

## Research Article

# Teachers' Perceptions of Integrating Computational Thinking Strategies for Effective Senior Secondary Curriculum Implementation in Nigeria

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**How to cite this article:** Eke. O. Eke, N. Enwereuzo, I. Ubochi, O. Charles, U. Ibebuike. (2026). Teachers' Perceptions of Integrating Computational Thinking Strategies for Effective Senior Secondary Curriculum Implementation in Nigeria, *Proceedings of the International Academy of Sciences, RPC Publishes*, 3(1); 1-8.

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**Submitted:** March 17, 2026

**Approved:** April 20, 2026

**Published:** April 25, 2026

## Abstract

Computational thinking is a vital 21st century skill that fosters problem solving, logical reasoning and innovation across disciplines. In Nigeria the senior secondary curriculum remains outdated and disconnected from global demands underscoring the need for computational thinking integration to enhance relevance and critical thinking. This study examined teachers' perceptions of embedding computational thinking instructional strategies in senior secondary education in Owerri Nigeria and explored gender-based differences. Using a descriptive survey design 310 public school teachers 78 males 232 females were purposively sampled. Data were collected with a 20 item 4-point Likert scale questionnaire Cronbach alpha 0.88 and analyzed via mean scores and independent t tests. Results revealed strongly positive perceptions overall mean 3.21 greater than 2.50 with teachers affirming computational thinkings benefits for problem solving mean 3.53 collaboration mean 3.64 and curriculum alignment. However low ratings on preparedness mean 2.22 to 2.34 and resource availability mean 2.38 to 3.55 highlighted critical barriers. No significant gender difference emerged  $t = 208.017$   $p = 0.980$ . These findings, the first large scale empirical evidence of Nigerian teachers computational thinking readiness, signaled strong support but underscore the urgency of targeted training infrastructure investment and policy reform to enable effective implementation and modernize the curriculum.

**Keywords:** Computational Thinking; Curriculum Integration; Teacher Perception; Secondary Education; Nigeria. TPACK

## Introduction

Computational thinking plays a pivotal role in the modern educational landscape, transforming the way students approach problem-solving, logical reasoning, and decision-making. As Sengupta et al. (2021) aptly defines it, computational thinking is not just about learning how to use computers, but it is a fundamental skill that enables individuals to think algorithmically and solve complex problems efficiently [Sengupta et al. 2021]. In the context of education, this skill set has several critical implications. First and foremost, computational thinking fosters a mindset of analytical problem-solving [Lye & Koh (2020)]. By breaking down problems into smaller, manageable parts and designing algorithms to solve them, students develop a structured approach to problem-solving that is applicable across various disciplines [Kazakoff & Bers (2020)]. This analytical approach not only enhances their mathematical and scientific abilities but also equips them to tackle real-world challenges in fields such as economics, engineering, and even social sciences. Moreover, computational thinking promotes creativity and innovation [Resnick et al., 2009]. When students learn to think algorithmically, they can envision multiple solutions to a single problem. They can experiment with different strategies, fostering creativity and encouraging them to think outside the box [Akinoso & Oginni, 2023]. In an era where innovation is a driving force behind economic and social progress, nurturing creative computational thinkers is paramount.

Furthermore, computational thinking enhances digital literacy and technological fluency [Ibrahim, Abubakar & Achi, 2022]. In today's digital age, understanding the basics of programming and algorithms is as essential as reading and writing. Computational thinking empowers students to understand the logic behind software, enabling them to use and create technology effectively. This digital literacy is not only crucial for their academic pursuits but also for their future careers in a technology-driven world [Sengupta et al. (2021)]. Additionally, computational thinking cultivates collaboration and teamwork [Ibrahim, Abubakar & Achi, 2022]. Through activities like coding projects and collaborative problem-solving tasks, students learn to work together, share ideas, and build upon each other's contributions. These collaborative experiences mirror real-world scenarios, preparing students for collaborative efforts in their future workplaces [Ng & Leung 2022]. This is to say that, computational thinking is indispensable in the modern educational landscape. It equips students with analytical problem-solving skills, nurtures creativity and innovation, enhances digital literacy, and promotes collaboration. By integrating computational thinking into education, we are not just preparing students for the future; we are empowering them to actively shape and contribute to the ever-evolving digital

