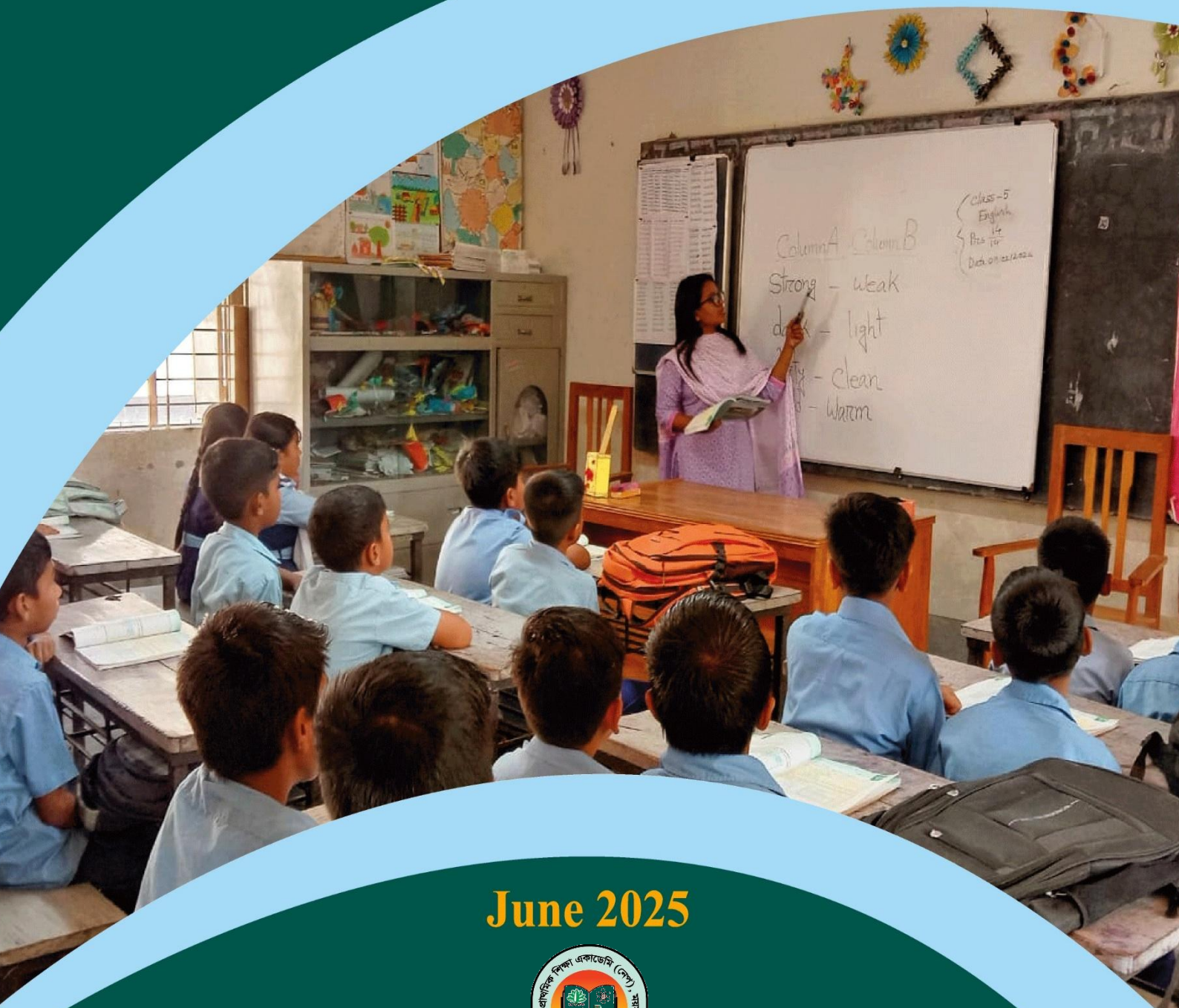
Exploring Government Primary School Teachers' Understanding and Implementation Challenges of the 21st Century Skills in Bangladesh



June 2025

প্রশিক্ষণ গবেষণা উন্নয়ন

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Acknowledgement

The successful completion of this research has been made possible through the invaluable guidance, support, and cooperation of many distinguished individuals and institutions.

Our profound thanks go to Mr. Abu Taher Md. Masud Rana, Secretary, Ministry of Primary and Mass Education (MoPME), for his exemplary administrative leadership and strategic support in facilitating this research endeavor.

We are especially indebted to Mr. Farid Ahmed, Director General, NAPE, and Chief Coordinator of this research initiative, for his dedicated leadership, continuous supervision, and steadfast commitment throughout every stage of the process. His visionary direction and consistent guidance ensured the successful completion of the study.

We offer our special thanks to Mr. Zia Ahmed Suman for his valuable support, insightful suggestions, and meaningful contributions that greatly enriched the quality and depth of this research.

We extend our sincere thanks to the 'Faculty of Research and Curriculum Development', NAPE, for invaluable advice and contributions to the completion of this research.

We also gratefully acknowledge the faculty members of NAPE for their scholarly input, professional dedication, and active participation in conducting the research. Our appreciation further extends to the writers' panel, data providers and all individuals involved in data collection, analysis, and documentation whose collective efforts substantially strengthened the study.

Finally, we extend our sincere thanks to all stakeholders and contributors who directly or indirectly supported this work. Their cooperation, commitment, and collaborative spirit played a vital role in the successful completion of this research.

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Chapter 1: Introduction

1.1 Background of the Study

In the 21st century, the world is experiencing unprecedented changes due to rapid technological advancements, globalization, and the ever-evolving job market. These transformations are reshaping the way we live, work, and learn. As a result, the concept of 21st century skills has emerged as a critical framework in education systems globally, aiming to equip students with the knowledge and competencies necessary to succeed in an interconnected and dynamic world (Dishon & Gilead, 2021; Gut, 2011). These skills are not merely technical; they involve higher-order thinking abilities and social-emotional competencies that are vital for success in both professional and personal life. The most commonly recognized 21st century skills include critical thinking, creativity, problem-solving, communication, collaboration, and digital literacy.

The push for integrating these skills into education policies has been particularly strong in the past few decades. Many developed and middle-income countries, recognizing the importance of preparing students for an unpredictable future, have prioritized the inclusion of these competencies within their curriculum frameworks (Adamson & Darling-Hammond, 2015; Hilt et al., 2019). Research by Jedaman et al. (2019) and Griffin & Care (2015) underscores that embedding these skills into school curricula and teaching practices is crucial for fostering students' readiness for life beyond school. These studies have advocated for a more holistic approach to teaching that goes beyond traditional knowledge acquisition and promotes skills that are adaptive and applicable in real-life situations.

The emphasis on 21st century skills is also reflected in educational frameworks such as the Partnership for 21st century skills (P21), which advocates for the integration of these competencies into educational systems worldwide. Researchers like Dede (2007) and Teo (2019) have explored how educational technologies can be used to enhance the teaching and learning of these skills, highlighting the need for teachers to adapt their pedagogical approaches in line with the demands of modern society.

Moreover, teachers play a central role in the successful integration of 21st century skills. Scholars such as Plomp (2018), Jacobson-Lundeberg (2016), and Valli et al. (2014) have emphasized the importance of teacher professional development and the need for continuous support to ensure that educators can effectively teach these competencies in the classroom. In particular, Selvi (2010) and CAIE (2018) argue that teachers' professional competencies are vital to improving education quality. This aligns with the context of Bangladesh, where there is a growing recognition of the importance of competent teachers in enhancing learning outcomes (MoPME, 2017). However, the integration of 21st century skills remains a challenge, especially in countries like Bangladesh, where socio-economic factors and infrastructural limitations often hinder the implementation of such reforms.

While much of the research on 21st century skills has focused on developed countries, Bangladesh presents a unique case. As a low-income country, Bangladesh faces specific educational challenges that need to be addressed in a local context. Given the country's socio-economic realities, educational strategies must be tailored to the specific needs and constraints of the system, particularly in government primary schools (GPS), where resources are often limited.

In Bangladesh, the quality of education is often hindered by issues such as large class sizes, insufficient teacher training, and inadequate teaching materials. According to Hossain (2016), despite the ambitious efforts to integrate global education standards, many teachers in Bangladesh still struggle to deliver quality education due to these systemic issues. Moreover, the lack of adequate professional development opportunities for teachers in government schools further complicates the integration of 21st century skills into teaching practices.

1.2 Problem Statement

In light of the growing emphasis on 21st century skills, both globally and within Bangladesh, it is essential to evaluate how well teachers, particularly in GPS, understand and implement these skills in their classrooms. Although global education reform agendas advocate for the integration of 21st century competencies, little is known about the specific challenges faced by GPS teachers in Bangladesh when it comes to understanding and teaching these skills.

