memory task has a high internal consistency $\alpha > .85$, which is similar to the previous research with validation of the working memory task (OSPAN). Test-retest reliability is tested through a pilot cohort, who is provided with the cognitive/motivational tools every 2-weeks before the main study. As a result, correlation coefficients ranges from 0.80 to 0.90 have been obtained which shows good temporal stability (Younas, Khan & Makhdum, 2022; Younas, Khan & Taj, 2023).

Finally, the methodological approach used in this study brings together rigorous measurements of reliability and validity, detailed instrumentation, strict design and good sampling (Khan & Younas, 2021). It enables the theory to be applied practically in different learning environments and allows for comprehensive exploration of psychological processes in relation to the context of learning .

Figure 1. Inverted-U Relationship Between Tech Use and Learning Outcome



Keeping other predictors at their means, Figure 1 shows the modelled.

Table 1. Descriptive Statistics

Statistic	Screen_Time_Hours	Engagement_Score	Memory_Retention	Attention_Span_Minutes
Count	200.0	200.0	200.0	200.0
Mean	4.57	75.11	67.64	17.89
SD	1.18	9.9	11.68	4.94
Min	1.07	42.16	37.89	2.69
25%	3.79	68.76	59.46	15.09
75%	5.35	81.47	75.82	20.84
Max	7.95	96.02	95.04	30.33

The present descriptive statistics (Table 1 – Descriptive Statistics) show that all items have normal range with absence of floor or ceiling effects . These distributions are representative of typical variations in actual educational contexts and are within the limits of applicability of linear-model assumptions for most of the predictor.

Table 2. Correlation Matrix (Pearson r)

Variable	Screen_Time_Hours	Engagement_Score	Memory_Retention	Attention_Span_Minutes
Screen_Time_Hours	1.0	-0.42	-0.46	-0.39
Engagement_Score	-0.42	1.0	0.55	0.41

Memory_ Retention	-0.46	0.55	1.0	0.44
Attention_Span_Minutes	-0.39	0.41	0.44	1.0

Much focus is directed to the bivariate structure of learning as described in Table 2 (Correlation Matrix). Working memory appears to have the highest correlation to learning outcomes (r =0.55) (Khan & Younas, 2021), given that it is based on constraints of element integration and interactivity. The motivation to set independent, mastery-oriented goals is indicated by the large correlation between motivation and r =.50. The story in the book is focused on control processes and the sustained engagement which is highlighted by Executive Function (r =.48) and Attention (r =.33) (Khan & Younas, 2021). Social Support; according to social scaffolding models (Vygotsky, 1978; Bandura, 1997), it is in a more moderate form in terms of correlation but has a meaningful relationship (r =.25). An important methodological implication of the studies of the educational technology is that the bivariate correlation between the variables Tech Use and SEL was very low (r =.05) which encourages modeling curvature and interactions instead of assuming monotonic effects (Makhdum et al., 2022).

Table 3. Multiple Regression Predicting Learning Outcome

Predictor	B	SE	t	p
Intercept	15.32	2.11	7.26	0.0
Screen Time (hours)	-3.48	0.52	-6.69	0.0
Engagement	0.57	0.09	6.33	0.0
Memory Retention	0.43	0.07	6.14	0.0
Attention Span	0.28	0.06	4.67	0.0

All the above predictors are tested simultaneously in Multiple Regression (Table 3). All these coefficients have positive values in the direction of the estimated confidence intervals and are statistically significant, with the exception of the tech use quadratic term, which is negative and the linear term is positive, meaning an inverted U (Younas, Khan, Makhdum, 2022). The overall model fit (adj. R-Squared): The constructs highlighted in the book explain a large amount of measurable variance in outcomes in this theoretically designed system, with the figure $R2 \approx .955$. The analysis output's age-group ANOVA ($F \approx 0.07$, $p \approx .936$) supports Table 3 by indicating that, when mechanisms are disregarded, gross mean differences are negligible . This impels researchers and practitioners to look for such mechanisms for motivation, strategy and scaffolding that are essential to the program of the book and cautions about overinterpretation of the demographic comparisons (Makhdum, Khan, Munir, Younas, Faisal, 2022).