world. Computational thinking (CT) has emerged as a fundamental skill set in the modern educational landscape, preparing students for the challenges of the digital age. CT involves problem-solving techniques, logical reasoning, and algorithmic thinking, all of which are vital in various disciplines and everyday life [Unwin & Unwin, 2023]. As our society becomes increasingly reliant on technology, the importance of CT in education cannot be overstated. It equips students with the ability to analyze complex problems, break them down into smaller parts, and develop efficient solutions [Voogt & Robl, 2023]. Computational Thinking (CT) has evolved from a niche concept in computer science to a core 21st-century skill essential across disciplines (Wing, 2006). It encompasses a set of problem-solving methods that involve decomposition, pattern recognition, abstraction, and algorithmic thinking. These skills are not only applicable in programming but also in mathematics, science, and everyday decision-making [Grover & Pea, 2013]. Nigeria's senior secondary school curriculum faces several challenges, including outdated content, lack of relevance to real-world applications, and limited focus on critical thinking and problem-solving skills [Tedre & Kale, 2023]. The curriculum often struggles to keep pace with the rapid advancements in technology and the changing demands of the global job market [Adegoke & Olatunji, 2023]. Moreover, there's a gap in integrating modern pedagogical approaches, such as computational thinking, into the existing educational framework. Integrating computational thinking instructional strategies in senior secondary education addresses these challenges. Computational thinking equips students with problem-solving skills essential for the digital age [Oyelere, Suhonen & Niemi, 2021]. By infusing computational thinking into the curriculum, teachers can engage students in activities that encourage algorithmic thinking, logical reasoning, and creativity [Rich, Bly, & Leatham, 2020]. This approach fosters a deeper understanding of complex concepts and enhances students' ability to tackle real-world challenges. Teachers' perceptions play a crucial role in the successful implementation of computational thinking strategies. Studies have shown that teachers' attitudes, beliefs, and knowledge significantly impact their instructional practices [Yadav, Gretter, Good, & McLean, 2022]. In the context of Nigeria, understanding teachers' perceptions regarding the integration of computational thinking is vital. Research findings indicate that teachers often express concerns about their preparedness and the availability of resources for teaching computational thinking [Okeke & Hassan, 2021]. Addressing these concerns is essential for effective implementation. Incorporating computational thinking instructional strategies into senior secondary education in Nigeria is a promising avenue to address the challenges faced by the current curriculum. Understanding and addressing teachers' perceptions are pivotal in ensuring successful implementation. Computational thinking (CT) instructional strategies have garnered significant attention in educational research worldwide due to their role in nurturing essential skills for the digital age. Several studies have explored diverse approaches to integrating CT into educational settings. Sengupta et al. (2021) defines computational thinking as a fundamental skill that involves problem-solving, system design, and understanding human behavior, which is not limited to computer science but is applicable across various disciplines. Many researchers emphasize the importance of integrating CT into the K-12 curriculum. Grover and Pea (2013) conducted a comprehensive review, highlighting the pivotal role of CT in fostering critical thinking and creativity. Their study provides insights into various instructional methods, such as game-based learning and programming activities, to enhance CT skills among students. Furthermore, Ng & Leung (2022), emphasize the significance of bringing CT to K-12 education and outline the pedagogical approaches involved. Their work delves into how educators can effectively infuse CT into different subjects, not just computer science. They discuss problem-solving, pattern recognition, and algorithmic thinking as key components of CT, essential for students to develop irrespective of their future career paths. In the context of higher education, Voogt et al. (2015) conducted a literature review focusing on technological pedagogical content knowledge (TPACK) and its relation to CT. Their study highlights the integration of CT with teachers' existing knowledge frameworks, emphasizing the importance of preparing educators to effectively implement CT in classrooms. Additionally, Yadav, Mayfield, Korb, & Hambrusch, (2020) explored teachers' perceptions of CT in K-12 classrooms. Their study investigated how teachers view the challenges and opportunities associated with integrating CT, shedding light on the practical aspects of implementing CT instructional strategies. Research findings by Johnson et al. (2016) reveal emerging trends in CT, such as the use of robotics and coding in primary and secondary education. They discuss how these innovative tools provide hands-on experiences, enhancing students' problem-solving abilities and collaboration skills. In summary, existing literature on CT instructional strategies demonstrates a wide array of approaches, from game-based learning to integrating CT within existing knowledge frameworks. These studies underline the importance of nurturing CT skills from an early age and preparing educators to effectively implement CT strategies in diverse educational contexts.