Research on 21st century skills in Bangladesh is still in its infancy. While there is a significant body of literature that discusses the importance of these skills, there is limited

empirical data on how teachers in Bangladesh perceive these skills, how they incorporate them into their teaching, and the obstacles they face in doing so. Without addressing these gaps, Bangladesh's education system may not be fully equipped to prepare students for the future. The risk is that students will leave school without the essential competencies required to thrive in a complex and rapidly changing world, potentially stalling their future career prospects and contributing to the country's ongoing challenges in meeting its developmental goals.

This study, therefore, aims to explore GPS teachers' understanding of 21st century skills, the challenges they face in integrating these skills into their teaching, and the implications for educational policy and teacher training in Bangladesh. By investigating these issues, the study seeks to offer evidence-based recommendations that can help bridge the gap between educational policy and classroom practices in the context of 21st century learning.

1.3 Significance of the Study

This research holds significant value for the education sector in Bangladesh. It aims to:

1. **Identify Teachers' Understanding of 21st century Skills**: This study will assess the extent to which GPS teachers in Bangladesh understand 21st century skills and their relevance to modern education. By identifying gaps in knowledge, it will help inform targeted professional development programs for teachers.

2. **Highlight Practical Challenges**: The research will provide insights into the practical challenges teachers face in integrating 21st century skills into their classrooms. These challenges might include limited access to resources, lack of training, large class sizes, and the absence of supportive teaching environments.

3. **Contribute to Teacher Training and Policy Development**: The findings from this study will inform the design and delivery of professional development programs. Teachers will be better equipped to incorporate 21st century skills into their lessons, which will ultimately contribute to improved student outcomes. Additionally, the study will contribute to the development of national educational policies that align with global standards for the 21st century.

1.4 The 21st Century Skills in Bangladesh's National Curriculum Framework

In 2021, the National Curriculum Framework of Bangladesh was updated to reflect the need for students to develop competencies that will help them succeed in the 21st century. This framework outlines a comprehensive list of skills, which include:

- **Critical Thinking**: The ability to analyze information, evaluate evidence, and make reasoned decisions.
- **Creative Thinking**: Encouraging innovation and thinking outside the box.
- **Problem-Solving**: Developing strategies to solve complex, real-world problems.
- **Self-Management**: Cultivating personal responsibility, time management, and goal setting.
- **Decision-Making**: Making informed and effective decisions.
- **Communication**: Developing skills to express ideas clearly and collaborate with others.
- **Employability Skills**: Preparing students for their roles in society, with a focus on employability and personal well-being.
- **Collaboration Skill:** Working effectively in teams and understanding the value of diverse perspectives.
- **Global Citizenship**: Understanding global issues and developing a sense of responsibility for the community and the planet.
- **Literacy and Numeracy Skill:** Abilities needed to perceive the surrounding environment using the five senses; to read, speak, write, or express oneself; to measure and calculate; and to conduct searches using various media.
- **Digital Literacy**: Developing skills to navigate and use technology responsibly.

These competencies are essential for preparing students to thrive in the interconnected, digital world. The challenge, however, is ensuring that teachers are equipped with the necessary tools and knowledge to teach these skills effectively. The curriculum reforms in Bangladesh have aimed to integrate these skills, but whether teachers in government primary schools are equipped to teach them remains a key question.

1.5 Research Questions

The primary focus of this research is to explore the current level of understanding and the challenges faced by Government Primary School (GPS) teachers in Bangladesh regarding the integration of 21st century skills into their teaching practices. To address these central themes, the study is guided by the following two main research questions, which are designed to gather comprehensive insights into the teachers' perspectives and their classroom practices. This study seeks to answer the following research questions:

1. What is the current level of understanding of 21st century skills among government primary school teachers in Bangladesh?
2. What are the key challenges GPS teachers face in integrating 21st century skills into their classroom teaching?

By addressing these two central research questions, the study will provide a holistic understanding of how GPS teachers in Bangladesh perceive and implement 21st century skills in their classrooms. The study will also explore the broader educational context in Bangladesh, offering recommendations for improving teacher training and policy frameworks.

1.6 Limitations of the Study

While this research aims to provide valuable insights into the understanding and challenges of GPS teachers in Bangladesh regarding 21st century skills, it is important to acknowledge certain limitations that could impact the scope and generalizability of the findings.

1. Limited Geographic Scope

This study is focused on government primary schools in Bangladesh, and therefore, its findings may not be directly applicable to private schools, or other educational institutions in different regions of the country. The socio-economic conditions, teaching methodologies, and resources in government schools might differ significantly from those in private schools, which could result in differences in how 21st century skills are perceived and taught.

2. Sample Size and Representation

The research will likely involve a relatively small sample of GPS teachers, and as such, it may not represent the entire population of primary school teachers across the country. The sample size may limit the extent to which the findings can be generalized. Moreover, the teachers included in the study may come from different regions, backgrounds, and teaching experiences, which may introduce variability in their responses.

3. Subjectivity and Bias

The study is based on qualitative data collected through interviews or surveys, which could introduce researcher bias or subjectivity in data interpretation. Teachers' responses might also be influenced by their own perceptions of what is socially desirable, leading to a tendency to give responses that they think align with expected norms or educational reforms. This could affect the authenticity of the findings, especially when assessing teachers' own understanding and self-assessment of their teaching practices.

4. Time Constraints

The study's timeframe may limit the depth and breadth of data collection. In-depth interviews or classroom observations, if conducted, may be restricted by time and availability of participants, which could reduce the scope of data and potentially limit the findings' comprehensiveness. Teachers' schedules and availability may also limit how much time can be dedicated to data collection.

5. Limited Access to Classroom Observations

While this study aims to focus on understanding teachers' perspectives, direct classroom observations would provide a more detailed picture of how 21st century skills are implemented in practice. However, due to logistical challenges such as access permissions and classroom schedules, it might not be feasible to conduct comprehensive classroom observations. This limitation means that the findings will largely be based on teachers' self-reports and may not fully capture the complexities of real-time classroom interactions.

6. Variability in Teacher Training Programs

Teachers in Bangladesh often have access to varying levels of training. Some might have attended professional development programs that include a focus on 21st century skills,

while others may not have had any exposure to such initiatives. The differences in training and experience could affect the consistency of responses from teachers, making it difficult to establish a uniform understanding of 21st century skills across the sample.

7. Lack of Longitudinal Data

This research will be cross-sectional, meaning it will capture the views and experiences of teachers at one point in time. It will not be able to track how teachers' understanding or implementation of 21st century skills evolves over time. Longitudinal studies would offer more insight into the impact of teacher training and policy changes on teaching practices over an extended period.

Despite these limitations, the study aims to provide valuable insights into the perceptions and challenges faced by GPS teachers in Bangladesh. The findings will contribute to ongoing discussions about improving teacher professional development and enhancing the quality of education in the country. Furthermore, the study will help policymakers, educators, and training institutions design more effective strategies for integrating 21st century skills into the curriculum and classroom practices.

Chapter 2: Literature Review

2.1 Introduction to 21st century Skills

The concept of 21st century skills is central to educational reforms globally, driven by the need to prepare students to navigate an increasingly complex, interconnected, and technology-driven world. These skills are seen as essential for both personal success and active participation in the global workforce. As Greenstein (2012) and Trilling & Fadel (2009) argue, these competencies go beyond basic academic knowledge, focusing on higher-order thinking, collaboration, communication, and the ability to engage critically with the rapidly changing technological landscape. In the context of the 21st century, students must be able to:

- Adapt to new challenges and innovative practices
- Solve complex problems collaboratively and creatively
- Communicate effectively across diverse platforms and mediums
- Engage with technology to enhance productivity and creativity

These skills are widely recognized as essential for students' future success. According to Dede (2007), 21st century skills can be divided into three categories:

1. Learning Skills: These include critical thinking, creativity, collaboration, and communication—key competencies for adapting to new knowledge and responding to the rapidly changing nature of work and life.
2. Literacy Skills: This category includes digital literacy, information literacy, and media literacy, which are essential for navigating the vast amounts of information available through digital technologies and making sense of it in meaningful ways.
3. Life Skills: These involve skills such as flexibility, initiative, leadership, social responsibility, and productivity, which are necessary for personal and professional growth in an interconnected, fast-paced world.

At the heart of this framework is the notion that traditional education systems, which primarily emphasize content knowledge, must adapt to equip students with the skills necessary to function effectively in the 21st century (Griffin & Care, 2015). These skills

are essential not only for students' success in the workforce but also for their ability to engage as responsible, informed global citizens (Gut, 2011).