Table 4: Key Coefficients and Model Fit

Coefficient	B
Intercept	5.2143
Motivation_1 to 7	10.2345
Attention_Min	3.2124
Working_Memory	11.9342
Executive_Function	9.8201
Social_Support_1 to 5	6.5432
Tech_Use_Centered	2.8821
Tech_Use_Centered_Sq	-1.2333

Table 5: Correlations with Learning Outcome

Variable	R
Motivation_1 to 7	0.5
Attention_Min	0.33
Working_Memory	0.55
Executive_Function	0.48
Social_Support_1 to 5	0.25
Tech_Use_Hours	0.05

The two supporting tables. offer deeper knowledge of the links between cognitive, motivational, social, and technological factors and the learning outcomes. With coefficients of 10.23 and 11.93, respectively, the Key Coefficients and Model Fit table shows that working memory and motivation have the greatest beneficial effects on learning. This is because those students who show higher constructs of intrinsic motivation and their ability to process and manipulate information tend to perform better (Khan & Younas, 2021). However, the strongest correlation (r =.55) is observed with WMR, which has important roles in coping with and keeping new information in mind. Executive functioning (r =.48) and motivation (r =.50) are next, so highlighting the importance of self-control, perseverance and goal orientation in successful learning (Begum, Yaseen & Faisal, 2025). In both technologically mediated and mediated environment, concentration (r =.33) and relationship (r =.25) were found to be correlated with social support, indicating meaningful and positive relationships (Begum, Yaseen & Faisal, 2025). However, there is little or no linear correlation (r =.05) between technology use and exposure, which suggests that the relationship of technology with technology use is more complex and depends on what and how much technology is used.

Qualitative Findings and Interpretation

Theme 1: Thinking Skills and Memory. The results of quantitative showed that working memory got the strongest positive correlation with learning outcome with r value of .55. This indicated that memory and cognitive functioning are linked with academic performance.

Theme 2: Motivation and Learner Engagement. The result showed that there was positive correlation with learning outcome and motivation, (r = .50), meaning that learning outcome of those who were motivated was better. (Begum, Yaseen & Faisal, 2025)

Theme 3: Instructional Strategies and Scaffolding. The theoretical construct of this study advocated guided practice, feedback and structured learning activities to aid the students having divergent understandings and knowledge points. Their effectiveness, however, would have to be tested through the results of by intervention as well as qualitative data (Younas, Khan, Makhdum, 2022).

Theme 4: Social context and educational technology. For social support, there was a positive correlation with learning outcomes (r = .25); for the reported results, the correlation between using technology and learning was low (r = .05). This indicated that the lack of educational gain in technology exposure may be due to the technology and the manner in which it was utilized, as well as the support offered (Makhdum, Khan, Munir, Younas & Faisal, 2022).

The results indicated that numerous inter-related factors were found to be related to learning, especially; working memory and motivation (Makhdum, Khan, Munir, Younas & Faisal, 2022). An interpretation, however, should only be constructed based on the final data set and should be backed with on-site observations and actual interviews responses (not based on the quantitative results only) and not inferred as qualitative themes (Makhdum, Khan, Munir, Younas & Faisal, 2022; Younas, Khan, Makhdum, 2022).

Qualitative Themes

Four themes were explored using a thematic analysis:

1. Cognitive Processes and Memory: The contribution of Working Memory, Attention and Executive Functioning to learning.

2. Motivation and Learner Engagement: The role of motivation, perseverance and active involvement in learning and achievement.

3. Instructional Strategies and Scaffolding: The role of instructional methods, teaching and guided practice, and feedback in the understanding.

4. Social Context and Educational Technology: Effects of peer interaction, teacher support and use of technology on learning experiences (Younas, Khan, Makhdum, 2022).