## Theoretical Framework

### Technological Pedagogical Content Knowledge (TPACK)

This study is anchored on the TPACK framework by Mishra & Koehler (2006), which posits that effective technology integration requires a synergistic understanding of Technology (T), Pedagogy (P), and Content (C). Teachers must not only

understand CT concepts but also know how to teach them across different subjects using appropriate pedagogical strategies.

For CT to be effectively integrated, teachers must develop TPACK for CT, a specialized form of knowledge that combines computational concepts, pedagogical techniques, and subject-specific applications [Yadav et al., 2022]. This framework guided the development of the survey instrument and the interpretation of teachers' perceptions.

In the context of Nigerian schools, computational thinking (CT) education is still in its nascent stages, facing challenges but also showing promising developments. Nigeria's educational system grapples with numerous challenges, including overcrowded classrooms, limited resources, and a curriculum that often struggles to keep up with modern demands [Tedre & Kale 2023]. These challenges impact the incorporation of innovative pedagogical approaches like CT into the educational framework. Despite challenges, there are early initiatives and pilot programs focusing on CT education. Organizations like the Nigeria Computer Society (NCS) have been advocating for the integration of CT into the national curriculum (Adegoke & Olatunji, 2023). However, these initiatives are often localized and lack standardized implementation across the country. One significant hurdle is the preparedness of teachers to impart CT skills. Adeyemo and Adu (2018) found that many Nigerian teachers lack the necessary training and resources to effectively teach CT. This lack of teacher preparedness hampers the widespread integration of CT education. Access to technology is another challenge. While urban areas might have better access to computers and the internet, rural schools often lack these resources [Eze, Chinelo, & Obayi, 2025]. This digital divide further exacerbates the disparities in CT education across different regions.

Despite these challenges, there are positive developments. The Nigerian government has shown interest in enhancing digital literacy and computer education, which could pave the way for CT integration (National Policy on Education, 2013). Moreover, collaborations with international organizations and the private sector have resulted in initiatives providing computer education and digital skills training in certain regions [Ibrahim, Abubakar & Achi, 2022]. It is on this note that the researchers investigate Senior secondary school teachers' perception on integrating Computational thinking instructional learning strategy in SS instructional delivery for effective Senior secondary school curriculum implementation in Nigeria. The state of computational thinking education in Nigerian schools is marked by challenges such as inadequate resources, limited teacher preparedness, and disparities in technology access. However, the early initiatives and the government's focus on digital literacy provide a glimmer of hope. Addressing these challenges requires concerted efforts from policymakers, educators, and stakeholders to ensure a standardized, inclusive, and comprehensive integration of computational thinking education in Nigerian schools.

Understanding teachers' perceptions of integrating computational thinking (CT) in education is crucial for successful implementation. Several studies have delved into this area, providing valuable insights.

Researchers such as Ng & Leung (2022), have explored teachers' perceptions of CT in K-12 classrooms in various contexts. Their study revealed that teachers often express concerns about their preparedness, available resources, and pedagogical strategies for teaching CT. Additionally, Wang et al. (2019) investigated teachers' attitudes and beliefs regarding CT integration, highlighting the significance of professional development and supportive school environments in shaping teachers' perceptions.

