BEHIND THE NUMBERS: EXPLORING STUDENTS' LEARNING EXPERIENCES WITH THE SIX THINKING HATS INSTRUCTIONAL STRATEGY IN NIGERIAN BASIC EDUCATION

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Abstract

A substantial body of studies has documented, largely through quantitative evidence, the effectiveness of the Six Thinking Hats instructional strategy (STHIS) in enhancing students' learning outcomes. However, there remains a critical need to look behind numerical indicators to understand how pedagogical practices are experienced among students in real classroom contexts. Using a descriptive phenomenological design, this study explores Basic Education students' views and experiences associated with the use of STHIS in the Nigerian classroom contexts. Data were collected through semi-structured focus group interviews with nine (9) students. Following the thematic analysis, five (5) key themes emerged: (i) structured thinking enhances conceptual understanding, (ii) role-based participation promotes inclusive classroom engagement, (iii) role of emotional safety and confidence, (iv) guided learning supports cognitive organisation, and (v) cognitive load and time constraints present potential challenges. Drawing on this rich qualitative data, the findings indicate that STHIS, associated with a structured, role-based, and cognitively scaffolded approach, enhances conceptual understanding, promotes inclusive participation, fosters emotional safety in the classroom and supports cognitive organisation. However, the study identified several challenges, namely, cognitive load and time constraints, as potential challenges that could inhibit classroom instruction through STHIS. Overall, the study provides nuanced and valuable insights into how STHIS shapes students' overall learning experiences within the Nigerian educational context and provides a foundation for broader future research.

Keywords: Six thinking hats instructional strategy, Students' Learning experiences, Qualitative study, Basic Education

Introduction

Effective classroom instruction remains central to the pursuit of quality education, national growth, and sustainable development. Beyond the transmission of content, contemporary perspectives conceive the classroom as a social space where knowledge is co-constructed rather than imposed. Such learning spaces or environments are characterised by discussion, curiosity, and learning discovery (Snodgrass, 2020), making it essential for meaningful learning. In Basic Education, where learners are still developing cognitive and social capacities, these elements are particularly critical for fostering engagement and effective learning. However, achieving such classroom conditions requires instructional approaches that deliberately structure participation and interaction, while preserving students' voices.

The Six Thinking Hats Instructional Strategy (STHIS), developed by De Bono (1999), represents a structured framework of distinct thinking modes used to approach problems and situations from multiple perspectives (Karmakar & Chattopadhyay, 2024). Rather than literal hats, the colour-coded system symbolises specific cognitive roles, each aligned with a particular function (Tannous & Al-Dlalah, 2022): white (facts and information), red (emotions and feelings), black (critical judgment), yellow (optimism and benefits), blue (process control and organisation), and green (creativity and new ideas). Although inherently discursive, STHIS is not primarily argumentative; instead, it systematically guides learners through organised modes of thinking to facilitate structured problem-solving.

A substantial body of empirical studies has extensively examined STHIS, highlighting its application and effectiveness on students' learning outcomes across contexts. Geographical evidence from Nigeria, Turkey, Egypt and Jordan suggests that STHIS implementation is effective in improving students' attitude, academic achievement, critical thinking disposition, and problem-solving skills (Chado et al., 2021; Doğan et al., 2023; Morsy & Darweesh, 2021; Tannous & Al-Dlalah, 2022). Notably, much of this evidence is grounded in quantitative, quasi-experimental designs that emphasise measurable learning outcomes and statistically significant gains. While these studies provide valuable insights into *what* STHIS achieves, they offer a limited understanding of *how* students experience and make meaning of the strategy within real classroom contexts.

Learning is inherently a situated and multidimensional process, shaped not only by numerical cognitive gains but also by students' participation, emotional responses, and interactional dynamics during instruction. Consequently, an exclusive reliance on quantitative indicators risks obscuring the pedagogical mechanisms and experiential pathways through which strategies such as STHIS

influence students' learning. Few qualitative studies on this subject (Dhanapal and Ling, 2013; Wu et al., 2024) remain peripheral to the dominant quantitative paradigm and are situated in higher education contexts, which are far removed from basic education. More critically, differences in context, participants, and setting in Wu et al. and Dhanapal & Ling's studies limit the transferability of their findings, leaving students' experiences with STHIS in Nigerian Basic Education underexplored. It is within this gap "*behind the numbers*" that the present study is underpinned, seeking to foreground students' voices and explore their learning experiences with STHIS.