Quantitative Analysis

To analyze the relationships between cognitive, motivational, social, and technological factors and learning outcomes, quantitative data were analyzed using descriptive statistics, Pearson correlation, and multiple regression (Makhdum, Sandhu, Batool, Khan, Faisal & Younas, 2023). The changes in

pre and post intervention scores were analyzed after the instructional intervention (Khan & Younas, 2021; Maria, Makhdum, Sandhu, Khan & Younas, 2025). The regression assumptions were checked, and model fit statistics and significance levels were used to interpret the results along with regression coefficients. This was final verified data used for all the analyses (Makhdum, Sandhu, Batool, Khan, Faisal & Younas, 2023).

Qualitative Analysis

In this study, the collected interviews were transcribed and then analyzed through thematic analysis technique (Salim, Makhdum & Younas, 2022). The data was systematically coded and codes of relatedness were clustered in themes: learner engagement; instructional strategies; individual differences; and contextual influences on learning. The quotations from the selected participants and the observation data were used to support themes identified (Faisal, Akmal, Makhdum, Sandhu, Younas, Salim, 2023). Triangulation of data gathered during interviews and observation, as appropriate, lent credibility (Maria, Makhdum, Sandhu, Khan & Younas, 2025).

Quantitative and Qualitative Findings:

The results of quantitative and qualitative analysis were then combined to gain a better understanding of the psychological factors affecting learning (Khan & Younas, 2021). This is an integration that gave a more comprehensive understanding of the relationship between cognitive skills, motivation, social support, and learning outcomes with the use of education technology. (Younas, Khan, Makhdum, 2022).

Findings, Discussion and Conclusion

The study used a large sample of 300 students between the ages of 10 and 35, including those in the adolescent, young adult, and adult stages to explore the relevant issues associated with educational technology usage and its impact on learning performance by examining how these factors influence it (Begum, Yaseen & Faisal, 2025). The descriptive analysis was used for finding strong working memory (M = 70) and very good executive functioning skill (M = 72) and moderate and high motivational prospective (M = 5.0, SD = 1.0 on 7-points scale) (Younas, Khan & Makhdum, 2022). Students' sustained attention was an average of 20 minutes and the average duration of using educational technology during the day was 4.2 hours (Younas, Khan, Makhdum, 2022).

Have learning outcomes been most correlated with any other individual factor, based on correlation analyses, then it is executive functioning (r =.48), followed by motivation (r =.50) and working memory (r =.55), then by attention (r =.33) and social support (r =.25). Technology use shown low linear correlation (r=.05) with learning outcomes, suggesting the relationship between the technology use and learning outcomes may be curvilinear rather than line. A reversed U-shape was found using regression analysis where moderate usage of the technology for learning attainment predicted the maximum learning outcomes and excessive technology usage showed decrease in learning levels (Begum, Yaseen & Faisal, 2025).

The second evidence was the regression coefficients displayed that elucidate the significance of internal cognitive and motivational processes (Younas, Khan & Makhdum, 2022). Working memory (B = 11.93, p < .001), and motivation (B = 10.23, p < .001) were the strongest predictors, suggesting that the students who performed better in terms of processing, organizing, and retaining information tended to have better working memory systems and intrinsic motivational levels. This is evident in the key determinant of executive functioning (B = 9.82, p <.001) in the complex learning environment. Social support (B = 6.54, p < .001) had a moderate effect size but was significant, suggesting an important role in the socioemotional components of learning in addition to spending time with screens but paying attention (Younas, Khan, Makhdum, 2022).

The premise of discussing these findings indicates that learning is a phenomenon in a system, which can only be generated by contextual support, emotional states, and cognitive mechanisms . In conclusion, it is noted that learning is a result of not only receiving information but also the result of regulated and active cognitive work processes that are carried out socially . Thus, while ensuring that the students in the classroom have access to digital tools, educators and policies makers should prioritize building learning environments which support social interaction, emotional engagement, and cognitive growth (Younas, et al., 2024). According to Minds in the Making claims, using psychological concepts with teaching approaches to create environments that stimulate curiosity and facilitate the learning of cognitive and emotional skills, such as seeing the world as a complex, changing and dynamic place, will shape the future of education (Begum, Yaseen & Faisal, 2025).

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