However, despite the growing body of literature on teachers' perceptions of CT integration, there are notable gaps specific to the Nigerian context. Firstly, limited research has specifically focused on Nigerian teachers' attitudes towards CT. [Eze, Chinelo & Obayi, 2025] conducted a study on pre-service teachers in Southwestern Nigeria, but there is a scarcity of research on in-service teachers, particularly their beliefs, challenges, and readiness concerning CT integration. Secondly, there is insufficient exploration of the alignment between teachers' perceptions and the existing curriculum guidelines in Nigeria. Examining whether teachers' beliefs align with the national educational objectives or if there are discrepancies can provide valuable insights into potential barriers to CT integration. It is on this note that the researchers investigated the teachers' perception on SS teachers' perception on integrating CT on SS instructional delivery for effective SSS curriculum implementation.

### **Purpose of the Study**

The main purpose of the study is to determine teachers' perception towards integrating Computational thinking instructional learning strategy in senior secondary school curriculum for improved curriculum implementation. To find out if there are differences between male and female senior secondary school teachers' perception towards integrating Computational thinking instructional learning strategy in senior secondary school curriculum for improved curriculum implementation.

### **The following Research Questions were posed:**

1. What is the perception of senior secondary school teachers towards integrating Computational thinking instructional learning strategy in senior secondary school curriculum for improved curriculum implementation?

2. What is the difference between the perception of male and female senior secondary school teachers towards integrating Computational thinking instructional learning strategy in senior secondary school curriculum for improved curriculum implementation?
3. One null hypothesis was formulated at 0.05 alpha level
4. There is no significant difference between the perception of male and female senior secondary teachers towards integrating Computational thinking instructional learning strategy in senior secondary school curriculum for improved curriculum implementation?

## Method

This study adopted a descriptive survey research design to investigate senior secondary school teachers' perceptions of integrating Computational Thinking (CT) instructional strategies into the Nigerian senior secondary school curriculum. The design was deemed appropriate because it allows for the collection of large-scale data from a representative sample, enabling generalization of findings [Creswell, 2014].

## Population and Sample

The target population comprised all public senior secondary school teachers in Imo State, Nigeria. A multi-stage sampling technique was employed to select participants. First, three education zones [Owerri, Orlu, and Okigwe] were purposively selected. From each zone, five schools were randomly selected, giving a total of 15 schools. In each school, 20 teachers were randomly selected, resulting in a sample size of 300 teachers. However, only 230 questionnaires were duly completed and returned, representing a 76.7% response rate.

## Instrument for Data Collection

A structured questionnaire titled "*Teachers' Perception of Computational Thinking Integration Questionnaire (TPCTIQ)*" was developed by the researchers. The instrument was divided into two sections:

- Section A: Demographic information (gender, years of experience, qualification).
- Section B: 20 Likert-scale items measuring teachers' perceptions of CT integration, adapted from validated instruments by Yadav et al. (2020) and Ng & Leung (2022), and modified to suit the Nigerian context.

The items were rated on a 4-point Likert scale: Strongly Agree (4), Agree (3), Disagree (2), Strongly Disagree (1). The instrument was validated by three experts in Educational Technology and Measurement & Evaluation. A Cronbach's alpha reliability coefficient of 0.82 was obtained, indicating high internal consistency.

## Procedure for Data Collection

Permission was sought from the Imo State Post Primary Schools Management Board (PPSMB). With approval granted, the researchers visited the selected schools during school hours. The purpose of the study was explained to the participants, and informed consent was obtained. The questionnaires were administered personally by the researchers to ensure high return rates. Participants were assured of anonymity and confidentiality.

## Method of Data Analysis

Data were analyzed using descriptive statistics (mean and standard deviation) and inferential statistics. Research Question 1 was answered using mean scores, with a cut-off point of 2.50 as the benchmark for acceptance. Research Question 2 was addressed using an independent t-test to determine gender differences in teachers' perceptions. The null hypothesis was tested at a 0.05 level of significance.

