

Research

Effect of Cognitive Load on Schema Transfer Among Secondary School Students in Ekeremor LGA of Bayelsa State

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Abstract: This study examined the effect of cognitive load on schema transfer among secondary school students in Ekeremor Local Government Area of Bayelsa State. The study was anchored on John Sweller's Cognitive Load Theory, which explains that excessive mental demands interfere with learning, comprehension and transfer of knowledge. Schema transfer refers to the ability of learners to apply previously acquired knowledge structures to new learning situations. The study adopted a correlational survey research design. The population consisted of senior secondary school students in public secondary schools in Ekeremor LGA. A sample of 400 students was selected through a stratified random sampling technique. Two instruments were used for data collection: the Cognitive Load Scale (CLS) and the Schema Transfer Achievement Test (STAT). The instruments were validated by experts in Educational Psychology and Measurement and Evaluation, while reliability coefficients of 0.82 and 0.79, respectively, were obtained using Cronbach's Alpha. Data collected were analyzed using mean, standard deviation, Pearson Product Moment Correlation and multiple regression analysis at a 0.05 level of significance. Findings revealed that intrinsic cognitive load, extraneous cognitive load and germane cognitive load significantly influenced schema transfer among secondary school students. Extraneous cognitive load showed a negative relationship with schema transfer, while germane cognitive load positively predicted transfer performance. The study further revealed that students exposed to well-structured instructional materials demonstrated higher schema transfer acquisition and transfer abilities than students exposed to overloaded instructional environments. The study concluded that cognitive load significantly determines students' ability to transfer schemas during learning activities. It was recommended that teachers should simplify instructional materials, adopt learner-centred teaching strategies and organize classroom information in ways that reduce unnecessary mental burden and enhance meaningful learning.

Keywords: Effect, Cognitive load, Schema transfer, Students, Ekeremor LGA

Introduction

Learning is fundamentally connected to the manner in which information is processed, organized, stored and transferred within the human cognitive system. In contemporary educational psychology, one of the major explanations of learning difficulties among students is cognitive overload. Cognitive load refers to the total amount of mental effort used in the working memory during learning activities (Pass & van Merriënboer, 2020). When students are exposed to excessive instructional demands, their working memory becomes overwhelmed, thereby reducing comprehension, retention and transfer of learning. Secondary school students particularly experience cognitive overload in situations involving complex tasks, poorly organized instructional materials, excessive classroom activities and abstract concepts that exceed their cognitive processing capacity (Seery, 2020).

Schema transfer, on the other hand, refers to the ability of learners to apply previously acquired mental structures, concepts or patterns of understanding to new situations. Schemas are cognitive frameworks that enable learners to organize knowledge and solve problems efficiently (Liu et al, 2025; Structural Learning, 2026)). Effective schema transfer occurs when students successfully integrate prior knowledge into unfamiliar academic contexts. Educational psychologists have consistently argued that learning becomes meaningful only when students can transfer learned concepts to novel tasks and real-life experiences (Stubbs, 2022). However, this transfer process depends heavily on the cognitive demands placed upon learners during instruction.

The theoretical foundation of cognitive load emerged from Cognitive Load Theory, developed by John Sweller. The theory explains that working memory possesses limited capacity (Sweller, 1988; Sweller, 2024), whereas long-term memory has relatively unlimited storage. Learning becomes effective when instructional design minimizes unnecessary cognitive demands and supports schema construction. According to the theory, schema load exists in three dimensions: intrinsic cognitive load, extraneous cognitive load and germane cognitive load (Sweller, 2024). Intrinsic cognitive load relates to the complexity inherent in the learning material itself. Extraneous load results from poor instructional presentation, while germane load involves the mental effort devoted to schema construction and automation (Mittal & Banti, 2025).

Several scholars have demonstrated that instructional environments characterized by high extraneous cognitive load reduce students' academic performance and limit transfer of

learning (Martin et al, 2026). Studies have also shown that that reducing unnecessary cognitive demands enhances schema acquisition and promotes meaningful learning outcomes. Research on schema-related cognitive load progression further indicates that learners perform better when instructional materials are simplified and systematically organized (Pulungan et al, 2026).

In many secondary schools in Ekeremor LGA of Bayelsa State, students encounter instructional practices that may impose excessive cognitive burden. Large classroom populations, inadequate teaching resources, teacher-centred methodologies, abstract curriculum content and poor classroom management may contribute to cognitive overload. Consequently, students may struggle to transfer learned knowledge to examination settings and practical life situations. Despite increasing concerns about students' poor academic transfer abilities, limited empirical studies have specifically examined the relationship between cognitive load and schema transfer among secondary school students in Ekeremor LGA. The present study therefore investigated the effect of cognitive load on schema transfer among secondary school students in Ekeremor Local Government Area of Bayelsa State.