2.2 The Integration of 21st century Skills in Education Systems

Globally, countries have embraced the integration of 21st century skills into their educational frameworks to prepare students for future challenges. P21 (2019) in the United States, Finland's National Core Curriculum, and Singapore's educational reforms have all been influential in pushing for curriculum changes that prioritize these competencies.

One of the key arguments in favor of these reforms is the recognition that traditional education systems, which were designed for the industrial era, are insufficient for addressing the demands of the knowledge economy and digital society. Trilling & Fadel (2009) emphasize that today's students need more than just factual knowledge—they need to develop critical thinking and the ability to apply their knowledge in practical, real-world contexts. Hilt et al. (2019) assert that integrating these skills into education requires a shift from teacher-centered to learner-centered pedagogies, where students engage in project-based, inquiry-driven, and collaborative learning.

Despite these advances, challenges in integration persist. Teo (2019) and Dede (2007) have noted that education systems are often slow to adopt these changes due to institutional inertia, traditional teaching methods, and the pressure of standardized assessments that often prioritize rote memorization over critical thinking. For many educators, integrating 21st century skills means not only adopting new pedagogical approaches but also overcoming resistance to change within the classroom.

2.3 The Case of Bangladesh: Contextualizing 21st century Skills

In Bangladesh, the call for integrating 21st century skills into the educational system have gained momentum in recent years. The National Curriculum Framework (NCF) of 2021 emphasizes the need to prepare students for a rapidly changing world by developing competencies such as critical thinking, creative thinking, problem-solving, self-management, decision making, communication, employability, collaboration, global citizenship, literacy and numeracy, and digital literacy. These skills are seen as essential for students to adapt to the globalized economy and the technological advancements shaping their future careers.

However, the integration of these skills into the education system faces significant challenges, primarily due to the country's socio-economic and infrastructural realities. Hossain (2016) points out that many schools, particularly in rural areas, face severe resource constraints, with insufficient access to technology, overcrowded classrooms, and outdated teaching materials. These challenges severely limit the ability of teachers to deliver the kind of interactive, student-centered learning that is essential for fostering 21st century skills.

- **Critical Thinking**: The ability to analyze information, evaluate evidence, and make reasoned decisions.

The definition of critical thinking has changed with time and it has no sole definition. Critical thinking methodically encompasses the ability of assessing and analyzing arguments or claims, making decisions or solving issues and drawing conclusions using inductive or deductive reasoning (Lai, 2011). It also entails skills for assessing validity and dependability of available assumptions, data sources, and information (Kennedy et. al., 1991). Knowledge alone is insufficient for critical thinking; one needs the ability to evaluate facts to make sense of the knowledge (Wilson, 2017). This skill assures that along with more significant interpersonal relationships (Rayan, 2017). Besides, students' motivation, creativity, and metacognition are all closely linked to critical thinking (Lai, 2011). According to NCF (2021), Critical thinking is following a specific systematic process to search for, analyze, and use data to understand a subject deeply or solve a problem. When thinking critically, people follow disciplined steps to reach a decision. Skilled students coordinate multiple thinking abilities, such as: thinking based on the nature of the subject; using investigative questioning techniques; analysis, synthesis, and determining logicality.

- **Creative Thinking**: Encouraging innovation and thinking outside the box.

Creativity is the ability to create something which requires both originality and effectiveness (Runco & Jaeger, 2012). Creativity is seen as an individual's capacity to generate original things that have certain values (Gaut, 2010) which significantly add to the prevailing concepts (DeHaan, 2009). Creativity is necessary for students' intellectual development, increase of motivation, building personal pattern of thinking (Mazeh, 2020) and it facilitates them to be influential citizens and problem solvers in workforce (Majid et al., 2012). According to the NCF (2021), creative thinking is the ability to create and implement new ideas by moving beyond conventional thoughts through original opinions. Skilled students look at subjects from new perspectives rather than traditional ones. This leads to: the discovery of new techniques and methods;

the creation of new paths and possibilities; helping individuals and society move forward in a changing world.

- **Problem-Solving**: Developing strategies to solve complex, real-world problems.

According to D'Zurilla and Nezu (2001), problem solving is the self-directed cognitive-behavioural process by which a person attempts to identify or discover effective or adaptive solutions for specific problems encountered in everyday living. Csapó and Funke (2017) have included comprehending the problem thoroughly as a crucial part of problem solving. This process aims at flourishing students' capacities in solving the problem even when students are not aware of any primary solution (Rahman, 2019). Moreover, the problem-solving process helps an individual in being a responsible citizen (OECD, 2014). According to the NCF (2021), problem-solving skill is the ability to identify a problem and reach an effective solution systematically. This skill is sharpened through the practice of a systematic problem-solving process. It grows by: identifying and analyzing the cause of a problem; evaluating and selecting potential solutions accordingly; taking specific decisions and implementing them.

- **Self-Management**: Cultivating personal responsibility, time management, and goal setting.

Self-management (also known as self-control) is 'the self-initiated regulation of thoughts, feelings, and actions when enduringly valued goals conflict with momentarily more gratifying goals,' according to Duckworth et al. (2019). CASEL (2020) have similarly asserted the ability of controlling emotions, stress, thoughts and behaviour as self-management which is a pivotal element of the personalities of individuals. To build a prosperous life and an advanced society, individuals need various skills, including the ability to achieve well-being through effective self-care or positive self-direction through self-management NCF (2021). This requires a combination of specific skills, such as: the ability for self-awareness and self-analysis; emotional intelligence and social intelligence; self-control and managing social and cultural influences; effective use of interpersonal relationships; daily life management skills and, above all, time management skills.

- **Decision-Making**: Making informed and effective decisions.

Decision-making encompasses individual choosing, implementing, and being able to reevaluate the alternative that will produce the most effective outcome for themselves when needed (Marco et al., 2003). Students' overall academic success is correlated with their ability to make decisions (Majeed, 2021). As the training progresses, the number of options and level of complexity can rise to boost students' self-confidence and decision-making skills. This process requires a combination of various cognitive and psychological

functionalities rather than only one skill to formulate a uniformed decision (Küçükay, 2018). Decision-making skill is the ability to reach multiple information-based solutions by understanding a situation and choosing one solution logically NCF (2021). While many make decisions without logical thought, those proficient in decision-making: identify the issue specifically; analyze it from various perspectives; consider possibilities and risks to select the best option.

- **Communication**: Developing skills to express ideas clearly and collaborate with others.

Communication skill can be defined as the ability to speak effectively, comprehend what the interlocutor is saying, and negotiate to achieve goals. It is termed as the exchange of concepts, thoughts and expressions resulting in meaningful understanding by Keyton (2011). The pedagogical prerequisites for the development of students' communication abilities are recognized and supported (Yahaya & Nordin, 2006) and students' communication in the classroom has positive correlation with achieving intended learning outcomes (Frymier, 2005). However, communication skills are the ability to effectively exchange thoughts and receive or express information and opinions. We use various verbal and non-verbal methods (oral and written messages, expressions, signals, etc.) to share facts, opinions, and feelings NCF (2021). This skill is enhanced through the combined application of: active listening; presentation style; eagerness in giving and receiving messages.

- **Employability Skills**: Preparing students for their roles in society, with a focus on employability and personal well-being.

According to the NCF 2021, employability skills are the skills required to prepare for the workforce and to mold oneself as a capable candidate for changing situations and contexts. In addition to technical knowledge and expertise, these include: the ability to manage one's own work; financial literacy and management skills; business communication and entrepreneurship skills; work experience, safety awareness, and job-seeking skills.

- **Collaboration Skill:** Working effectively in teams and understanding the value of diverse perspectives.

UNICEF (2017) defines collaboration skills as the ability to work effectively and respectfully with diverse people or teams, make compromises, build consensus in decision-making, assume shared responsibility for cooperative work, and value the opinions and contributions of individual team members, from a position of firm self-identity. Mutual collaboration is vital for performing any task and achieving excellence. This requires fostering a collaborative mindset and team spirit. Reducing divisions by valuing diversity, defining specific areas and activities for collaboration, and expanding

the scope of collaboration through effective communication are primarily part of these skills. According to NCF (2021)

- **Global Citizenship**: Understanding global issues and developing a sense of responsibility for the community and the planet.