## Results

Data generated from survey questionnaire were analyzed and presented in tables below.

### Research Question 1

What is the perception of teachers towards integrating Computational Thinking Instructional Learning Strategy in Senior Secondary School curriculum for improved Curriculum Implementation?

S/N	ITEM STATEMENT	Male Teacher			Female Teacher		
		X	SD	REM	X	SD	REM
1	I believe computational thinking is a fundamental skill for students in the digital age	3.31	0.73	Accept	3.38	0.69	Accept
2	I feel adequately prepared to integrate computational thinking into my teaching practices.	2.22	0.36	Reject	2.34	0.21	Reject
3	I have access to sufficient resources and materials to teach computational thinking effectively.	2.38	0.45	Reject	3.55	0.51	Reject

4	I think integrating computational thinking enhances students' problem-solving abilities.	3.54	0.69	Accept	3.51	0.68	Accept
5	I believe computational thinking fosters creativity and innovation among students.	3.21	0.61	Accept	3.34	0.64	Accept
6	I find it easy to incorporate computational thinking into existing subjects in the curriculum.	2.40	0.59	Reject	2.48	0.53	Reject
7	I think students' collaboration and teamwork skills improve when computational thinking is integrated.	3.68	0.80	Accept	3.59	0.82	Accept
8	I believe integrating computational thinking is essential for preparing students for future careers	3.4.1	0.55	Accept	3.54	0.53	Accept
9	I face challenges in integrating computational thinking due to contextual factors	2.44	0.42	Accept	2.40	0.49	Accept
10	I think integrating computational thinking aligns well with the national educational objectives in Nigeria	3.29	0.60	Accept	3.50	0.54	Accept
	I require additional training and support to effectively integrate computational thinking.	3.27	0.82	Accept	3.39	0.89	Accept
12	I believe integrating computational thinking is essential to address the challenges faced by the current curriculum.	3.49	0.58	Accept	3.60	0.60	Accept
13	I face challenges in integrating computational thinking due to limited access to technology and resources.	3.53	0.70	Accept	3.33	0.48	Accept
14	I believe students' academic performance improves with the integration of computational thinking.	3.22	0.60	Accept	3.04	0.58	Accept
15	I am optimistic about the future of computational thinking education in Nigerian schools.	3.56	0.69	Accept	3.53	0.72	Accept
	Cluster mean	3.16	0.57	-	3.26	0.47	
	Average mean response	3.21	-	-	-	-	

Result in Table1 shows that majority of the items on the questionnaire were accepted as they had response mean greater than the instrument scale mean (2.50). Also, the average mean (3.17) is greater than the scale means the acceptable mean average. This implies that teachers have high/positive perception towards integrating Computational Thinking Instructional Learning Strategy in Senior Secondary School curriculum for improved Curriculum Implementation. It is noteworthy that item no 2(I feel adequately prepared to integrate computational thinking into my teaching practices), no3 (I have access to sufficient resources and materials to teach computational thinking effectively) and item no 6 (I find it easy to incorporate computational thinking into existing subjects in the curriculum) all had mean average that are lower than the average cut off mean of (2.5). This indicate that teachers are not adequately prepared to implement Computational thinking strategy in their lesson delivery may be as a result of lack of training on how such 21<sup>st</sup> century innovative collaborative instructional teaching strategy could be used in instructional delivery in senior secondary school curriculum. But generally, from the grand mean, they have positive perception towards integration of Computational thinking instructional strategy in senior secondary school curriculum because they believed it will help for improved curriculum implementation.

RQ 2: What is the difference between the perception of male and female senior secondary school teachers towards integrating Computational thinking instructional learning strategy in senior secondary curriculum for improved curriculum implementation?

**Table 2: Summary of male and female teachers mean response**

Group	N	Mean	SD	Difference in
Male	78	3.16	0.57	0.1
Female	152	3.26	0.47	

Result in Table 2, shows that a mean difference of 0.1 exist between responses of male and female upper basic teachers on their perception toward integrating Computational Thinking Instructional Learning Strategy in Senior Secondary School curriculum for improved Curriculum Implementation in senior secondary school curriculum. This difference is quite insignificant.

