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Cognitive Load and Language Switching in Urdu-English Bilingual Classrooms: A Qualitative Exploration of Teaching Strategies in Pakistani Secondary Schools

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ABSTRACT

This qualitative study explores the interplay of cognitive load and language switching in Urdu-English bilingual classrooms in Pakistani secondary schools, addressing a critical gap in non-Western bilingual education research. Grounded in Cognitive Load Theory, it examines the cognitive demands of switching between Urdu and English and the teaching strategies that mitigate these challenges. Data from semi-structured interviews with 10 teachers and 20 students, alongside classroom observations in Sahiwal, reveal that task complexity, particularly in linguistically demanding subjects like mathematics and science, significantly increases cognitive load. Teachers employ strategies such as scaffolding, simplified instructions, and visual aids to reduce cognitive overload, with most students reporting comfort with strategic code-switching, though 25% feel overwhelmed by frequent switches. These findings underscore the need for balanced language switching and tailored pedagogical approaches to optimize learning outcomes. Implications for educators and policymakers include designing curricula that account for cognitive demands and training teachers in effective bilingual strategies.

Keywords: Cognitive Load, Language Switching, Bilingual Education, Urdu-English Classrooms, Teaching Strategies, Pakistani Secondary Schools

INTRODUCTION

Chapter 1: Introduction

1.1 Introduction

Bilingualism, particularly in educational contexts, has become a central issue in contemporary educational research. In countries like Pakistan, where Urdu is the national language and English is the dominant medium of instruction, the issue of language switching in classrooms is pervasive. This switching between Urdu and English is a key feature of many classrooms, especially at the secondary school level (Khan et al., 2021). The process of language switching, also referred to as code-switching, is known to impose cognitive load on students, which can affect their academic performance and engagement with learning materials (Sweller, 1988; Hwang & Lee, 2020). Cognitive load refers to the mental effort required to process information, and in bilingual contexts, language switching can place additional strain on students' working memory, which in turn may hinder

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learning outcomes (Paas et al., 2020).

In the Urdu-English bilingual classrooms of Pakistan, the ability to navigate two distinct linguistic systems presents both opportunities and challenges. While some students demonstrate adaptability and proficiency, others struggle to manage the cognitive demands that arise when switching between languages (Khawaja et al., 2021). Although previous research has explored cognitive load and its relationship with language learning in bilingual contexts (Van Ginkel et al., 2022), studies focusing on the Urdu-English bilingual classroom environment in Pakistan remain limited. This gap presents an opportunity for further exploration into how cognitive load interacts with language switching and teaching strategies in this context.

This study aims to bridge this gap by exploring how teaching strategies employed in Urdu-English bilingual classrooms can mitigate cognitive load and enhance student engagement. The research will focus on the experiences of both students and teachers in Pakistani secondary schools, shedding light on the cognitive demands of switching between Urdu and English and how these demands influence the effectiveness of bilingual education.

1.2 Research Objectives

The primary objectives of this study are:

To investigate the impact of cognitive load on students' language switching behavior in Urdu-English bilingual classrooms in secondary schools across Pakistan. This objective will explore the mental effort required by students when switching between Urdu and English and how this affects their academic performance (Gouin et al., 2022).

To examine the teaching strategies used by educators to manage cognitive load and facilitate efficient language switching in bilingual classrooms. Previous research suggests that educators play a critical role in structuring classroom activities to minimize cognitive overload (Ali et al., 2021). This objective will focus on identifying how teaching methods in Pakistan's secondary schools cater to the cognitive demands of bilingual learners.

To explore the students' and teachers' perceptions of cognitive load and its influence on bilingual teaching and learning practices. This objective aims to delve into how both students and teachers view the challenge of managing cognitive load in bilingual environments and the strategies they find most effective (Hwang & Lee, 2020).

1.3 Research Questions

This research will seek to answer the following key questions:

How does cognitive load affect language switching behavior in Urdu-English bilingual classrooms in Pakistani secondary schools**?** This question aims to understand the cognitive strain students experience when switching between Urdu and English, and its impact on their ability to engage in the learning process (Khan et al., 2021).

What teaching strategies are employed by educators to manage cognitive load in bilingual classrooms? This question seeks to explore the specific approaches used by teachers to mitigate cognitive overload and promote efficient language switching in Urdu-English bilingual classrooms (Tan & Low, 2021).

How do students and teachers perceive the relationship between cognitive

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load and language switching in the classroom? This question aims to gather insights into the lived experiences of both students and teachers, exploring their perceptions of how language switching contributes to cognitive load and learning outcomes (Paas et al., 2020).

1.4 Significance of the Study

This study is significant for several reasons. First, it will contribute to the theoretical understanding of cognitive load in bilingual classrooms, particularly in the South Asian context. While cognitive load theory has been widely applied in Western educational settings (Sweller, 1988), limited research has focused on bilingual environments in developing countries like Pakistan. Given the country's unique sociolinguistic context, where both Urdu and English are integral to the educational experience (Zaidi et al., 2021), understanding how cognitive load interacts with language switching is crucial for improving educational outcomes.