This study is particularly significant within the context of Basic Education in Nigeria, where learning is largely foundational, rote-oriented and often hindered by traditional, teacher-centred methodologies (Oguezue & Osuafor, 2021), and where contextual realities such as large class sizes, limited resources, and diverse learner needs may fundamentally shape how any instructional strategy is viewed and experienced. Therefore, understanding students' views and experiences of STHIS is not merely a methodological supplement to quantitative findings; it is rather essential to uncover mechanisms underlying STHIS's effectiveness and bridge the gap between quantitative evidence and qualitative insights in learning processes. The study also informs a contextually grounded understanding of instructional effectiveness, without which classroom instructional recommendations may be theoretically strong but lack practical relevance.

This study, therefore, adopts a descriptive phenomenological design to explore students' views and experiences of the STHIS within the Basic Education context in Nigeria. To achieve this purpose, the study specifically explored the following questions: *(i) How do Basic Education students in Nigeria describe their views and experiences of the STHIS in learning Basic Science? (ii) Which aspects of the STHIS do Basic Education students find most engaging, and why? (iii) What challenges do Basic Education students associate with the implementation of STHIS in the Nigerian classroom?*

Method

Research Design & Participants

To achieve the study's objective, the researcher adopted a descriptive phenomenological design. This type of qualitative design is appropriate as it enables the researcher to study personal experience and description or interpretation of the meanings of phenomena experienced by participants in an investigation (Padilla-Diaz, 2015). Qualitative research design involves an in-depth exploration and description of phenomena using non-numerical data (Oranga & Matere, 2023). This

approach was necessitated by the need to explore the nuances and experiences associated with the use of the STHIS among students in Basic Education in Nigeria. In Basic education, teaching and learning are largely foundational and are also known as elementary education. The study focused on students at this level in public secondary schools in the Awka Metropolis of South-eastern Nigeria.

The study participants consisted of nine (9) students aged 11years+ enrolled in the 2024/2025 academic session. A purposive sampling technique was adopted to select the students for the study, which is appropriate for an exploratory study. According to Palinkas et al. (2015), purposive sampling is a widely adopted strategy in qualitative research, employed to select cases that are particularly information-rich and capable of providing in-depth insights into the phenomenon under study. The selection of participants was based on specific criteria, including: (1) Students in Basic Education for the academic year 2024/2025, (2) students who participated in the STHIS intervention, and (3) those who were willing to participate in the study/interviews exercise. Before conducting the interviews, the researcher ensured that the stated criteria were satisfied.

Table 1: demographic characteristics of participants *(N=9)*

Group	Participant	Age	Gender	School type
STHIS (9)	P1	12	Female	Mixed
	P2	11.5	Female	Mixed
	P3	11.7	Male	Mixed
	P4	11.3	Male	Mixed
	P5	12	Female	Mixed
	P6	12.4	Female	Mixed
	P7	12	Male	Mixed
	P8	12.1	Male	Mixed
	P9	13	Male	Mixed

Table 1 presents the demographic characteristics of the participants involved in the study. To ensure confidentiality, the students were given pseudonyms P1, P2, P3, P4,…, P9, to ensure anonymity in data presentation. Their age ranged from 11 to 13 years, which is typical of students at the upper basic or junior secondary level. The group comprised both male and female students, indicating gender representation within the sample. Additionally, all participants were drawn from mixed (co-educational) schools where male and female students learn together. This demographic information provides contextual background for understanding the participants involved in the study.

Implementation procedure

The implementation of the STHIS was conducted by the research assistant (regular classroom teacher), who was recruited and sensitised for the study. Specifically, the teacher establishes the learning objectives, prepares students, assigns the thinking roles (hats), facilitates and monitors the structured thinking process, guides group presentations, leads reflection and debriefing, and evaluates students' learning outcomes (Mulnix, 2012; Kivunja, 2015). Some basic science concepts, namely, the concept of energy, crude oil, and petrochemicals, were selected as the conceptual basis for the implementation. The selected concepts are consistent with the basic education curriculum and possess huge academic and economic value. The procedure is presented in Table 2 below;

Table 2: Summary of the research Procedure

s/n	Procedure steps	Preparation process/ Activities
1	Before Implementation (1 week)	Briefing/sensitisation with the research assistant
		Establishment of the learning objectives
		Preparation of students for STHIS activities
		Assignment of Hats/thinking roles
2	Implementation (5 weeks)	Implementation process using STHIS
		Guide and monitor students' activities
		Reflection and debriefing of the process
3	After Implementation (1 week)	Interview exercise
		Retrieving & Coding of data
		Analysis and presentation of the key themes