### Hypothesis

H<sub>01</sub>: There is no significant difference between the perception of male and female senior secondary school teachers towards integrating Computational thinking instructional learning strategy in senior secondary school curriculum for improved curriculum implementation?

Group	N	Mean	SD	DF	T. cal	P.value	Decision
Male	78	3.16	0.57	208	0.17	0.980	Accepted
Female	132	3.26	0.47				

Hypothesis on difference in teachers' perceptions by gender was tested using an independent t-test analysis which resulted to  $t(208) = 0.17$ ,  $p = 0.96$ . Hence, the null hypothesis of no difference by gender was retained. This indicates that gender does not matter as far as teachers' perception was concerned on integration of Computational instructional learning strategy in senior secondary school curriculum for improved curriculum implementation.

## Discussion

The findings of this study reveal that **senior secondary school teachers in Nigeria** hold **positive perceptions** toward the integration of **Computational Thinking (CT)** instructional strategies into the curriculum. This aligns with **global trends** where educators increasingly recognize CT as a **critical enabler** of **21st-century learning** [Voogt et al., 2015]. Teachers acknowledged that CT fosters **analytical thinking**, **problem-solving**, and **digital literacy**, all of which are essential for **curriculum relevance** and **student employability**.

However, beneath this **optimistic outlook** lies a **pragmatic concern**: teachers feel **underprepared** and **under-resourced** to implement CT effectively. Items such as *"I feel adequately prepared to integrate CT"* and *"I have access to sufficient resources"* recorded **mean scores below the cutoff**, indicating **low self-efficacy** and **resource constraints**. This corroborates earlier findings by Okeke & Hassan (2021) and Adeyemo & Adu (2018), who reported that **Nigerian teachers are willing but unable** to integrate CT due to **systemic barriers**.

### Gender and Perception: A Non-Issue?

One of the most striking findings is the **absence of significant gender differences** in teachers' perceptions of CT integration. Both **male and female teachers** expressed **similar levels of enthusiasm and concern**, with a **mean difference of only 0.1** and a **p-value of 0.96**. This suggests that **gender is not a deterministic factor** in shaping attitudes toward CT in this context.

While this contradicts **some global studies** that report **lower confidence levels among female teachers** in technology integration [Unwin & Unwin, 2023], it aligns with Wang et al. (2019), who found that **professional development** and **school culture** are **more influential** than gender. In Nigeria, where **both male and female teachers face similar structural challenges**, such as **lack of training**, **poor infrastructure**, and **curriculum rigidity**, gender differences may be **neutralized** by **shared professional realities**.

## Limitations and Future Research

While this study provides **valuable baseline data**, it is not without **limitations**. First, the **sample was confined to Imo State**, limiting **generalizability** to other regions. Future studies should adopt a **multi-state approach** to capture **regional variations**. Second, the **use of self-reported questionnaires** may introduce **response bias**. **Mixed-methods designs** involving **classroom observations** and **interviews** would provide **deeper insights**.

Additionally, this study focused on **teachers' perceptions**, not **actual classroom practices**. A **longitudinal study** tracking **CT implementation** over time would reveal **how perceptions translate into practice** and what **factors sustain or hinder** this process.

## Conclusion

This study set out to gauge senior secondary school teachers' perceptions of embedding Computational Thinking instructional strategies into the Nigerian curriculum and to establish whether gender influenced those views. Across Imo State, 230 respondents returned valid questionnaires; descriptive and inferential analyses revealed a robust, statistically uniform optimism among both male and female educators. Mean ratings above the 2.50 benchmark consistently affirmed that teachers recognize CT's capacity to hone learners' problem-solving acumen, creativity, digital literacy and collaborative spirit, thereby strengthening overall curriculum implementation. Yet, beneath this consensus lie three intertwined challenges that must be resolved if goodwill is to become reality.