According to NCF (2021), global citizenship is a concept that helps individuals understand national and global contexts and define their place within them. An individual skilled in global citizenship, inspired by a sense of nationality, plays an active role in their own sphere, society, culture, and country. They establish a communication network that contributes to creating a world free of discrimination and upholding human rights, democracy, and social justice. The generation skilled in global citizenship plays an active role in the social, political, economic, and environmental development of the country and the world. Global citizenship inspires the creation of a peaceful, tolerant, inclusive, secure, and sustainable world for all by changing people's knowledge, skills, and attitudes.

- **Literacy and Numeracy Skill:**

Foundational skills like literacy and numeracy skill refer to the abilities needed to perceive the surrounding environment using the five senses; to read, speak, write, or express oneself; to measure and calculate; and to conduct searches using various media. In short, these are the fundamental tools of communication and logic. Furthermore, to keep pace with a rapidly changing world, science and technological literacy are among the most important foundational skills required today (NCF, 2021).

- **Digital Literacy**: Developing skills to navigate and use technology responsibly.

In today's technology-dependent society, digital skills are essential for living as an enlightened citizen. A vital component of digital literacy is information and media literacy, though its scope is much broader. In the 21st century, these skills are emphasized to ensure that students do not just remain "consumers" of technology but become "innovators." Digital skills include: understanding how various digital technologies work; the effective use of digital tools to solve real-world problems; planning, designing, and implementing new digital solutions as needed; the ability to verify the effectiveness of different technologies; ensuring the creative, ethical, and safe use of technology in line with various professional requirements (NCF, 2021).

In Bangladesh's government primary schools (GPS), many teachers still rely on traditional, teacher-centered pedagogies, such as rote memorization, which is more in line with the conventional examination system. This is despite the recognition that these pedagogies are insufficient for teaching the higher-order thinking and collaborative skills necessary for the 21st century. Hasan & Hossain (2020) argue that the curriculum reform in Bangladesh must go hand-in-hand with teacher professional development to effectively integrate 21st century skills.

Moreover, while the National Curriculum Framework of 2021 outlines the integration of these competencies, there are still gaps in the training and preparedness of teachers to implement the changes effectively. According to Hossain (2016), teacher training programs often focus on content delivery rather than pedagogical approaches that foster creativity, critical thinking, and collaboration. Teachers are often left without the necessary resources or support to integrate technology into their classrooms, making it difficult to teach digital literacy, which is one of the core competencies emphasized in the curriculum.

2.4 Teachers' Understanding and Implementation of 21st century Skills

A crucial aspect of integrating 21st century skills into classrooms is the understanding and competence of teachers. Globally, research has shown that while teachers generally recognize the importance of these skills, there is often disconnect between awareness and practice (Adamson & Darling-Hammond, 2015). Teachers' ability to teach these skills effectively is influenced by several factors, including their personal beliefs, their understanding of pedagogy, and their access to resources (Plomp, 2018).

In developed countries like the United States and the United Kingdom, research by Griffin & Care (2015) and Hilt et al. (2019) suggests that while educators understand the importance of 21st century skills, many struggle with the practical integration of these skills into their daily teaching practices. For instance, Griffin & Care (2015) found that teachers often lacked the knowledge and training to implement these competencies effectively, particularly when it came to assessing and measuring skills like creativity, collaboration, and critical thinking.

Similarly, in Bangladesh, GPS teachers face significant challenges in their understanding of 21st century skills. Hasan & Hossain (2020) report that many teachers are either unaware

of the specific competencies associated with 21st century learning or lack the confidence and professional development needed to teach them. Moreover, as Plomp (2018) suggests, teachers' beliefs about teaching and learning play a crucial role in how they approach the integration of these skills. Teachers who hold more traditional views of education may be less inclined to adopt student-centered, innovative teaching methods that foster skills like collaboration, problem-solving, and creativity.

In Bangladesh, this issue is compounded by limited access to technology and professional development programs. Research by Teo (2019) suggests that effective integration of 21st century skills requires training in both pedagogy and the use of digital tools. However, GPS teachers in Bangladesh often lack access to such training, and as Hossain (2016) notes, most professional development programs are focused on traditional methods, leaving teachers unprepared for the demands of modern pedagogy.

2.5 The Role of Professional Development in Teaching 21st century Skills

Teacher competency is central to the successful implementation of 21st century skills. Selvi (2010) and CAIE (2018) highlight that professional development programs are essential for helping teachers acquire the knowledge and skills necessary to teach 21st century competencies. These programs should not only focus on the content but also on the pedagogical strategies and technological tools needed to engage students in active, inquiry-based learning. In their study, Dede (2007) argues that professional development must include a multifaceted approach, focusing on content knowledge, teaching methods, and technology integration to prepare teachers for the evolving demands of the classroom.

In the context of Bangladesh, however, teacher training programs often fall short in equipping teachers with the knowledge and tools needed to teach 21st century skills. According to Hossain (2016), most training programs focus on subject-specific knowledge and rarely address pedagogical techniques for fostering critical thinking or digital literacy. Furthermore, there is often a lack of continuous professional development in Bangladesh's educational system, which is essential for ensuring that teachers can stay up-to-date with new teaching methodologies and technological advancements.

2.6 Teaching-learning strategies for fostering 21st century Skills

The cultivation of 21st century competencies necessitates a shift from traditional pedagogical paradigms toward student-centered, experiential learning environments. Critical thinking is systematically developed through the presentation of authentic problems, the utilization of visual tools, and reflective discourse that encourages students to analyze and validate their own cognitive processes. Critical thinking involves reasoned judgment, analysis of evidence, and reflective skepticism (Facione, 1990, Gut, 2011). Effective strategies include structured problem-solving tasks, inquiry-based questioning, and dialogic discussion formats that require justification of claims. Teachers may embed visual analytic tools—such as concept maps, argument maps, and graphic organizers—to scaffold reasoning processes. Classroom debates, evidence-based discussions, and reflective journals encourage students to examine assumptions, evaluate alternative perspectives, and test hypotheses. Formative assessment practices that require explanation of reasoning ("why" and "how") further cultivate analytical depth. Reflective activities—such as metacognitive prompts and post-task evaluation—enable learners to monitor and refine their thinking processes (Paul & Elder, 2006; Adamson & Darling-Hammond, 2015).

Simultaneously, creative thinking is fostered by engaging students in idea generation, mind mapping, and project-based tasks that challenge conventional thought patterns and encourage alternative perspectives. Problem-solving proficiency is sharpened through methodological approaches such as "think-pair-share," interdisciplinary activities, and the deconstruction of complex issues into manageable components (Mazeh, 2020). Creative thinking is fostered when learners engage in divergent thinking, imaginative exploration, and design-based problem solving (Runco & Jaeger, 2012). Instructional strategies include real-life problem scenarios, open-ended project-based learning (PBL), and design challenges requiring alternative solutions. Mind mapping, creative writing, visual analysis of images or designs, and "what-if" questioning stimulate ideational fluency. Peer exchange and collaborative critique sessions further enhance originality by exposing learners to diverse viewpoints. Integrating arts-based expression, drawing, storytelling, and multimedia production also supports creativity by connecting cognition with emotional and symbolic expression.

Problem-solving competence develops when students engage in structured reasoning within authentic contexts. Think–pair–share, collaborative inquiry, and stepwise problem

decomposition are effective techniques. In mathematics and interdisciplinary tasks, teachers can model heuristic strategies such as identifying givens, generating possible pathways, and evaluating outcomes. Project-based and real-world contextualized learning connects theoretical content to practical application (Hmelo-Silver, 2004). Reflective questioning—focused on reasoning processes rather than final answers—enhances transferability of problem-solving strategies across domains.

Self-management, are promoted through autonomous goal-setting, time management exercises, and role-playing scenarios that instill personal responsibility (Moore, 2018). Self-management encompasses goal setting, time management, emotional regulation, and responsibility. Research on self-regulated learning highlights the importance of explicit instruction in planning, monitoring, and self-evaluation. Teachers may guide learners in setting personal learning goals, developing action plans, and conducting structured self-assessments. Role-play, reflective diaries, and peer mentoring support social responsibility and empathy. Classroom routines that assign leadership roles and task accountability further cultivate autonomy. The integration of audio-visual tools and digital planners can enhance time management and organizational skills.

Decision-making capabilities are enhanced when students are required to logically evaluate multiple information-based solutions and consider potential risks within team-based frameworks. Decision-making skills require systematic analysis of alternatives, risk evaluation, and ethical reasoning. Instruction can involve scenario-based learning, case studies, and collaborative deliberation tasks where students must justify choices based on evidence. Problem identification, information analysis, and group consensus-building exercises encourage responsible decision-making. Embedding decision matrices or evaluation rubrics helps students compare options systematically and reflect on consequences (Hilt, Schulz & Zeitz, 2019; Harris, Mishra, & Koehler, 2010; Hennessy, Harrison, & Wamakote, 2005).