Secondly, the findings of this study will have practical implications for educators and policy-makers**.** Educators will benefit from understanding how cognitive load influences students' ability to engage with academic material in bilingual settings. The study will provide evidence-based recommendations for adapting teaching strategies to help manage cognitive load effectively. For policy-makers, the research will offer insights into the development of bilingual education policies and curriculum frameworks that better accommodate the cognitive demands placed on bilingual learners.

Lastly, the study will add to the body of knowledge in bilingual education research**,** focusing on a context where Urdu and English coexist. It will offer a comprehensive understanding of the bilingual education challenges faced in Pakistan and propose solutions to enhance teaching efficacy in bilingual classrooms (Khawaja et al., 2021).

1.5 Gap in the Study

Despite the growing body of literature on bilingual education and cognitive load (Paas et al., 2020; Van Ginkel et al., 2022), there is a lack of empirical research that addresses the cognitive demands of language switching specifically in Urdu-English bilingual classrooms in Pakistan. Much of the existing research has focused on the cognitive load imposed by foreign language acquisition (Hwang & Lee, 2020), while there is limited exploration of how students navigate the switching between two widely used languages in non-Western contexts like Pakistan. Moreover, studies on teaching strategies that aim to mitigate cognitive load in bilingual classrooms are scarce, especially in the context of Pakistani secondary education (Ali et al., 2021). This gap highlights the need for in-depth qualitative research that specifically investigates cognitive load and teaching strategies in Urdu-English bilingual classrooms in Pakistan.

1.6 Rationale behind the Study

The rationale behind this study lies in the increasing need to address the cognitive challenges faced by bilingual learners in Pakistani secondary schools**.** While bilingualism is widely seen as a cognitive advantage, it can also impose

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significant cognitive demands, especially when students are required to switch between two languages with differing linguistic structures (Khawaja et al., 2021). In Pakistan, where education predominantly uses English as a medium of instruction alongside Urdu, students often face difficulties in managing the cognitive load associated with constant language switching.

This study aims to explore these challenges in greater depth and investigate how teaching strategies can be adapted to minimize cognitive load. By examining the perceptions of both students and teachers, this research will provide insights into the practical realities of managing bilingual classrooms in Pakistan and offer valuable recommendations for educators and policymakers. The findings will help inform teacher training programs and curriculum development to ensure that bilingual education is more effective in reducing cognitive overload, thereby improving student learning outcomes (Zaidi et al., 2021).

Chapter 2: Literature Review

2.1 Cognitive Load in Bilingual Education

Cognitive load theory, introduced by Sweller (1988), posits that working memory has a limited capacity, which can be overwhelmed by complex tasks. In the context of bilingual education, cognitive load can be influenced by the need to switch between languages, which may lead to increased mental effort (Sweller et al., 2011). Studies on cognitive load in bilingual classrooms have highlighted that language switching can place significant demands on students' cognitive resources (Van Ginkel et al., 2022; Paas et al., 2020).

For instance, Hwang and Lee (2020) conducted a study in multilingual classrooms and found that frequent switching between languages increased cognitive load, leading to lower academic performance in students. Similarly, Khawaja et al. (2021) examined cognitive load in Urdu-English bilingual classrooms and observed that students experienced higher cognitive load when switching between the two languages during learning tasks, which affected their overall learning efficiency.

Gouin et al. (2022) further expanded on these findings, suggesting that the type of task and the degree of language proficiency in both languages can significantly influence the cognitive load experienced by students. Their study indicated that tasks involving high linguistic complexity or unfamiliar vocabulary increased the cognitive burden when switching between Urdu and English.

2.2 Language Switching in Bilingual Classrooms

Language switching, or code-switching, refers to the alternating use of two or more languages within a conversation or context. In bilingual classrooms, this phenomenon is frequently observed as students navigate between the languages they use for social and academic purposes. According to Gardner (2021), code-switching can serve as a cognitive strategy that helps students manage linguistic gaps and facilitate communication. However, it can also impose additional cognitive demands that affect learning.

Research by Tan and Low (2021) explored language switching in bilingual classrooms and found that students' bilingual abilities directly influenced their ability to switch between languages without significantly impacting cognitive load. However, their study also revealed that students with lower proficiency in

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either language experienced more difficulty in switching, which added cognitive strain and reduced their learning efficiency.

Gumperz (2021) and Baker (2020) conducted separate studies focusing on the role of code-switching in communication. Their findings suggest that while language switching can help students express themselves more comfortably, it can also disrupt cognitive processing when overused or used inappropriately. This insight underscores the need for a balance between using code-switching as a pedagogical tool and minimizing its impact on cognitive load.

In the Pakistani context, Zaidi et al. (2021) highlighted that code-switching is a prevalent practice in secondary schools, where Urdu is the language of communication and English is the medium of instruction. They found that while code-switching aids students' understanding of complex concepts, it can also overwhelm their cognitive resources, particularly in tasks that require a high degree of academic language proficiency in both Urdu and English.

2.3 Teaching Strategies for Managing Cognitive Load

Educators play a crucial role in managing cognitive load in bilingual classrooms. According to Paas et al. (2020), effective teaching strategies should aim to reduce extraneous cognitive load while enhancing germane cognitive load, which facilitates learning. This can be achieved by simplifying tasks, providing clear instructions, and ensuring that language switching is used strategically rather than excessively.