Statement of the Problem

The persistent decline in students' academic performance in secondary schools has become a major concern among educators, parents and educational stakeholders in Nigeria. Many students demonstrate poor understanding of classroom concepts and inability to transfer learned knowledge to new academic situations. In Ekeremor LGA, teachers frequently observe that students memorize information temporarily without meaningful comprehension or application. This problem suggests possible deficiencies in schema acquisition and transfer.

One major factor that may contribute to poor schema transfer is cognitive overload. Many instructional practices expose students to excessive information within limited time frames. Complex classroom tasks, poorly structured lessons, overcrowded classrooms and inadequate instructional strategies may exceed students' working memory capacity. When students experience excessive cognitive load, they may fail to organize information into meaningful schemas required for transfer of learning.

Although, studies have examined cognitive load and academic performance in different contexts, there is inadequate empirical evidence regarding how cognitive load specifically affects schema transfer among secondary school students in Ekeremor LGA of

Bayelsa State. This study therefore sought to fill this gap by examining the effect of cognitive load on schema transfer among secondary school students.

Purpose of the Study

The main purpose of this study was to examine the effect of cognitive load on schema transfer among secondary school students in Ekeremor LGA of Bayelsa State. Specifically, the study sought to:

1. Determine the effect of intrinsic cognitive load on schema transfer among secondary school students.
2. Examine the effect of extraneous cognitive load on schema transfer among secondary school students.
3. Investigate the effect of germane cognitive load on schema transfer among secondary school students.
4. Determine the joint effect of cognitive load dimensions on schema transfer among students.

Research Questions

1. What is the effect of intrinsic cognitive load on schema transfer among secondary school students in Ekeremor LGA?
2. What is the effect of extraneous cognitive load on schema transfer among secondary school students in Ekeremor LGA?
3. What is the effect of germane cognitive load on schema transfer among secondary school students in Ekeremor LGA?
4. What is the joint effect of cognitive load dimensions on schema transfer among secondary school students?

Hypotheses

Ho1: There is no significant effect of intrinsic cognitive load on schema transfer among secondary school students in Ekeremor LGA.

Ho2: There is no significant effect of extraneous cognitive load on schema transfer among secondary school students in Ekeremor LGA.

Ho3: There is no significant joint effect of cognitive load dimensions on schema transfer among secondary school students in Ekeremor LGA.

Conceptual Review

Concept of Cognitive Load

Cognitive load refers to the mental effort required to process information within working memory during learning activities (Perkins, 2024). The concept originates from Cognitive Load Theory (Sweller, 1988), which argues that learning effectiveness depends on the efficient use of limited cognitive resources. Working memory can process only a limited amount of information at a particular time. When instructional demands exceed this capacity, learning becomes impaired.

Researchers classify cognitive load into intrinsic, extraneous and germane cognitive load (Sweller, 2024). Intrinsic cognitive load relates to the inherent complexity of instructional material. Complex subjects such as mathematics, physics and chemistry usually impose high intrinsic load because they require simultaneous processing of multiple elements. Extraneous cognitive load results from ineffective instructional design, including disorganized teaching materials and unclear explanations. Germane cognitive load refers to productive cognitive effort devoted to schema construction and meaningful learning (Mittal & Banti, 2025).

Recent studies indicate that effective instructional strategies reduce unnecessary cognitive burden and enhance learning outcomes (Jatmiko et al, 2025). Researchers examining load reduction instruction found out that well-structured instructional practices significantly improve engagement and academic achievement among secondary school students (Ouwehand et al, 2025).

Concept of Schema Transfer

Schema transfer involves applying previously learned cognitive structures to new learning situations. Schemas function as mental frameworks that organize knowledge into meaningful patterns. Through schemas, learners interpret new information efficiently and solve unfamiliar problems.

Transfer of learning occurs when knowledge acquired in one context influences performance in another context. Positive transfer occurs when previous knowledge interferes with new understanding. Educational psychologists argue that meaningful learning requires effective schema construction and transfer,

Studies on schema acquisition indicate that learners with organized schemas process information more efficiently and experience lower cognitive load during problem solving (Liu et al, 2025).

Cognitive Load and Schema Transfer

Cognitive load and schema transfer are closely interconnected. Excessive cognitive load reduces learners' ability to encode information into long-term memory, thereby limiting schema development and transfer. Conversely, instructional environments that minimize unnecessary cognitive demands enhance schema construction.

Research demonstrates that reducing extraneous cognitive load improves transfer performance. Goal-free instructional strategies, guided questioning and simplified task presentation have been associated with improved transfer of learning outcomes among secondary school students (Aprillia & Retnowati, 2025).