Instrument and Data Collection

The instruments used in this study involved semi-structured interviews. Semi-structured interviews are guided conversations in which predetermined questions are used alongside flexible probing to obtain rich, detailed qualitative data. Creswell (2012) noted that interviews are appropriate because they enable the researcher to ask questions about issues that cannot be directly observed/quantified. The interviews took place in the sixth (6) week of the implementation process and sought to capture a deeper understanding of students' views and experiences of the STHIS. The interview consisted of two sections: Section A collected participants' demographic information, including age, gender, and school name, while Section B explored participants' views and learning experiences in basic education through an interview schedule. The interviews include questions such as: *(i) What are your*

views and experiences regarding the use of STHIS in learning Basic science? (ii) What aspects of this strategy interested you the most? (iii) What are the challenges associated with the use of STHIS? The interview schedule was designed by the researcher based on a thorough literature review and the attendant gaps in this research area.

Before the commencement of data collection, pilot testing of the interview was conducted with six (6) students to identify potential issues with the wording of the instructions and questions, as well as to estimate the time required for the interviews. Based on the feedback obtained, a few revisions were made as recommended by the experts. The actual interview was conducted as a focus group discussion and lasted approximately 50 minutes. To ensure the trustworthiness of the study, the criteria of credibility, transferability, dependability, and confirmability as proposed by Lincoln (1985) and Ahmed (2024) were applied. Additionally, three experts reviewed the interview schedule and data analysis procedures to provide methodological guidance.

Data analytics

Qualitative research is a diverse field that utilises a range of analytical techniques to generate meaningful understanding from rich and complex datasets (Lochmiller, 2021). Among the commonly used techniques in qualitative research, thematic analysis involves identifying recurring patterns in the data, which are subsequently organised and presented as overarching themes by the researcher. The analysis of data in this study followed a rigorous and transparent process consistent with Braun & Clarke's (2006) six-step guide to thematic analysis. This process involves familiarisation with the data; generating initial codes; searching for themes, reviewing themes, defining and naming themes; and producing the report. Following this procedure, the researcher coded the data, analysed the generated codes and themes in relation to existing literature and presented the interpretations in the discussion section.

Ethical/Informed Consent

Before the interviews, written informed consent was obtained from the school administrators, and the participants after the study procedure was clearly explained to them. Additionally, parental/guardian consent was also obtained. They were assured that their identities would remain confidential and also informed of their right to withdraw from the interview at any time.

Findings and Discussion

The findings highlight the key themes that emerged from the semi-structured interviews. These themes provide insight into the nuances that shape students' experiences through this instructional approach.

Table 3: Thematic Analysis of Student participation and experiences using STHIS (N=9)

Major theme	Key Codes	Supporting evidence
Structured Thinking Enhances Conceptual Understanding	Multiple perspectives; deep thinking; reduced memorisation	*"We looked at the topic from different angles. It was not just memorising." (P4)* *"...this method made me think deeply instead of just copying notes." (P3)*
Role-Based Participation Promotes Inclusive Classroom Engagement	Clear roles; equal participation; active engagement	*"Everyone had a role. Even shy students talked when it was their turn." (P6)*
Emotional safety and confidence	Reduced fear of making mistakes Confidence in participation	*"I was not afraid of answering wrongly" (P5)* *"I felt confident because I knew what to say". (P1)*
Guided Learning Supports Cognitive Organisation	Teacher guidance; lesson structure; clarity	*"The teacher guided our thinking and discussion so we didn't get confused." (P3)*
Cognitive Load and Time Constraints	Confusion with colours; time limitation	*"It was confusing at first to remember what each colour meant." (P3, P8)*

Table 3 presents the thematic analysis of students' responses in the STHIS. The response shows the emergence of five (5) key themes for STHIS.

Structured Thinking Enhances Conceptual Understanding

The Interviewees revealed that learning concepts through STHIS in Basic Education from multiple thinking perspectives improved students' understanding of Basic Science concepts. Multiple perspectives and structured thinking represent the

key features of the STHIS. Structured thinking is associated with organising thought into explicit steps, which influenced the students' understanding beyond mere procedures. One student (P4) stated, *"...we looked at the concepts from different angles. I was active during the class..."* Another (P3) noted, *"...this approach to learning made me think deeply instead of just copying notes."* This finding is particularly significant within the Nigerian Basic Education context, where learning is often characterised by memorisation and mere recall, without deep understanding. Students' emphasis on *"thinking from different angles"* suggests not merely improved understanding, but a disruption of familiar passive learning routines consistent with the conventional approach to instruction.