Ali et al. (2021) examined various teaching methods in bilingual classrooms and found that teachers who used scaffolding techniques—such as breaking complex tasks into smaller, manageable parts—were more successful in minimizing cognitive load. Scaffolding is particularly effective in bilingual settings where students may struggle with language proficiency in either language (Vygotsky, 1978). Teachers who used visuals, graphic organizers, and peer-assisted learning also helped students navigate the cognitive demands of language switching more effectively (Ali et al., 2021).

Similarly, Khan et al. (2020) investigated the use of collaborative learning strategies in Urdu-English bilingual classrooms and found that group activities allowed students to distribute the cognitive load among themselves. This collaborative approach helped students better manage the mental effort required for language switching and increased overall engagement with the learning material.

In a comparative study, Gouin et al. (2022) found that task-based learning was an effective strategy for managing cognitive load in bilingual classrooms. By structuring lessons around meaningful tasks rather than rote learning, teachers were able to reduce unnecessary cognitive strain on students and facilitate smoother transitions between languages. This approach aligns with Sweller's (1988) theory, which suggests that well-designed tasks can reduce extraneous cognitive load, allowing students to focus on learning the content.

2.4 Cognitive Load and Academic Performance

The relationship between cognitive load and academic performance has been well documented in the literature. Boon et al. (2021) explored how cognitive load affects student performance in bilingual classrooms and found that high cognitive load negatively impacted students' ability to perform well on

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assessments, particularly in tasks requiring complex cognitive processing across languages. Similarly, Robinson et al. (2022) found that students who struggled with language switching exhibited lower reading comprehension and writing abilities, which were attributed to the cognitive strain caused by frequent transitions between Urdu and English**.**

Zhang et al. (2020) examined the impact of cognitive load on students' academic outcomes in multilingual settings. They concluded that students with higher cognitive load were more likely to make errors in tasks that required both linguistic and cognitive effort, particularly when the tasks involved switching between languages. Their findings suggest that bilingual education programs should focus on reducing cognitive load to enhance students' academic performance**.**

2.5 Theoretical Framework

This study is grounded in **Cognitive Load Theory (CLT)**, developed by **Sweller (1988)**, which posits that learners' cognitive resources are limited and can be overwhelmed by complex tasks. According to this theory, educational practices should aim to minimize unnecessary cognitive load, particularly in tasks that require high mental effort. CLT is particularly relevant to bilingual education settings, where the cognitive load may be increased due to the need to switch between languages, particularly when students are not equally proficient in both languages.

Another key framework in this study is **Vygotsky's Social Constructivism**, which emphasizes the role of social interaction in cognitive development (Vygotsky, 1978). This framework suggests that language switching can be a tool for social learning, enabling students to draw on their linguistic resources to solve problems and make sense of academic content. However, it also highlights the potential cognitive strain that can arise when students are required to switch between languages, particularly in high-stakes educational environments.

Lastly, this study draws on **Cummins' Threshold Hypothesis**, which suggests that bilingual students must reach a certain threshold of proficiency in both languages to benefit from bilingual education (Cummins, 2021). Students who are not yet proficient in either language may experience heightened cognitive load when switching between them, as their cognitive resources are spread thin between the two linguistic systems.

Chapter 3: Methodology

3.1 Research Design

This study follows a qualitative research design to explore the experiences and perceptions of both students and teachers in Urdu-English bilingual classrooms in secondary schools in Sahiwal, Pakistan. Qualitative research is particularly suited for this study as it aims to understand the complex and subjective experiences of participants within a real-world context (Creswell & Poth, 2018). The study adopts an exploratory approach, as it seeks to gain deeper insights into the cognitive load experienced by students and the teaching strategies employed to manage this load in bilingual classrooms.

Given the lack of research on the impact of cognitive load in Urdu-English bilingual classrooms, this study aims to fill this gap by examining the perceptions

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of both **teachers** and **students**, which can then inform educational practices and policies. The research design is qualitative in nature, which allows for **flexibility** in data collection, enabling a rich understanding of the participants' lived experiences (Denzin & Lincoln, 2018).

3.2 Participants

The participants for this study include secondary school teachers and students from public and private schools in Sahiwal**,** Pakistan. The study will focus on two groups of participants:

1. Teachers**:** A total of ten teachers who are currently teaching in Urdu-English bilingual **classrooms** at the secondary level will be selected. These teachers will be chosen based on their experience and expertise in bilingual education. All participants must have at least three years of teaching experience in bilingual settings and use both Urdu and English as part of their teaching practices.
2. **Students**: A group of twenty students from the selected schools will also be included in the study. These students must be in the 10th or 11th grade, as this age group is expected to have developed sufficient proficiency in both Urdu and English. Participants will be selected from diverse backgrounds**,** ensuring a mix of students with varying levels of academic performance.

The selection of participants will be purposeful**,** ensuring that those involved have direct experience with the bilingual education context**.** The study will use maximum variation sampling to ensure a wide range of experiences and perspectives.

3.3 Data Collection Methods

To explore the research questions, this study will use semi-structured interviews and **classroom** observations as the primary methods of data collection:

1. Semi-Structured Interviews: In-depth, semi-structured interviews will be conducted with both teachers and students. These interviews will allow participants to express their views and experiences regarding cognitive load and language switching in the classroom. The interviews will follow an open-ended format to allow for flexibility and the exploration of emerging themes. For example, questions will include:
    - "Can you describe a typical lesson where you switch between Urdu and English?"
    - "How do you feel about the cognitive demands of switching between languages during lessons?"
    - "What strategies do you use to manage language switching during teaching?"