Communication expertise is refined through active listening, collaborative writing, and the mastery of both verbal and non-verbal cues. Communication skills extend beyond verbal expression to include digital, visual, and non-verbal competencies. Group discussions, structured debates, collaborative writing, and presentations develop clarity and persuasion. Emphasis on eye contact, gesture, and tone strengthens non-verbal communication. Digital communication platforms, blogs, and multimedia storytelling enhance technological

fluency alongside interpersonal skills (OECD, 2018). Peer feedback mechanisms and dialogic instruction further reinforce communicative competence.

Employability skills integrate practical application, collaboration, and adaptability. Hands-on experimentation, simulations, play-based learning (particularly in primary contexts), and real-life communication tasks cultivate workplace-relevant competencies. Reflection on teamwork processes, problem-solving approaches, and professional conduct enhances transferable skills (Griffin & Care, 2015; Trilling, & Fadel, 2009). Embedding authentic tasks that mirror workplace challenges strengthens readiness for future employment.

Collaboration is best developed through structured group work with clearly defined roles and shared accountability. Peer feedback, cooperative problem-solving tasks, and team reflection sessions promote collective efficacy. Role-play and consensus-building exercises strengthen negotiation and interpersonal understanding (Valli, Jacobs, & McLaughlin, 2014). Teachers should scaffold conflict resolution and perspective-taking to enhance group dynamics.

Furthermore, global citizenship are nurtured via peer feedback, debates on global issues, and the use of multimedia to promote inclusivity and social justice (Jedaman, Park, & Sato, 2019). Global citizenship education integrates awareness of global issues, intercultural dialogue, and ethical responsibility. Strategies include multimedia analysis of global challenges, structured debates on international issues, cross-cultural collaboration projects, and reflective discussions on sustainability and equity. Integrating global case studies within subject instruction strengthens contextual understanding and civic engagement.

Foundational literacy and numeracy remain critical to broader skill development. Reading and writing tasks, word games, number charts, and contextualized mathematical problem-solving form the core. Problem-based and collaborative activities enhance deeper comprehension and application. Integrating literacy and numeracy within interdisciplinary projects promotes transfer and relevance.

Digital literacy instruction should extend beyond tool usage to include critical evaluation, ethical participation, and content creation (Dede, 2007). Multimedia presentations, digital collaboration platforms, mobile-assisted learning, and information verification tasks foster technological competence. Integrating digital research projects and media production

activities enhances both cognitive and technical skills (Dishon & Gilead, 2021; Dede, 2007).

2.7 Systemic and Institutional Challenges to 21st century Education

The challenges in integrating 21st century skills into the education system are not just personal or pedagogical; they are also systemic and institutional. As Teo (2019) suggests, these challenges can be broadly categorized into the following:

1. **Curriculum Constraints**: Many educational systems, including that of Bangladesh, still operate on a content-heavy curriculum that prioritizes rote memorization and factual recall over critical thinking, creativity, and problem-solving. The assessment system in many countries—including Bangladesh—also reflects this traditional focus on knowledge recall rather than skills like collaboration and critical thinking (Hossain, 2016).
2. **Resource Limitations**: The lack of adequate resources, including technology, teaching materials, and trained personnel, is a significant barrier. Hossain (2016) points out that GPS teachers in Bangladesh face infrastructural challenges that prevent them from incorporating technology into their teaching, thereby hindering the development of digital literacy in students.
3. **Institutional Resistance**: **Dede (2007)** argues that institutional resistance, often manifested as a reluctance to change or innovate within established systems, can impede the integration of 21st century skills. In Bangladesh, cultural and institutional factors, such as reliance on exams and memorization, contribute to the slow adoption of student-centered learning approaches.

2.8 Conclusion

The literature suggests that while 21st century skills are universally recognized as essential for preparing students for the future, their integration into education systems faces significant challenges. In Bangladesh, these challenges are compounded by socio-economic constraints, a lack of resources, and an educational system still largely reliant on traditional, content-heavy pedagogies. Teachers' understanding of these skills is crucial for their successful integration into the curriculum, yet many teachers are inadequately trained or lack the support necessary to implement these changes. For effective integration to occur,

policymakers must invest in teacher professional development, curriculum reform, and resource allocation, ensuring that teachers have the tools, knowledge, and support to teach 21st century skills.

Chapter 3. Methodology

3.1 Study Design

The study followed a convergent parallel mixed methods design in order to access government primary school teachers' understandings about 21st century skills as well as their challenges in incorporating 21st century skills in Bangladesh. This enabled the data to be collected at the same time and to be analyzed independently (quantitative and qualitative), aggregating at the interpretation stage. The reason underlying such a framework is the desire to statistically capture teacher competencies and, at the same time, the contextual depth of (teachers') life-worlds. Triangulation increased the validity of the study using a mixed methods design, which enabled the researcher to attain a more comprehensive and holistic response to the research questions (Creswell & Plano Clark, 2018). The philosophical base is one of pragmatic paradigm that values methodological flexibility and practical results (Tashakkori & Teddlie, 2010).

3.2 Population and Sampling

The study population for the current study was: All government Primary School teachers in Bangladesh, P = 13,391, covering all of the eight administrative divisions. Both (metropolitan) urban and (upazila) rural Schools/schoolteachers were included to have geographical and contextual diversity.

Sampling Procedure

To enhance regional representativeness is employed a two-stage sampling system:

Stage 1: Purposive Sampling

A total of eight divisions were represented by 16 upazilas or thanas selected purposively so as to contemplate the teaching spectrum while covering urban and rural areas.

Stage 2: Stratified Proportional Sampling

Sample size for teachers in each selected upazila was calculated from a stratified proportional sampling according to as per the total number of teachers in that area. Despite

the gender-stratified design, final sampling proceeded based on available demographic data that resulted in the uneven gender representation in some areas. But equal numbers of deputies were preserved in all regions.

There were 691 teachers in our final sample, constituting around 5.2% of total customers. This sampling rate is consistent with common statistical advice for large educational populations, and is attendant to generalizability, and practicality of a mixed-methods design (Krejcie & Morgan, 1970).

Justification for 5% Sampling: A 5–6% sample size is frequently adequate for education research to provide statistically valid findings that are manageable for institutions (Fraenkel et al., 2012). The selected sample guaranteed adequate representativeness in terms of divisions and upazilas.

Sample Distribution

A detailed sample distribution by division, upazila, gender, and location is provided in Table 1

Table 1: Sample Distribution by Division, Upazila, Gender, and Location

Division	Upazila	Total Teachers	Male	Female	Sample Size (Male)	Sample Size (Female)	Total Sample
Barishal	Barishal Sadar	1,358	225	1,133	21	47	68
	Mehendiganj	1,180	494	686	18	41	59
Chattagram	Doublemooring	372	47	325	6	15	21
	Chandanaish	664	198	466	16	35	51
Dhaka	Dhanmondi	124	6	118	3	7	10
	Nawabganj	930	274	656	14	32	46
Khulna	Khulna Sadar	1,001	189	812	16	36	52
	Koyra	773	372	401	12	27	39
Mymensingh	Mymensingh Sadar	1,261	114	1,147	20	44	64
	Dhobaura	508	188	320	8	17	25
Rajshahi	Boalia (Rajshahi Sadar)	471	74	397	6	14	20
	Bagmara	1,145	469	676	17	39	56
Rangpur	Kotowali (Rangpur Sadar)	1,034	165	869	17	38	55
	Gangachara	1,015	404	611	16	35	51
Sylhet	Sylhet Sadar	803	224	579	11	24	35
	Kanaighat	752	294	458	12	27	39
Total		**13,391**	**2,763**	**10,628**	**212**	**479**	**691**

(*Source: Upazila Primary Education Office Data, 2023)

3.3 Data Collection tools

3.3.1 Quantitative tools

A structured questionnaire was constructed using established frameworks for 21st century skills systems (Partnership for 21st Century Skills, 2009 and Griffin, McGaw, & Care, 2012), and modified to match Bangladesh's National Curriculum Framework (NCF, 2021). The questionnaire assessed teachers' perceived competence in and use of 11 skills:

• Critical Thinking
• Creative Thinking
• Problem Solving
• Self-Management
• Decision Making
• Communication
• Life and Livelihood
• Cooperation
• Global Citizenship
• Literacy and Numeracy
• Digital Literacy

Participants rated their understanding and application of each of the statements on a scale of 5 where 5 = Excellent and 1 = Need Support.