This position aligns with previous studies (Jang, 2011; Agustina & Rahman, 2025), supporting the idea that structured thinking consistently improves students' conceptual understanding and could reduce instructional cognitive load (Wu et al., 2025). Structured thinking fosters conceptual understanding by supporting problem decomposition, relationship of ideas (Al-Samarraie et al, 2013), and enhancement of knowledge transfer. This suggests that, instead of recalling a definition of basic science concepts like energy, students were able to analyse the energy conversion process across systems, implying that when thinking is structured, students can apply knowledge to new contexts, generalise concepts and promote knowledge construction. Thus, the effectiveness of STHIS may stem not only from supporting students' thinking, but also from introducing a different and more engaging way of learning compared to traditional classroom practices.

Role-Based Participation Promotes Inclusive Classroom Engagement

Students cherished the idea of assignment of thinking roles/colours associated with STHIS, i.e., role-based participation in the classroom. A role assignment in this approach means each student takes on one thinking hat/colour, focusing only on that mode of thinking during their turn. The students strongly view this exercise as influential to their learning. One student (P6) reflected, "*Everyone had a role..., I had colour green. Every student talked when it was their turn"*. Another student (P1) expressed, *"...I knew exactly what to say when it was my turn"*. In many Nigerian classrooms, participation is often dominated by a small group of confident or high-achieving students. The structured allocation of colour/thinking roles appears to disrupt this hierarchy by redistributing opportunities to speak. This suggests that STHIS does not merely increase participation but reconfigures classroom power relations, enabling quieter students to engage without the social risks typically associated with open discussion.

This position is corroborated by the findings of Ingram (2025) and Christian et al. (2020), that role-based participation enhances classroom engagement and

promotes learning accountability. Nafsiyah (2025) added that such structured roles contribute to the development of students' social skills. Within this context, role-based participation, central to STHIS, acted as a critical pathway in fostering inclusive classroom engagement through systematic regulation of students' participation and contribution to the instructional process.

Emotional Safety and Confidence

Interview evidence revealed that the STHIS fostered a sense of emotional safety and enhanced students' confidence among students, which, in turn, contributed to their expressed reduction in classroom-related anxiety. A student (P5) said, *"I was not afraid of answering wrongly..."*, while another (P1) maintained, "*…I felt confident because I knew what to say before it was my turn"*. In exam-oriented classrooms where fear of failure limits participation, students' reduced anxiety suggests that STHIS creates a safer space that supports active engagement in learning. When students feel emotionally secure and confident about their learning, they are more willing to participate openly, take intellectual risks, and view mistakes as integral to the learning process. Such an atmosphere could also strengthen students' confidence in their ability to understand and effectively apply scientific concepts, thereby reinforcing their capacity for meaningful learning.

Previous studies related to this finding (Dhanapal & Ling, 2013; Hammouda & Abu-Jarad, 2020) emphasised that STHIS fosters a learning environment that enhances students' emotional safety and learning confidence. This aligns with the work of Wu et al. (2024), who extend the discussion beyond the classroom learning context by demonstrating that such supportive environments also positively influence students' emotions and confidence in medical settings. Collectively, these studies substantiate the broader impact of STHIS in promoting emotional well-being and confidence across different contexts.

Guided learning supports cognitive organisation.

The students expressed that their learning experiences were guided. Guided learning enables students to structure and organise their thinking, allowing them to understand and connect new knowledge more effectively. This view is further substantiated: "*The teacher guided our thinking/roles and discussion so we didn't get confused in the process.*" (P3). This finding indicates that providing appropriate instructional guidance helps students structure their thinking processes, which supports a clearer understanding of learning content. Studies (Kirschner et al., 2010; Honomichl & Chen, 2012) have affirmed, in light of the STHIS, that guided learning influences cognitive organisation among students. This support is achieved through the scaffolding of instructions, sequencing ideas and provision of a cognitive framework (Setyaningtyas & Radia, 2019). The hats' role in the STHIS instructions

may have provided a required guided framework that broke complex thinking into clear, step-by-step modes, which reduces cognitive ambiguity, thereby leading to cognitive organisation of ideas.

While student-centred approaches often emphasise learner autonomy, participants' reliance on teacher guidance suggests that unstructured learning may be less effective in this context. Given students' prior exposure to teacher-led instruction, guided structuring of thinking may serve as a necessary transitional scaffold, enabling them to gradually adapt to more participatory forms of learning without cognitive overload.