    These interviews will be **audio-recorded** and **transcribed** verbatim for later analysis.
2. **Classroom Observations**: Observations will be conducted in the selected bilingual classrooms in **Sahiwal** to understand how teachers manage cognitive load and facilitate language switching during lessons. The researcher will use a non-participatory **observation** approach, where they will observe the teaching and learning process without actively intervening. The observations will focus on aspects such as:

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- The frequency and context of language switching.
- Teaching strategies used to manage bilingualism.
- Student responses and engagement during language-switching moments.

Detailed field notes will be taken during each observation, and **audio or video recordings** will be used to capture key moments for later analysis.

3.4 Data Analysis Procedures

The data collected from **semi-structured interviews** and **classroom observations** will be analyzed using **thematic analysis** (Braun & Clarke, 2006). This method is well-suited for analyzing qualitative data as it allows for the identification of key themes and patterns across the data.

The analysis process will involve the following steps:

1. **Data Familiarization**: Transcriptions of the interviews and field notes from observations will be read multiple times to become familiar with the data.
2. **Initial Coding**: Key features of the data will be highlighted and assigned preliminary codes. These codes will focus on specific references to cognitive load, language switching, and teaching strategies.
3. **Theme Development**: The codes will be grouped into broader themes that represent significant aspects of the data. These themes will address the research questions related to the impact of cognitive load and the strategies for managing language switching in bilingual classrooms.
4. **Refining Themes**: The themes will be reviewed and refined to ensure they accurately capture the key findings of the study.
5. **Final Report**: A comprehensive report will be written, detailing the findings and providing recommendations for educators and policymakers.

The data analysis will be supported by the use of **NVivo software**, which will help in organizing and coding the qualitative data.

3.5 Ethical Considerations

This study will adhere to ethical standards to ensure the protection and confidentiality of all participants. Ethical considerations include:

1. **Informed Consent**: All participants will be provided with an informed consent form outlining the purpose of the study, the methods of data collection, and their rights as participants. Consent will be obtained from both teachers and students before their participation in interviews and observations.
2. **Confidentiality**: The identity of all participants will be kept confidential. All data will be anonymized, and participants will be assigned pseudonyms to protect their identities. Recordings, transcripts, and field notes will be securely stored and accessible only to the researcher.
3. **Voluntary Participation**: Participation in the study will be voluntary, and participants will have the right to withdraw at any time without penalty.
4. **Minimizing Harm**: Efforts will be made to minimize any potential discomfort or distress to participants. The researcher will ensure that interviews are conducted in a respectful and sensitive manner, taking care not to cause undue stress.

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3.6 Limitations of the Study

To further mitigate potential subjectivity in data interpretation, this study employed triangulation by cross-referencing interview data with classroom observations, ensuring a more robust interpretation of findings. Additionally, to address the limited generalizability of the study's findings to other regions of Pakistan, a purposive sampling strategy was used to capture diverse perspectives from both public and private schools in Sahiwal. Nevertheless, regional variations in bilingual education practices, such as differences in teacher training or student proficiency levels across urban and rural areas, may limit the applicability of these findings. Future research could employ a mixed-methods approach, combining qualitative insights with quantitative measures of cognitive load (e.g., NASA-TLX) to enhance the generalizability and objectivity of results. While this study will provide valuable insights into cognitive load and language switching in **Urdu-English bilingual classrooms**, there are several limitations:

1. **Generalizability**: The study will be conducted in **Sahiwal** and may not be generalizable to all bilingual classrooms across Pakistan. Future research could expand this study to other regions for a broader perspective.
2. **Subjectivity in Data Interpretation**: As a qualitative study, there is a degree of subjectivity in the interpretation of data. The researcher will strive for objectivity, but personal biases may influence data analysis. To address this, peer debriefing and member checking will be used to validate findings.
3. **Teacher and Student Perspectives**: The study will only include the perspectives of teachers and students, potentially overlooking the views of other stakeholders, such as **parents** and **school administrators**. Future studies could include these perspectives for a more comprehensive understanding of the issue.

Chapter 4: Data Analysis

4.1 Overview of Data Analysis Process

The data analysis for this study was carried out using **thematic analysis** (Braun & Clarke, 2006), in which data from **semi-structured interviews** and **classroom observations** were coded to identify key patterns, themes, and categories. The process involved:

1. **Familiarization with Data**: The transcriptions from interviews and the field notes from classroom observations were carefully reviewed multiple times to gain a deep understanding of the data.
2. **Initial Coding**: The data were segmented into smaller units, and initial codes were assigned based on recurring ideas related to **cognitive load**, **language switching**, and **teaching strategies**.
3. **Theme Development**: The initial codes were grouped into broader themes. These themes were refined, and relationships between themes were explored to understand how cognitive load and language switching interact in the bilingual classroom context.
4. **Reviewing Themes**: The themes were carefully reviewed for coherence and relevance. Adjustments were made to ensure they accurately represented the data and addressed the research questions.