3.3.2 Qualitative Part

The data were gathered through semi-structured open-ended face-to-face interviews which aimed to explore:

- Teachers' owns grasp of each 21st century skill.
- Mapping pedagogical methods used in instruction.
- Learning difficulties of these skills.
- Recommendations for overcoming challenges.

The qualitative instrument was developed based on the principles of open-ended educational interview protocols (Merriam & Tisdell, 2015).

3.4 Data Analysis Process

3.4.1 Quantitative Data Analysis

Quantitative analysis: Analysis of the quantitative data was performed by IBM SPSS (Version 27)

• **Descriptive Statistics:** Means, medians, frequencies and standard deviations for demographic-by-demographic variables.

• **Inferential Statistics:**

o **Independent Samples t-tests:** To explore differences in means between binary groups (eg gender, rural vs urban).

o **One-way ANOVA**: Determine if there are significant differences among groups or divisions (Field, 2018).

3.4.2 Qualitative Data Analysis

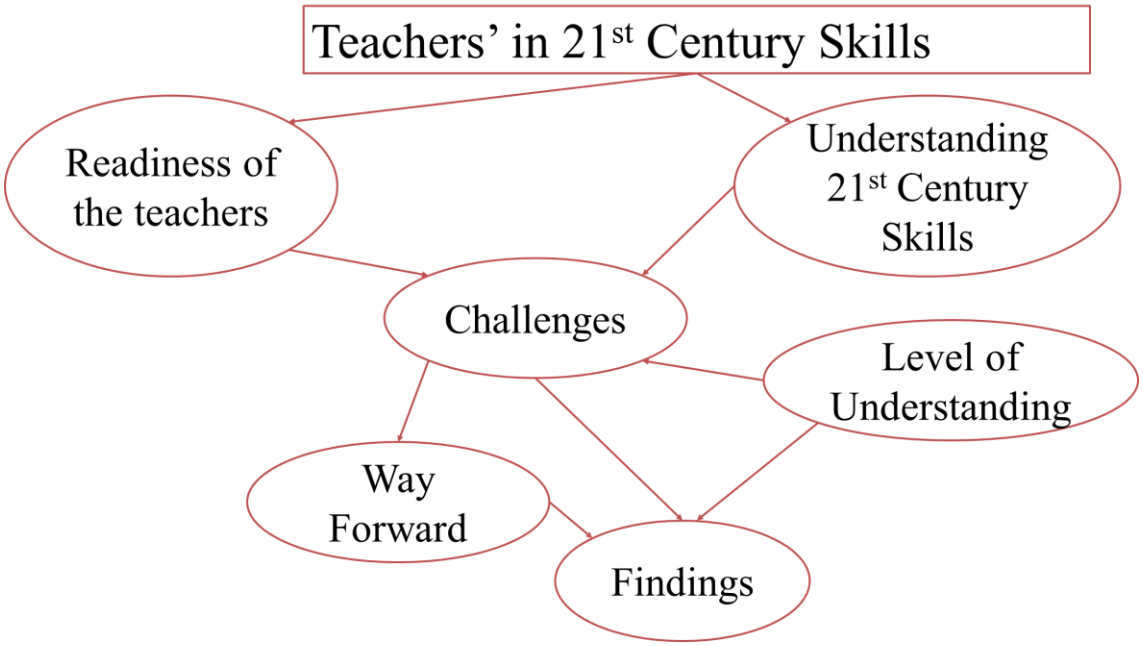
The thematic analysis was carried out according to the six phases [as proposed by Braun & Clarke (2006)]:

- Familiarization data
- Generation initial codes
- Searching themes
- Reviewing themes
- Defining and naming themes
- Reporting findings

This process was used to identify prevalent patterns, themes and categories in the qualitative interviews.

3.5 Conceptual Framework

The research was guided by Two established theoretical frameworks:



This framework is to provide an analytical lens for investigating the complex readiness of teachers to integrate 21st century skills—as defined by the National Curriculum Framework of Bangladesh into their daily teaching practice. The conceptual framework of this study illustrates the interrelationship between government primary school teachers' readiness, understanding, and implementation of 21st century skills, highlighting the mediating role of challenges and the pathway toward professional improvement and systemic reform.

At the core of the framework lies "Teachers in 21st century Skills", representing the central phenomenon under investigation. Teachers' capacity to foster learners' creativity, critical thinking, collaboration, communication, digital literacy, global citizenship etc. depends on how well they understand and integrate these competencies into classroom practices.

The framework begins with the readiness of the teachers, encompassing their motivation, attitudes, and preparedness to adopt 21st century pedagogies and technologies. Readiness reflects both cognitive and affective dimensions of teacher capacity — their willingness to innovate and their confidence in using digital and student-centered strategies.

The second major component, understanding of 21st century skills, refers to teachers' conceptual clarity about what these skills entail and how they align with the National Curriculum Framework (2021) and global educational standards. The level of understanding captures the extent and depth of teachers' knowledge — ranging from surface awareness to applied mastery. The study found that while many teachers were aware

of 21st century skill concepts, few could articulate or translate them into effective pedagogical designs.

At the center of the framework is the construct of challenges, which functions as a mediating factor connecting readiness, understanding, and outcomes. Challenges include contextual, institutional, and pedagogical barriers such as limited training opportunities, inadequate technological infrastructure, heavy workloads, and traditional assessment systems. These constraints impede teachers' capacity to actualize 21st century teaching despite their awareness and intent.

The findings emerging from this interaction provide evidence-based insights into the real status of teachers' competencies and the systemic limitations within Bangladesh's primary education sector. Finally, the way forward component represents the transformative direction derived from these findings. It emphasizes actionable strategies such as continuous professional development, curriculum realignment, enhanced institutional support, and policy coherence across NAPE, DPE, and NCTB to bridge the gap between policy aspiration and classroom reality.

3.6 Ethical Considerations

• Informed consent were used to collect data.

• Confidentiality and anonymity followed strictly

• The study was voluntary and individuals had the option to withdraw at any point.

Chapter 4. Data analysis and interpretation

4.1 Demographic Characteristics of the Sample

The study was conducted with 691 teachers working at different divisions of Bangladesh. With respect to designation most of participants were Assistant Teachers (88.3%) and there were 11.7% Head Teachers. Table showing 53.5% of the teachers worked at Grade A schools and 46.5% were at Grade B schools according to the school grade.

Male teachers formed 30.7% while the female counterpart made 69.3% of the respondents in the sample. With regard to teaching experience, more than half (51.4%) of the respondents reported of having the experience of teaching 16 years or above. An additional 25.0% worked for 11 to 15 years, 14.0% for 6 to 10 years and a mere 9.6% for 0 to 5 years. These numbers suggest a fairly representative teaching population.

In terms of location, 55.0% teachers were from rural (Upazila) and 45.0% were from urban/metropolitan settings. Respondents were located in all the administrative divisions of the country. Highest representation was from Barishal Division (18.4%) followed by Rangpur (15.3%), Khulna (13.2%), Mymensingh (12.9%), Rajshahi (11.0%), Sylhet (10.7%), Chattagram (10.4%), and Dhaka (8.1%).

Most cases were represented at the Upazila-level from Barishal Sadar (9.8%), Mymensingh Sadar (9.3%), and Mehendiganj (8.5%) with notable contributions also from Bagmara, Kotowali (Rangpur Sadar), Khulna Sadar, Chandanaish, and Gangachara. This distribution indicates an equilibrated geographical repartition between central and peripheral sub-districts.

The sample could be considered as decently educated in terms of academic performance. Most of the participants (53.8%) had completed a Master degree or 3-year Honours (pass) degree (28.9%). Of the rest, only minority had done general Honors (7.2%), HSC (9.6%) or SSC (0.4%).

All in all, these figures suggest a largely female teaching force that is experienced and relatively well-qualified and has good access in both rural and urban areas and across administrative divisions.