Cognitive Load and Time Constraints

Despite students' general positive perception of the use of STHIS, findings revealed potential associated challenges. The interviewees expressed that they had initial confusion recognising the thinking roles and what they represented. A Student (P8) expressed "*It was confusing at first to remember what each colour meant...*", and the inadequacy of time for implementation was also reported, "…*the time was not enough for all the activities in some cases*" (P3). The reported confusion and time constraints reveal an important tension between pedagogical innovation and classroom realities. While STHIS promotes structured thinking, its multi-step nature introduces additional cognitive and temporal demands, particularly for students unfamiliar with such approaches. This suggests that the effectiveness of STHIS is contingent not only on its design but also on students' readiness and the practical constraints of the classroom. Rather than a simple limitation, this finding highlights the need for gradual implementation and contextual adaptation.

The finding of Chien (2020) provides support that introducing the six modes and the demands of role-switching can pose initial challenges to the students and increase extraneous load. Further, cognitive load theory warns that when the implementation of an instructional strategy exceeds learners' cognitive capacity, meaningful learning breaks down (Castro-Alonso et al., 2021). The implementation of the STHIS is expected to take more time than a simple discussion, especially if the teacher aims to cycle through all six hats; however, limited time reduces students' ability to use the hats to their full potential (Chien, 2020). This study extends existing literature by moving beyond outcome-based evaluations to reveal the lived, contextualised experiences of learners within Nigerian Basic Education.

While this study offers valuable insights into students' views and experiences with the Six Thinking Hats Instructional Strategy (STHIS), certain limitations should be acknowledged alongside opportunities for further inquiry. The study is limited by the lack of generalizability due to a small sample size (N=9), which is characteristic of qualitative studies, to which the current study is not an

exception. The study primarily relied on self-reported data from students without triangulation through classroom observations, which may have introduced subjectivity and personal biases, limiting the depth of validation. The study's cross-sectional nature, capturing students' experiences at a single phase of implementation, further restricts understanding of the longitudinal effects of STHIS. Further, the purposive sampling style in this study is another limitation. Purposive sampling may not be representative of the population, leading to potential selection bias.

In light of these limitations, future research should adopt a mixed-method approach, combining qualitative data with quantitative measures to provide a more comprehensive analysis of STHIS's impact. A larger and more diverse sample across multiple educational contexts should be adopted beyond Basic Education to enhance generalizability. Moreso, longitudinal studies would be particularly valuable in examining the sustained views and experiences of the students. Together, such efforts would strengthen the empirical base and ease the application of STHIS in Basic Education in Nigeria and beyond. **Conclusion**

Behind the numbers, this study provides qualitative evidence on the pedagogical value of the Six Thinking Hats Instructional Strategy (STHIS) within Basic Education contexts in Nigeria. Drawing on students' views and lived experiences, the study concludes that STHIS functions primarily as a structured, role-based, and cognitively scaffolded approach that enhances conceptual understanding, promotes inclusive participation, and fosters emotional safety in the classroom, supporting cognitive organisation with potential challenges.

Importantly, the study reveals that role-based participation serves as a pathway for inclusive engagement, ensuring that all learners, irrespective of disposition or ability, actively contribute to classroom discourse. In parallel, the emergence of emotional safety and confidence suggests that STHIS not only influences cognitive outcomes but also cultivates a psychologically supportive learning environment conducive to intellectual exploration. Furthermore, the findings underscore the critical role of guided instruction in facilitating cognitive organisation, indicating that teacher-led scaffolding remains indispensable even within student-centred approaches. However, the study also surfaces implementation-related constraints, particularly initial cognitive overload and time demands, which may limit the effectiveness of STHIS if not carefully managed.

Overall, this study contributes to the growing body of evidence supporting structured thinking pedagogies such as STHIS as multidimensional tools for enhancing cognitive, social, and affective dimensions of learning, especially within basic education systems.

Theoretical Implications

The findings extend constructivist learning theory by demonstrating how structured thinking frameworks such as STHIS operationalise knowledge construction through guided cognitive segmentation and perspective-taking. The study also contributes to cognitive load theory, highlighting the dual role of STHIS in both reducing intrinsic load through structured guidance and potentially increasing extraneous load during initial implementation phases. This duality calls for a more nuanced theorisation of instructional scaffolds as both facilitators and temporary constraints in learning processes. Additionally, the study advances discourse on participatory pedagogy, positioning role-based instructional design as a mechanism for democratizing classroom interaction and mitigating participation inequalities.

Pedagogical Implications

For classroom practice, the findings imply that:

1. Teachers should integrate STHIS to enhance engagement and conceptual understanding among students in basic education
2. Effective implementation of STHIS requires intentional scaffolding, including explicit orientation to the thinking/colour assignment to the students.
3. Structured and thought-based strategies like STHIS could influence cognitive and metacognitive constructs, namely, computational thinking, creative and critical reasoning, problem-solving abilities, metacognitive awareness, and cognitive flexibility, amongst others.

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