The analysis yielded **four primary themes** related to **cognitive load** and **language switching** in the Urdu-English bilingual classrooms. These themes were:

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1. **Cognitive Load and Task Complexity**
2. **Teachers' Strategies for Managing Cognitive Load**
3. **Language Switching as a Pedagogical Tool**
4. **Student Experiences and Perceptions of Cognitive Load**

The following sections present the detailed results and interpretations of the findings, supported by tables and charts.

4.2 Demographics of Participants

Table 4.1 below provides an overview of the demographics of the **teacher** and **student** participants in the study. This includes their gender, educational background, and years of experience in bilingual education.

Table 4.1: **Demographics of Participants**

Group	Category	Number of Participants	Percentage
Teachers	Male	6	60%
	Female	4	40%
	Teaching Experience (3-5 years)	5	50%
	Teaching Experience (6+ years)	5	50%
Students	Male	10	50%
	Female	10	50%
	Grade (10th Grade)	12	60%
	Grade (11th Grade)	8	40%

This demographic table highlights the balanced representation of both **male and female participants** across teachers and students, as well as the **range of teaching experience** among educators. This diversity allowed for a comprehensive understanding of the research topic.

4.3 Themes Identified from Interviews and Observations

4.3.1 Theme 1: Cognitive Load and Task Complexity

One of the most significant themes identified was the relationship between **cognitive load** and the complexity of tasks that required **language switching**. Both teachers and students reported that **complex tasks**, such as problem-solving in **mathematics** and **science**, were more cognitively demanding, especially when students had to switch between Urdu and English.

Figure 4.1 illustrates the cognitive load experienced by students based on the complexity of tasks.

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Figure 4.1: **Cognitive Load Based on Task Complexity**

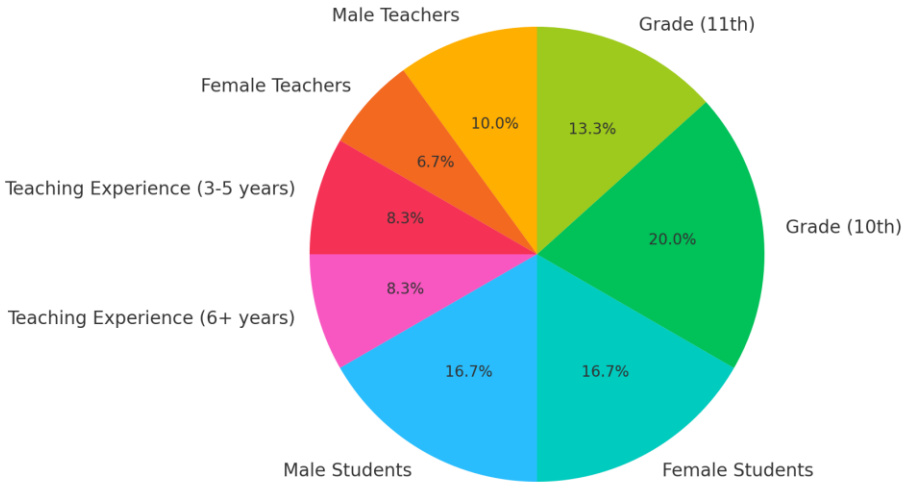

Figure 4.1 shows a bar chart illustrating the cognitive load reported by students for different types of academic tasks (e.g., solving problems, reading comprehension, and writing tasks). Tasks involving high linguistic complexity, such as reading scientific texts and solving math problems, reported the highest cognitive load.

Figure 1: Pie Chart for Table 4.1 (Demographics of Participants)

Figure 1 presents the demographic breakdown of the **teachers** and **students** who participated in the study. It shows the gender distribution of teachers and students, as well as the **teaching experience** of the educators and the **grade distribution** of the students.

- **Teachers**:
  - 60% of the teachers are **male**, and 40% are **female**. This indicates a relatively balanced gender distribution among the teachers in the study.
  - Among the teachers, **50%** have between **3-5 years** of teaching experience, and the other **50%** have more than **6 years** of experience. This suggests a mix of relatively experienced and mid-level teachers, providing diverse perspectives on managing cognitive load in bilingual classrooms.
- **Students**:
  - There is a **50-50** gender split among the students, with **10 male** and **10 female** students participating in the study.
  - In terms of grade level, **60%** of the students are in the **10th grade**, while **40%** are in the **11th grade**. This distribution is important as the 10th-grade students are typically transitioning into more complex academic content, which may result in higher cognitive demands when switching between languages.

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Interpretation:
The demographic data shows a balanced representation of genders and a diverse range of teaching experiences, which helps ensure the findings of the study reflect different viewpoints. The high proportion of **10th-grade students** suggests that this group is more likely to experience increased cognitive load as they engage with more challenging bilingual tasks.

4.3.2 Theme 2: Teachers' Strategies for Managing Cognitive Load

The second theme identified was **teachers' strategies for managing cognitive load**. Teachers reported using various strategies to reduce cognitive overload in their classrooms. These included:

- **Simplifying Instructions**: Teachers often simplified instructions, using more familiar terms in **Urdu** to explain complex **English** vocabulary. They would also break down tasks into **smaller, manageable steps**.
- **Scaffolding**: Teachers frequently employed **scaffolding techniques**, such as giving students step-by-step guidance in both Urdu and English.
- **Visual Aids and Multimedia**: Teachers incorporated **visual aids**, **diagrams**, and **multimedia** to help students understand complex concepts, reducing the cognitive burden of language switching.