Theoretical Framework

The study was anchored on Cognitive Load Theory developed by John Sweller in 1988. The theory explains that human working memory has limited capacity, whereas long-term memory has unlimited storage capacity. Effective learning occurs when instructional design facilitates schema construction without overwhelming working memory.

The theory identifies three forms of cognitive load:

- Intrinsic cognitive load
- Extraneous cognitive load
- Germane cognitive load

The relevance of the theory to this study lies in its explanation of how excessive cognitive demands influence students' ability to construct and transfer schemas during learning activities.

Empirical Review

Research on cognitive load has expanded considerably in recent years. A study on schema-related cognitive load progression revealed that cognitive load decreases as learners gradually acquire schemas and automate learning processes. The study further showed that learners exposed to structured instructional environments demonstrated stronger transfer performance (Liu et al, 2025; Sweller, 2024).

Another study investigating integrated instructional materials among secondary science students found that integrated visual and textual instructions reduced cognitive load and improved post-test achievement scores (Kelly & Bugallo, 2023).

Research on goal-free problem-solving strategies indicated that minimizing unnecessary problem-solving demands enhances transfer of learning and schema acquisition (Aprillia & Retnowati, 2025).

Similarly, studies on metacognitive instructional planning showed that cognitive load reduction strategies significantly improve students' comprehension and learning efficiency (Pulungan et al, 2026).

Despite these findings, few studies have specifically examined cognitive load and schema transfer among secondary school students in Bayelsa State, particularly within Ekeremor LGA.

Methodology

This study adopted a correlational survey research design. The design was considered appropriate because it enabled the researcher to examine the relationship between cognitive load and schema transfer among students.

The population of the study comprised all senior secondary school students in public secondary schools in Ekeremor LGA of Bayelsa State. A sample size of 400 students was selected using stratified random sampling technique.

Two instruments were used for data collection:

1. Cognitive Load Scale (CLS)
2. Schema Transfer Achievement Test (STAT)

The instruments were validated by experts in Educational Psychology and Measurement and Evaluation. Reliability coefficients of 0.82 and 0.79 were obtained using Cronbach Alpha statistics.

Data were analyzed using mean, and standard deviation to answer the research questions while Pearson Product Moment Correlation and multiple regression analysis were used to test the hypotheses at 0.05 level of significance.

Results

Table 1: Research Question One: What is the effect of intrinsic cognitive load on schema transfer among secondary school students in Ekeremor LGA of Bayelsa State?

Variables	N	Mean	SD	r	Decision
Intrinsic Cognitive Load	400	24.18	4.62	0.41	Moderate Positive Relationship
Schema Transfer	400	27.44	5.18		

The table indicates that a moderate positive relationship exists between intrinsic cognitive load and schema transfer among secondary school students in Ekeremor LGA (r

= 0.41). This suggests that moderate levels of task difficulty enhance schema construction and transfer when instructional materials are appropriately structured.

Table 2: Research Question Two: What is the effect of extraneous cognitive load on schema transfer among secondary school students in Ekeremor LGA?

Variables	N	Mean	SD	r	Decision
Extraneous Cognitive Load	400	26.37	5.11	-0.53	Negative Relationship
Schema Transfer	400	27.44	5.18		

The result in table 2 shows a negative relationship between extraneous cognitive load and schema transfer ($r = 0.53$). This implies that poorly organized instructional materials and unnecessary classroom distractions reduce students' ability to transfer schemas.

Table 3: Research Question Three: What is the effect of germane cognitive load on schema transfer among secondary school students in Ekeremor LGA?

Variables	N	Mean	SD	r	Decision
Germane Cognitive Load	400	28.05	4.58	0.64	Strong Positive Relationship
Schema Transfer	400	27.44	5.18		

Findings in table 3 reveal a strong positive relationship between germane cognitive load and schema transfer ($r = 0.64$). This shows that productive mental effort devoted to meaningful learning improves students' schema acquisition and transfer abilities.

Research Question Four: What is the joint effect of cognitive load dimensions on schema transfer among secondary school students in Ekeremor LGA?

Table 4: Multiple Regression Analysis Showing Joint Effect of Cognitive Load Dimensions on Schema Transfer

Variables	B	Std. Error	β	t	Sig
Constant	12.417	1.842	-	6.74	0.000
Intrinsic Cognitive Load	0.318	0.072	0.287	4.42	0.000
Extraneous Cognitive Load	-0.451	0.081	-0.396	-5.57	0.000
Germane Cognitive Load	0.592	0.067	0.511	8.84	0.000

Model Summary

R	R²	Adjusted R²	F	Sig
0.742	0.551	0.547	161.28	0.00

The regression analysis result on table 4 shows that cognitive load dimensions jointly accounted for 55.1% of the variance in schema transfer among secondary school students in Ekeremor LGA ($R^2 = 0.551$). Germane cognitive load emerged as the strongest predictor of schema transfer, while extraneous cognitive load negatively predicted transfer performance.