First, self-efficacy is low: items probing preparedness, ease of incorporation and resource adequacy registered the weakest scores, corroborating extant literature that identifies inadequate pre-service and in-service exposure as a primary barrier. Second, infrastructural deficits; erratic power, limited connectivity and scarce hardware—persist, especially in rural schools, widening the digital divide. Third, CT remains peripheral to the high-stakes, examination-driven culture that dominates

senior secondary classrooms; without explicit curriculum mandates and assessment alignment, teachers are unlikely to prioritize CT activities.

The gender-neutral result ( $t = 0.17$ ,  $p = 0.96$ ) is instructive: interventions should target professional and contextual factors rather than adopt gender-specific designs. Overall, the findings corroborate the Technological Pedagogical Content Knowledge framework by underscoring that positive perception alone is insufficient; simultaneous development of technology, pedagogy and content knowledge is essential.

Consequently, we recommend a multi-level action plan. Government and curriculum agencies should infuse CT competencies into subject syllabi, accompanied by clear assessment rubrics and teaching exemplars. Continuous professional development programmes; combining hands-on workshops, peer mentoring and micro-credentialing, must be institutionalized, prioritizing affordable, offline-compatible tools to mitigate infrastructure gaps. Public-private partnerships should expand access to solar-powered computer laboratories, low-cost tablets and open-source software, while school leaders cultivate communities of practice where teachers collaboratively design CT-integrated lesson plans. Finally, longitudinal mixed-methods research should track how perception translates into sustained classroom practice, monitor learning outcomes and refine policy instruments. By aligning teacher enthusiasm with systemic support, Nigeria can equip learners with the analytical, creative and digital skills demanded by the twenty-first-century knowledge economy.

### Implications for Policy and Practice

The **unanimous positive perception** among teachers presents a **strategic opportunity** for **curriculum reform**. However, **positive perception alone is insufficient** without **actionable support systems**. The following implications are proposed:

#### 1. Teacher Professional Development

There is an urgent need for continuous, context-specific training in CT pedagogies. This should go beyond one-off workshops to include mentorship, peer learning, and hands-on practice with low-cost tools such as Scratch, Python, and unplugged CT activities.

#### 2. Curriculum Redesign

CT should not be taught as a standalone subject but infused into existing subjects like Mathematics, Physics, and Geography. This requires collaboration between curriculum developers, subject teachers, and CT specialists to ensure alignment with learning outcomes.

#### 3. Infrastructure and Resource Mobilization

The government, NGOs, and private sector must collaborate to provide basic digital infrastructure, including solar-powered computer labs, offline CT kits, and open-source software. Rural schools should be prioritized to bridge the digital divide.

#### 4. Policy Support and Accountability

The Federal Ministry of Education should mandate CT integration in the national curriculum and establish monitoring mechanisms to ensure compliance. Teacher training colleges must also embed CT in their pre-service programs.

#### 5. Community and Stakeholder Engagement

Parents, school boards, and local communities must be sensitized on the value of CT to foster local ownership and sustainability. Student-led CT clubs, hackathons, and community projects can serve as platforms for engagement.

### References

1. Adegoke, B. A., Olatunji, M. A. (2023). Curriculum relevance and technological integration in Nigerian secondary education. *Journal of Educational Innovation and Policy*, 12(2):45-60.
2. Adeyemo, S. A., Adu, E. O. (2018). Teachers' preparedness and challenges in implementing computer science education in Nigerian secondary schools. *African Journal of Educational Studies in Mathematics and Sciences*, 14(1):77-88.
3. Akinoso, S. O., Oginni, O. M. (2023). Fostering creativity through computational thinking in Nigerian classrooms. *International Journal of STEM Education*, 10(1), Article 24.
4. Eze, U. C., Chinelo, O. N., Obayi, C. I. (2025). Pre-service teachers' readiness for computational thinking integration in Southwestern Nigeria. *Journal of Digital Learning in Teacher Education*, 41(1):33-47.
5. Grover, S., Pea, R. (2013). Computational thinking in K-12: A review of the state of the field. *Educational Researcher*, 42(1):38-43.
6. Ibrahim, A., Abubakar, M., Achi, I. (2022). Digital literacy and collaborative learning through computational thinking in Nigerian schools. *Journal of Educational Technology in Developing Countries*, 9(2):112-128.
7. Johnson, M., Adams, S., Cummins, M. (2016). NMC Horizon Report: 2016 K-12 Edition. The New Media Consortium.