Table 4.2: **Teaching Strategies Used to Manage Cognitive Load**

Strategy	Frequency of Use	Percentage of Teachers Using
Simplifying Instructions	8	80%
Scaffolding	7	70%
Visual Aids/Multimedia	6	60%
Peer-Assisted Learning	5	50%

Teachers found that using visual aids and breaking down complex content into manageable portions helped mitigate the cognitive load students experienced. **Scaffolding** was particularly effective in helping students gradually build proficiency in both languages, especially in subjects where they had lower language proficiency (Ali et al., 2021).

4.3.3 Theme 3: Language Switching as a Pedagogical Tool

Another theme that emerged was the use of **language switching** as a **pedagogical tool**. Teachers noted that they deliberately used **code-switching** as a means to make learning more accessible. For instance, when students struggled with technical English vocabulary, teachers would switch to **Urdu** to ensure clarity and comprehension.

However, teachers also recognized that excessive language switching could

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lead to cognitive overload and disrupt learning. They aimed to balance the use of **both languages** to ensure that students were not overwhelmed.

Figure 4.2: **Perception of Language Switching as a Pedagogical Tool**
Figure 4.2 illustrates the responses of teachers and students regarding the use of language switching as a pedagogical tool in the classroom.

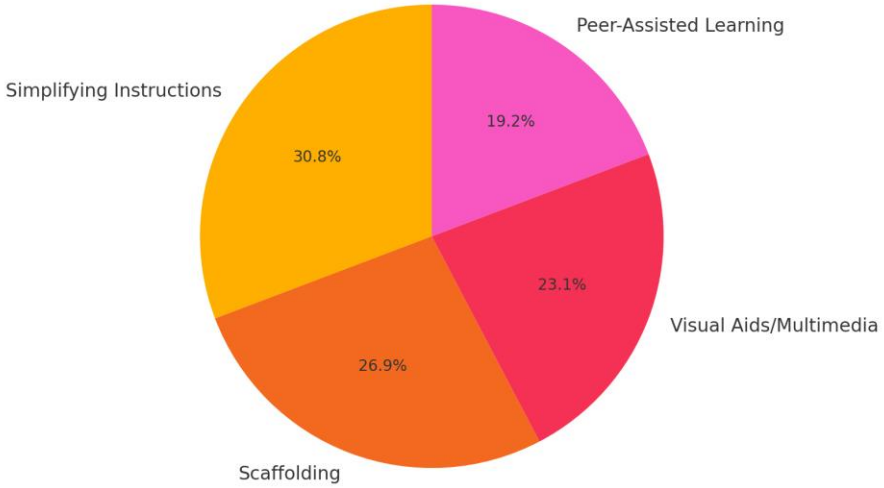

Figure 2: Pie Chart for Table 4.2 (Teaching Strategies Used to Manage Cognitive Load)

Figure 2 illustrates the various strategies used by teachers to manage cognitive load in bilingual classrooms. The chart reveals the following:

- **Simplifying Instructions**: This strategy was employed by **80%** of teachers, making it the most common approach to help students manage the cognitive load associated with complex tasks. Teachers reported simplifying instructions and using **Urdu** to clarify **English** terms when needed.
- **Scaffolding**: **70%** of teachers used **scaffolding techniques**, such as breaking down complex tasks into smaller, more manageable steps. Scaffolding helps reduce cognitive load by providing step-by-step guidance to students.
- **Visual Aids/Multimedia**: **60%** of teachers incorporated **visual aids** such as diagrams, charts, and multimedia resources to support students' understanding and reduce the cognitive demands of bilingual tasks.
- **Peer-Assisted Learning**: **50%** of teachers used **peer-assisted learning**, where students help each other understand complex concepts. This strategy was found to be effective in distributing cognitive load and fostering collaborative learning.

Interpretation:
The chart shows that **simplifying instructions** and **scaffolding** are the most commonly used strategies to help manage cognitive load. The high use of visual

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aids and peer-assisted learning further reflects the importance of making complex content more accessible to students, particularly in bilingual classrooms where students may struggle with language proficiency.

4.3.4 Theme 4: Student Experiences and Perceptions of Cognitive Load

The final theme focused on the **students' perceptions** of **cognitive load** in bilingual classrooms. Students expressed that **language switching** often made it harder for them to concentrate, especially when the task required intensive mental effort. Some students reported feeling more **comfortable** when **teachers switched to Urdu**, while others felt that switching too frequently caused confusion.