Table-02: Demographic characteristics (N=691)

Demographic Variable	Category	N	%
Designation	HT (Head Teacher)	81	11.7%
	AT (Assistant Teacher)	610	88.3%
School Grade	A	370	53.5%
	B	321	46.5%
Gender	Male	212	30.7%
	Female	479	69.3%
Years of Experience	0–5 Years	66	9.6%
	6–10 Years	97	14.0%
	11–15 Years	173	25.0%
	16+ Years	355	51.4%
School Location	Urban (Metropolitan City)	311	45.0%
	Rural (Upzilla)	380	55.0%
Division	Barishal	127	18.4%
	Chattagram	72	10.4%
	Dhaka	56	8.1%
	Khulna	91	13.2%
	Mymensingh	89	12.9%
	Rajshahi	76	11.0%
	Rangpur	106	15.3%
	Sylhet	74	10.7%
Upzilla	Barishal Sadar	68	9.8%
	Mymensingh Sadar	64	9.3%
	Mehendiganj	59	8.5%
	Bagmara	56	8.1%
	Kotowali (Rangpur Sadar)	55	8.0%
	Khulna Sadar	52	7.5%
	Chandanaish	51	7.4%
	Gangachara	51	7.4%
	Nawabganj	46	6.7%
	Kanaighat	39	5.6%
	Koyra	39	5.6%
	Sylhet Sadar	35	5.1%
	Dhobaura	25	3.6%
	Doublemooring	21	3.0%
	Boalia (Rajshahi Sadar)	20	2.9%
	Dhanmondi	10	1.4%
Educational Qualification	SSC	3	0.4%
	HSC	66	9.6%
	Hon's	50	7.2%
	Hon’s (pass course/3-year degree)	200	28.9%
	Masters	372	53.8%

4.2 Conceptual Understanding of 21st century Skills by Teachers

Table-02 provides a detailed understanding about how GPS teachers in Bangladesh estimate their conceptual understanding of 21st century skills. The table shows that although most teachers report that they have a "Good" understanding in most domain, the level of their conceptual understanding is low and in numerous important domain there is a high need of support.

The first two indices in Table-02 are the building blocks of the pedagogy knowledge (PK) and content knowledge (CK) integration on 21st century skills. Overall, teachers are moderately confident that they are as proficient at teaching, with 41.7% confidence in pedagogy and 42.8% in content knowledge as they self-identify as "Good." More modest proportions self-identify as "Excellent", with 6.7% of teachers expressing confidence in their pedagogical competence and 7.2% confidence in their content competence. This conclusion gives some indication that teachers currently have some confidence in both their pedagogical knowledge (knowing what to teach) and their educational content knowledge (knowing how to teach it) in terms of their readiness in teaching 21st century skills, but are not able to synthesize those into an integrated teaching approach (knowing how to teach it well) which is a hallmark of 21st century teaching.

Beyond readiness, Table-03 reveals that teachers are relatively confident about their understanding of some of the cognitive and communication 21st century skills. In particular, creative thinking, communication, critical thinking and problem solving are considered relative strengths. Just over half of teachers rated their understanding of such domains as "Good"—45.7% in the case of creative thinking, 44.6% for communication, 41.2% for critical thinking and 44.0% for problem solving. In addition to the "Very Good" and "Excellent" category, more than 60% of all teachers felt moderately to highly skilled in these areas. Nevertheless, teachers continued (and usually with <4%; i.e., low depth/advanced) to rate themselves "Excellent" in the majority of domains, throughout the years.

Strengths are manifested in cognitive aspects; Areas of moderate/Weak conceptual understanding also appears (as shown in Table-03). Abilities such as Decision Making, Life Skills, and Cooperation recorded very low scores in the "Fair" and "Unsatisfactory" categories. For example, in decision making, 20.7% of the teachers required support, in life skills 22.6% and in cooperation 20.4%. These skill domains are closely interrelated to student well-being, self-development and collaboration with others. The results indicate that teachers may not have access to the cognitive tools to support these forms of development and to cultivate the reference sub-cognition of self-regulation, ethical reasoning, and psocial behavior in the classroom.

Table-03 revealed the most significant conceptual gaps in the areas of global citizenship, digital literacy, self-management, and literacy and numeracy in a 21st century setting. The highest number of "Needs Support" ratings generated were in these domains: 35.2% of teachers described difficulty in understanding global citizenship, 29.8% in self-management, 29.5% in digital literacy, and 25.6% in literacy and numeracy. This finding implies that many teachers are inadequately equipped to teach the broader, more globally relevant and digitally-focused elements of the country's national curriculum. Thus, for instance, the education for global citizenship would urge teachers to teach for sustainable development, cultural sensitivity and civic engagement all of which, seem to be lacking in

conceptual clarity. So even if basic use of ICT tools has increased, (digital literacy including information assessment, safety and responsible behaviour on the Internet) is yet not well understood.

In conclusion, Table-03 shows that though the government primary school teachers feel they are average to above average in basic cognitive and communicative skills, they are deficient in utilizing integrated PK and CK in teaching for improving 21st century skills. The uniformly low evaluations of "Excellent" among the dimensions addresses The unanimously low ratings of "Excellent" across the dimensions reinforces that teachers have an awareness of these ideas, but have not yet obtained the depth of understanding that allows them to use them effectively in the classroom. These results thus highlight an urgent demand for specific professional learning in the area of conceptual knowledge development (both foundational and advanced) in particular with reference to the core domains of global citizenship and entitlement, digital literacy and pedagogical skill integration. It is critical that these gaps are addressed if the objectives of the National Curriculum Framework (NCF 2021) to prepare both students and teachers for the 21st century are to be realised.

Table-03: Teachers' Perception on Their Own Conceptual Understanding of 21st century Skills (N = 691)

Skill Area	Excellent (%)	Very Good (%)	Good (%)	Average (%)	Needs Support / Low (%)
Concept of Content Knowledge (CK)	7.2%	14.6%	42.8%	26.9%	8.4%
Concept of Pedagogy Knowledge (PK)	6.7%	15.9%	41.7%	22.7%	13.0%
Understanding of Critical Thinking	3.3%	15.3%	41.2%	26.6%	13.5%
Understanding of Creative Thinking	3.9%	14.2%	45.7%	22.7%	13.5%
Understanding of Problem Solving	2.9%	12.4%	44.0%	25.9%	14.8%
Understanding of Self-Management	1.2%	8.4%	35.7%	24.9%	29.8%
Understanding of Decision Making	2.6%	9.4%	41.1%	26.2%	20.7%
Understanding of Communication	3.8%	12.7%	44.6%	23.0%	15.9%
Understanding of Life Skills	2.6%	8.8%	38.2%	27.8%	22.6%
Understanding of Cooperation	3.6%	10.4%	42.1%	23.4%	20.4%
Understanding of Global Citizenship	2.2%	9.4%	28.9%	24.3%	35.2%
Understanding of Literacy & Numeracy	2.7%	10.3%	39.2%	22.1%	25.6%
Understanding of Digital Literacy	2.7%	9.1%	34.7%	23.9%	29.5%

4.3 Actual Perception of 21st century Skills Recognized

The results based on the qualitative codes extracted from teacher's written and spoken explanations are reported in the table-04 and those are quite revealing insights into teachers' realizing as evidenced by their expression than their perceived expression. Data analysis shows great distinctions between what teachers perceive to 'know' about 21st century skills (Table-03) and what they can actually articulate.

Teachers exhibited the most demonstrated understanding with respect to PK (29.7% sufficient) and CK (30.1% sufficient) with less than a quarter of teachers stating that they did not have lack of understanding. This means they are not quite ready for the developing 21st skills mentioned in NCF.

In the area of cognitive skill categories -critical thinking, creative thinking and problem solving-, teachers had the highest levels of partial understanding (about 46%-50%) and the lowest sufficiency. For instance, whereas essentially half of the teachers tried to articulate what was meant by being creative, less than a third of those were categorized as having even a partial understanding. In comparison, only 27.1% of students were considered adequate in critical thinking and 22.3% in problem solving. These findings indicate that although the concepts appear to be widely known by teachers, they do not have the depth of understanding that would allow them to be translated into practice in their classrooms.

Decision making, global citizenship, self-management and digital literacy were the least well understood. It is in fact worrisome to note that only 2.6% teachers could adequately explain about the decision making while only 2.5% teachers were found to be able to express about its application. The greatest theoretical challenge was global citizenship (48.3% did not adequately define what global citizenship was (e.g., provision of only home-perspective exposure, no international perspective, no discussion of civic responsibility, no discussion of sustainable development goals (SDGs) and 74.1% did not describe indicators of global citizenship). More than 40% had less than a basic level of knowledge of digital literacy, which pointed to deep gaps in digital basic skills, beyond the use of ICT.

Social-emotional skills and life-readiness competencies were also weaker. Self-management was described well by only 16.9% and life skills by 16.4%. These findings highlight the lack of knowledge of personal development competencies (e.g., time management, emotion regulation and adaptability) that are more and more insisted on in contemporary curricula, but usually overlooked in training.

Table-03 Overview as summarised in Table-04 some of the teachers were found to exhibit only partial recognition of 21st century skill domains and concepts are rarely developed in some domains, especially with respect to integration, global awareness and personal development. These results stand in stark contrast to the more positive self-portraits in table-03. They draw attention to the urgent demand for deep, skill-specific professional development that focuses on both awareness and practical understanding and use. It's important to address these gaps if we are to translate the aims of the National Curriculum Framework (NCF 2021) into operational terms and ensure that school practices are in harmony with the kind of competencies that today's students should possess.