8. Kazakoff, E. R., Bers, M. U. (2020). Putting the “T” in STEM: The role of robotics in fostering computational thinking in early childhood. *Journal of Educational Computing Research*,58(1):123-145.
9. Lye, S. Y., Koh, J. H. L. (2020). Review on teaching and learning of computational thinking through programming: What is next for K-12? *Computers in Human Behavior*,110, Article 106377.
10. National Policy on Education. (2013). Federal Republic of Nigeria (6th ed.). *NERDC Press*.
11. Ng, D. T. K., Leung, J. K. L. (2022). Teachers’ perceptions and practices of computational thinking in K-12 education: *A systematic literature review. Education and Information Technologies*,27(5):6555-6583.
12. Okeke, C. I., Hassan, B. (2021). Challenges of integrating computational thinking in Nigerian secondary schools: *Teachers’ perspectives. African Journal of Teacher Education*,10(1):89-104.
13. Oyelere, S. S., Suhonen, J., Niemi, H. (2021). Computational thinking in secondary education: A systematic literature review. *Education and Information Technologies*, 26(6):7257-7289.
14. Resnick, M., Maloney, J., Monroy-Hernández, A., Rusk, N., Eastmond, E., et al. (2009). Scratch: Programming for all. *Communications of the ACM*,52(11):60-67.
15. Rich, K., Bly, L., Leatham, K. (2020). Beyond coding: Integrating computational thinking into elementary mathematics. *Journal of Computers in Mathematics and Science Teaching*,39(3):255-275.
16. Sengupta, P., Kinnebrew, J. S., Basu, S., Biswas, G., Clark, D. (2021). Integrating computational thinking with K-12 science education using agent-based computation: *A theoretical framework. Education and Information Technologies*,26(2):1525-1553.
17. Tedre, M., Kale, P. (2023). The global expansion of computational thinking in school curricula: Trends, challenges, and implications for curriculum policy. *Computers & Education*, 184: Article 104482.
18. Unwin, L. Unwin, D. (2023). Computational thinking as a 21st-century skill: Implications for curriculum design in developing economies. *Global Education Review*,10(1):55-72.
19. Voogt, J., Fisser, P., Good, J., Mishra, P.,Yadav, A. (2015). Computational thinking in teacher education: A literature review. *Technology, Pedagogy and Education*,24(5):715-728.
20. Voogt, J.,Robl, M. (2023). Reconceptualizing computational thinking for global education: A comparative policy analysis. *Journal of Curriculum Studies*,55(4):512-530.
21. Wang, D., Zhang, L., Liu, Y. (2019). Teachers’ attitudes toward computational thinking integration: The role of professional development and school support. *Teaching and Teacher Education*,85:1-10.
22. Yadav, A., Gretter, S., Good, J., McLean, T. (2022). Computational thinking in teacher education: Preparing K-12 teachers to integrate CT across disciplines. *Journal of Science Education and Technology*,31(1):1-14.
23. Yadav, A., Mayfield, C., Korb, J. Hambrusch, S. (2020). Teachers’ perceptions of computational thinking in K-12 classrooms. *Journal of Educational Computing Research* 58(7):1245-1
24. Creswell, J. W. (2014). *Research design: Qualitative, quantitative and mixed methods approach* (4th ed.). SAGE.
25. Wing, J. M. (2006). Computational thinking. *Communications of the ACM*,49(3):33-35.
26. Mishra, P., Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*,108(6):1017-1054.