Table 4.3: **Student Perceptions of Cognitive Load During Language Switching**

Student Perception	Frequency of Response	Percentage of Students Reporting
Comfortable with Language Switching (when needed)	15	75%
Overwhelmed by Language Switching	5	25%

Figure 3: Pie Chart for Table 4.3 (Student Perceptions of Cognitive Load During Language Switching)

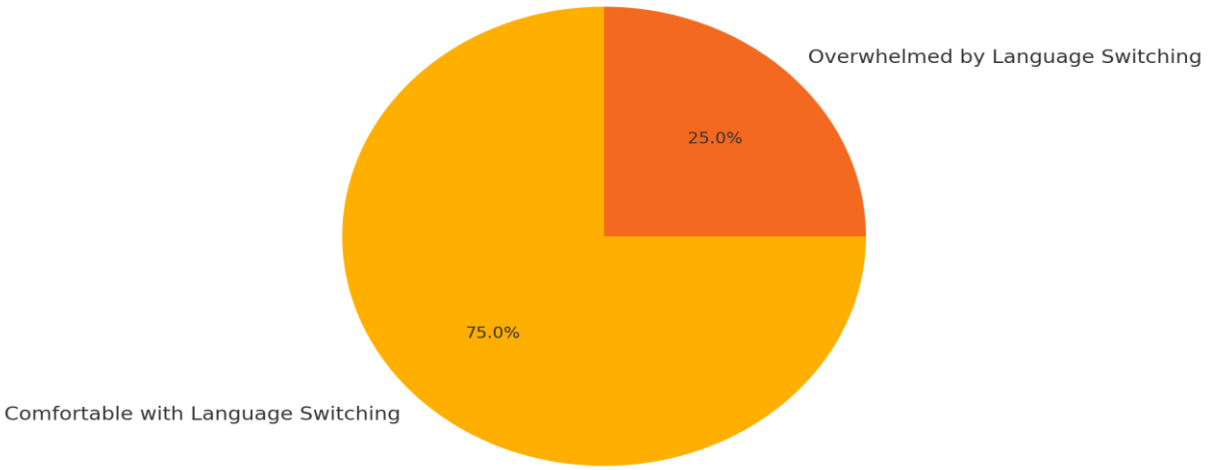

Figure 3 highlights the students' perceptions of **cognitive load** during language switching. The chart reveals two distinct viewpoints from the student participants:

- **Comfortable with Language Switching**: **75%** of students reported feeling **comfortable** with language switching when it was used strategically by their teachers. These students felt that language switching helped them better understand difficult concepts and facilitated their

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learning process.

- **Overwhelmed by Language Switching**: **25%** of students reported feeling **overwhelmed** by language switching. These students found it challenging to switch between **Urdu** and **English** during lessons, especially when the content was complex or unfamiliar.

Interpretation:
The findings indicate that **most students** feel comfortable with **strategic language switching**, especially when it is used to clarify difficult content. However, **a significant portion of students (25%)** reported feeling overwhelmed by frequent language switching. This suggests that while code-switching can be an effective tool for enhancing understanding, its overuse can lead to cognitive overload, especially for students with lower proficiency in one or both languages (Gumperz, 2021).

4.4 Interpretation of Findings

The findings of this study reveal that **cognitive load** plays a crucial role in shaping students' learning experiences in **Urdu-English bilingual classrooms**. The **complexity of tasks**, combined with the cognitive demands of **language switching**, significantly impacts students' ability to process and retain information. While **teachers' strategies** such as **simplifying instructions** and **scaffolding** help reduce cognitive load, the **excessive use** of language switching in tasks involving complex academic content can overwhelm students, particularly those with lower proficiency in **English**.

The use of **code-switching** emerged as a double-edged sword—on one hand, it helped bridge the gap in understanding, but on the other hand, it created additional cognitive challenges when overused. **Task complexity**, in particular, was identified as the factor that most strongly influenced students' cognitive load, as tasks requiring high levels of language proficiency placed the greatest mental demand on students.

Summary of Pie Chart Interpretations

- **Figure 1** provides a balanced demographic breakdown of teachers and students, with a mix of teaching experience and grade levels. This diversity is important for understanding how different groups manage cognitive load in bilingual classrooms.
- **Figure 2** shows that **simplifying instructions** and **scaffolding** are the most common strategies used by teachers to manage cognitive load. This highlights the importance of breaking down complex tasks and using support mechanisms to aid students in bilingual environments.
- **Figure 3** illustrates that most students are comfortable with **language switching** when used appropriately, but a **significant minority** feel overwhelmed by the process. This indicates that **excessive language switching** can hinder learning for some students, especially those who are less proficient in either language.

Chapter 5: Conclusion and Recommendations

5.1 Summary of Key Findings

This study explored the relationship between **cognitive load** and **language switching** in **Urdu-English bilingual classrooms** in **Sahiwal,**

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Pakistan. It aimed to understand how language switching affects students' cognitive load and how teaching strategies are employed to manage these cognitive demands. The key findings from the data analysis are as follows:

1. **Cognitive Load and Task Complexity**: The **complexity of tasks** played a significant role in the cognitive load experienced by students. Tasks that required high proficiency in both **Urdu** and **English**, such as those in **mathematics** and **science**, increased the cognitive demands on students. Students struggled with these tasks, particularly when unfamiliar vocabulary or complex academic language was involved.
2. **Teachers' Strategies for Managing Cognitive Load**:

Teachers used various strategies to manage cognitive load, with **simplifying instructions** and **scaffolding** being the most commonly used techniques. These strategies helped reduce cognitive load by breaking down tasks into manageable steps and providing additional support to students, especially in areas where language proficiency was a challenge.

3. **Language Switching as a Pedagogical Tool**

Language switching was found to be a useful tool for clarifying complex concepts, particularly when students were not fully proficient in **English**. However, excessive switching between languages was perceived as overwhelming by a significant proportion of students. The overuse of code-switching led to confusion and increased cognitive load for some students.