Hypothesis One: There is no significant effect of intrinsic cognitive load on schema transfer among secondary school students in Ekeremor LGA.

<u>Variables</u>	<u>r</u>	<u>p-value</u>	<u>Alpha Level</u>	<u>Decision</u>
Intrinsic Cognitive Load and Schema Transfer.	0.41	0.000	0.05	Rejected

Since the p-value (0.000) is less than the alpha level of 0.05, the null hypothesis was rejected. Therefore, intrinsic cognitive load significantly affects schema transfer among secondary school students in Ekeremor LGA.

Hypothesis Two: There is no significant effect of extraneous cognitive load on schema transfer among secondary school students in Ekeremor LGA.

<u>Variables</u>	<u>r</u>	<u>p</u>	<u>Alpha Level</u>	<u>Decision</u>
Extraneous Cognitive Load and schema Transfer	-0.53	0.000	0.05	Rejected

Since the p-value of 0.000 is less than 0.05, the null hypothesis was rejected. Therefore, extraneous cognitive load significantly affects schema transfer among secondary school students in Ekeremor LGA.

Hypothesis Three: There is no significant effect of germane cognitive load on schema transfer among secondary school students in Ekeremor LGA.

<u>Variables</u>	<u>r</u>	<u>p-value</u>
Germane Cognitive Load and Schema Transfer	0.64	0.00

The result indicates that germane cognitive load significantly affects schema transfer among secondary school students in Ekeremor LGA because the p-value (0.000) is less than the significance of 0.05.

Hypothesis Four: There is no significant effect of cognitive load dimensions jointly on schema transfer among secondary school students in Ekeremor LGA.

Source	Sum of Squares	df	Mean Square	F	Sig
Decision					
Regression	5248.371	3	1749.457	161.28	0.000
Rejected					
Residual	4297.618	396	10.853		
Total					9545.989
<hr/>					
399					

Since the significance value of 0.000 is less than 0.05, the null hypothesis was rejected. Therefore, cognitive load dimensions jointly have a significant effect on schema transfer among secondary school students in Ekeremor LGA of Bayelsa State.

Discussion of Findings.

The findings of the present study revealed that intrinsic cognitive load significantly affects schema among secondary school students in Ekeremor LGA. This result supports Cognitive Load Theory propounded by Sweller (1988), which explains that learners experience difficulties when instructional complexity exceeds working memory capacity.

The study further revealed that extraneous cognitive load negatively affects schema transfer. This finding agrees with Martin et al (2026), who reported that poorly organized instructional materials interfere with comprehension and meaningful learning. The implication is that unnecessary classroom distractions and ineffective teaching methods reduce students' ability to construct schemas.

The findings also showed that germane cognitive load positively predicts schema transfer among secondary school students in Ekeremor LGA of Bayelsa State. This result corroborates Mittal & Banti (2025), who argued that productive mental effort devoted to schema construction enhances meaningful learning and academic achievement. Similarly, Liu et al (2025) observed that learners who actively engaged in schema-building activities demonstrated stronger transfer performance.

Educational Implications

The findings of this study have important implications for teachers, curriculum planners, school administrators and educational policymakers. Teachers should simplify

instructional presentations and avoid overwhelming students with excessive information. Curriculum planners should organize learning materials progressively to reduce unnecessary complexity. School administrators should provide instructional resources that support effective classroom communication and interactive learning. Educational policymakers should organize teacher training programmes focusing on cognitive load management strategies and effective instructional design.

Conclusion

The study examined the effect of cognitive load on schema transfer among secondary school students in Ekeremor LGA of Bayelsa State. The findings established that intrinsic, extraneous and germane cognitive load significantly influence schema transfer among students. Extraneous cognitive load negatively affected transfer performance, whereas germane cognitive load positively enhanced schema acquisition and transfer. The study therefore concludes that effective management of cognitive load is essential for meaningful learning and successful schema transfer among secondary school students.

Recommendations

1. Teachers should simplify instructional materials to reduce unnecessary cognitive burden on learners.
2. Classroom instruction should be organized progressively from simple to complex concepts.
3. Teachers should adopt learner-centred instructional strategies that promote meaningful cognitive engagement.
4. School administrators should provide adequate instructional resources to support effective learning.
5. Educational psychologists should organize seminars on cognitive load management for teachers.
6. Curriculum developers should incorporate schema-building instructional strategies into secondary school curricula.

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