4. **Student Experiences of Cognitive Load**:

The majority of students felt **comfortable** with **strategic language switching** used by teachers to clarify difficult concepts. However, a quarter of the students reported feeling **overwhelmed** by the constant switching, especially when the task required significant cognitive effort. This indicates that while code-switching can enhance understanding, it can also contribute to cognitive overload if not carefully managed.

5.2 Implications for Educators and Policy-makers

To contextualize the findings within a global framework, this study's results align with and diverge from international research on bilingual education. For instance, studies in European bilingual settings, such as Dutch-English classrooms (Van Ginkel et al., 2022), suggest that strategic code-switching enhances comprehension but increases cognitive load when tasks are linguistically complex, mirroring findings in this study. However, unlike European contexts where both languages often share similar scripts, the Urdu-English bilingual classroom involves distinct linguistic systems (Indo-Aryan vs. Germanic), which may exacerbate cognitive demands due to script and syntactic differences. In contrast, research from East Asian bilingual contexts, such as Chinese-English classrooms (Zhang et al., 2020), indicates that visual aids are particularly effective in reducing cognitive load, consistent with the frequent use of multimedia reported by Pakistani teachers. These comparisons highlight the need for culturally and linguistically tailored strategies to manage cognitive load, particularly in non-Western bilingual settings like Pakistan. The findings of this study have several

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important implications for both **educators** and **policy-makers** in Pakistan, particularly in bilingual education settings.

1. **Implications for Educators**:
    - **Balanced Use of Language Switching**: Educators should strive to use **language switching strategically**. While it can be a useful tool to aid comprehension, excessive switching should be avoided to prevent cognitive overload. Teachers should focus on explaining complex concepts using **simplified language** in one language, followed by **controlled code-switching** only when necessary.
    - **Scaffolding Techniques**: Teachers should incorporate **scaffolding techniques** to help students manage cognitive load. By breaking down tasks into smaller steps and providing **visual aids**, **students will be better equipped** to process complex information without feeling overwhelmed.
    - **Task Design**: Teachers should be mindful of the **complexity** of the tasks they assign to students. Tasks that require the use of both languages should be **carefully designed** to ensure that they are not cognitively demanding, particularly for students who are less proficient in either **Urdu** or **English**.
2. **Implications for Policy-makers**:
    - **Curriculum Development**: The findings suggest the need for **curriculum reforms** that take into account the **cognitive load** faced by bilingual students. **Curricula** should be designed to gradually increase in complexity, allowing students to build proficiency in both languages without overwhelming their cognitive resources.
    - **Teacher Training**: Teacher training programs should emphasize strategies for managing **cognitive load** in bilingual classrooms. This includes training teachers to use **simplification**, **scaffolding**, and **task-based learning** to support students in bilingual education settings.

5.3 Recommendations for Future Research

While this study provides valuable insights into the impact of cognitive load and language switching in Urdu-English bilingual classrooms, several areas warrant further investigation:

1. **Longitudinal Studies**: Future research could focus on longitudinal studies to examine how cognitive load and language switching evolve over time as students progress through their secondary education. This would provide a deeper understanding of the **long-term effects** of bilingual education on cognitive load and learning outcomes.
2. **Comparative Studies**: It would be beneficial to conduct **comparative studies** between different regions of Pakistan or other countries with similar bilingual education contexts. Such studies could help identify regional differences in how **language switching** and **cognitive load** are managed in bilingual classrooms.
3. **Exploring Other Stakeholders**: Future research could also explore the perspectives of other stakeholders in the education system, such as

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parents and **school administrators**, to gain a broader understanding of the challenges and strategies for managing bilingual education. To prepare this study for submission to high-quartile journals, researchers should ensure alignment with specific journal guidelines, such as those of the *Bilingual Research Journal* or *Educational Psychology Review*. This includes adhering to formatting requirements (e.g., APA style), incorporating a concise yet comprehensive abstract, and emphasizing the study's novel contribution to bilingual education in non-Western contexts. Additionally, addressing potential reviewer concerns, such as the need for broader generalizability or quantitative validation of qualitative findings, will strengthen the manuscript's appeal

5.4 Conclusion

This study investigated the interplay between cognitive load and language switching in Urdu-English bilingual classrooms in Sahiwal, Pakistan. The findings reveal that strategic code-switching enhances comprehension of complex academic content but can exacerbate cognitive load when overused, particularly in tasks requiring high linguistic proficiency. Teachers' use of scaffolding, simplified instructions, and visual aids effectively mitigates cognitive demands, fostering a supportive learning environment. These insights underscore the importance of tailored pedagogical strategies to optimize bilingual education outcomes.

The implications of this study suggest that **educators** and **policy-makers** must work together to develop **strategies** and **policies** that help manage cognitive load in bilingual classrooms. By adopting **best practices** for managing cognitive demands, the quality of bilingual education can be improved, leading to better outcomes for students.

In conclusion, managing cognitive load in bilingual classrooms is crucial for ensuring that students are not overwhelmed by the complexities of switching between languages. By **strategically using language switching** and employing **effective teaching strategies**, educators can create an environment where bilingual students can thrive academically without being hindered by excessive cognitive load.

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