Table-04: Actual Understanding of 21st century Skills (n = 691)

Skill Area	Sufficient (%)	Partial (%)	Not Sufficient (%)
Pedagogical Knowledge (PK)	29.7%	46.3%	24.0%
Content Knowledge (CK)	30.1%	46.7%	23.2%
Critical Thinking	27.1%	46.6%	26.3%
Creative Thinking	26.0%	49.9%	24.0%
Problem Solving	22.3%	49.1%	28.7%
Self-Management	16.9%	45.0%	38.1%
Decision Making (Understanding)	2.6%	9.4%	20.7%
Decision Making (Application)	2.5%	9.4%	35.6%
Communication	24.7%	46.9%	28.4%
Life Skills	16.4%	45.2%	38.5%
Cooperation	22.0%	43.1%	34.9%
Global Citizenship	15.3%	36.3%	48.3%
Literacy & Numeracy	22.6%	39.8%	37.6%
Digital Literacy	19.4%	39.2%	41.4%

Table-03 and Table-04 comparison clearly shows the substantial gap among the teachers' perceived understanding and their demonstrated actual understanding of 21st century skills. In Table-02, most of the teachers self-reported 'Good' or better level of understanding in most of the domains, specifically in Pedagogy (41.7%), Technology (42.8%) and Critical thinking (41.2%). Yet, the Table-04 indicates that much fewer were able to express these notions adequately i.e., 29.7%, 30.1% and 27.1%, in case of pedagogy, technology use and critical thinking respectively. The gap is clearer in all complex domains such as integration of TPACK (38.5% "Good" in perception vs. 21.6% "Sufficient" in actual), global citizenship (28.9% "Good" in perception vs. 48.3% "Not Sufficient" in actual), and digital literacy (34.7% "Good" in perception vs. 41.4% "Not Sufficient" in actual). This disconnection indicates that although awareness of the critical features of teaching for education skills appears to be present, there is a lack of conceptual substance and clarity to apply skills effectively in practice, with professional development solutions which are needing to target practice-focused and practical strategies.

4.4 Application Plan in Teaching Learning Activity:

4.4.1 Strategies for Critical Thinking:

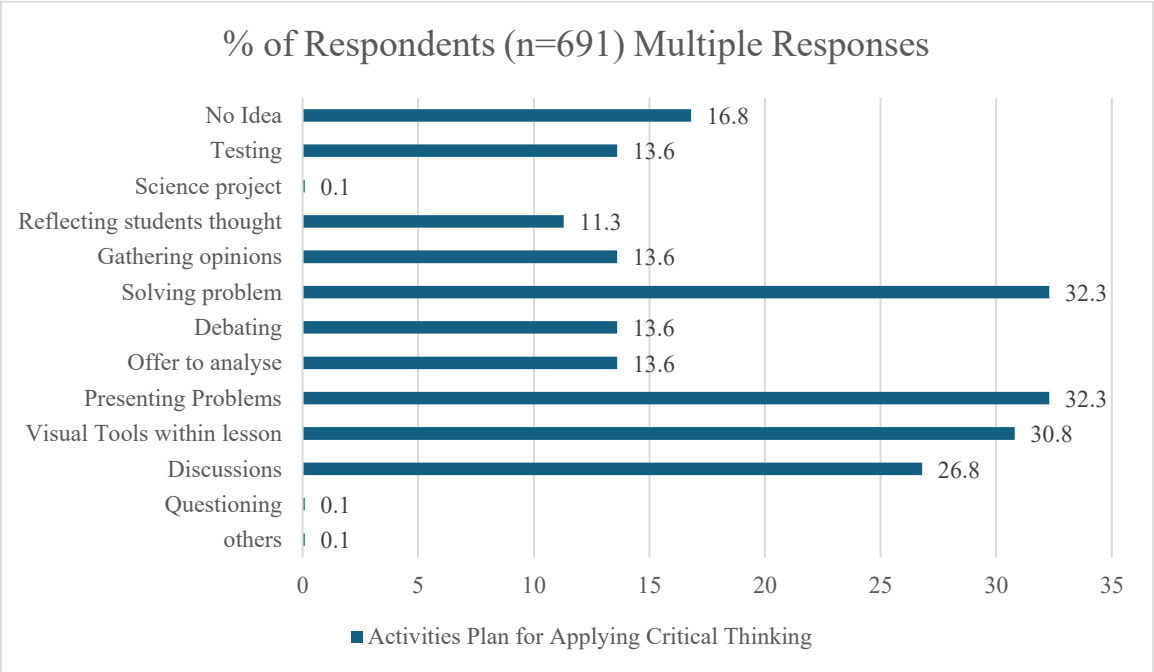


Figure-1: Strategies set by teacher for teaching Critical Thinking

Figure-1 shows that the highest reported use were presented problems or problem solving (32.3%), visual tools within lessons (30.8%), discussion (26.8% of teachers), gathering opinions (13.6%), offer to analyses (13.6%), testing (13.6%), and reflecting students thoughts (11.3%). Those examples show that quite a lot of educators see the importance of involving students in inquiry techniques and visual incentives to teach them to become critical thinkers. These techniques mentioned by the teacher can promote student-centered teaching and critical thinking skills. One teacher (CR_{245}) mentioned, *"I tried to use picture and ask students to analyze it and relate with the text."*

But 16.8% of teachers responded that they had "no idea" of good design strategies for critical thinking. One teacher (CrT_{003}) mentioned, *"I have no idea how to align Critical Thinking in teaching separately. I just read Bangla text aloud."*

This is a worrying statistic and indicates a notable neither lag nor leap in professional development. Finally, a very tiny amount (< 1%) referred to unique, or less common, approaches (such as "thinking differently," "preparation," and "teaching as play"), likely representing idiosyncratic or experimental practices.

4.4.2 Strategies for Creative thinking:

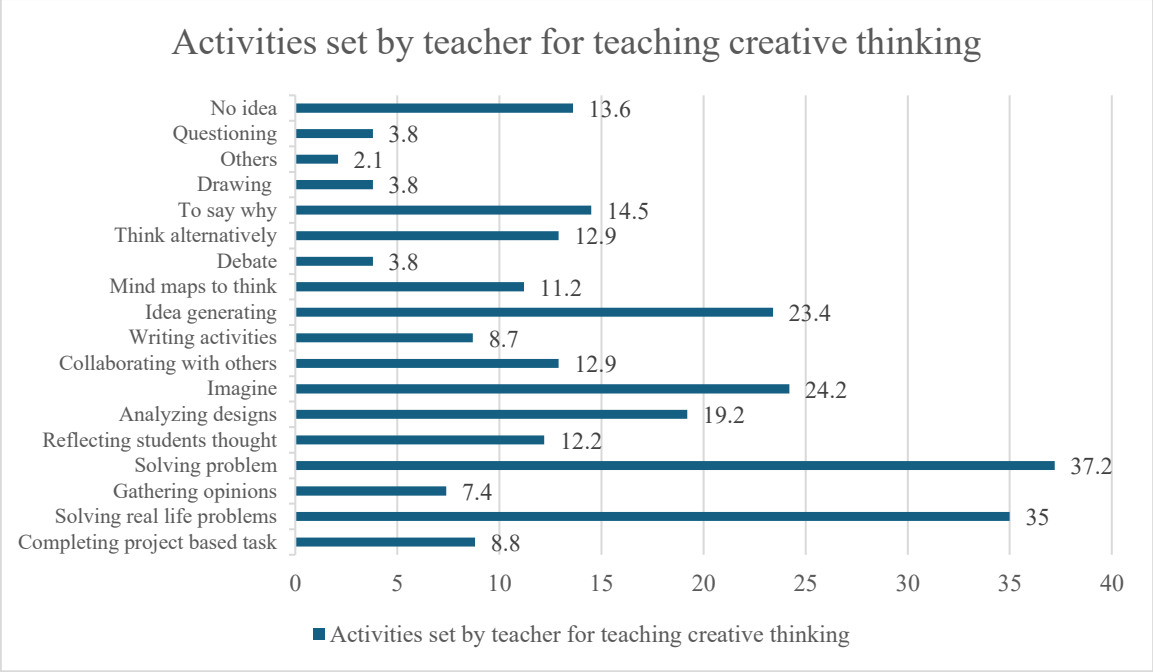


Figure-2: Strategies set by teacher for teaching Creative Thinking

Figure-2 shows that the highest reported use were solving problem (37.2%) and the other said that solving real life problem (35%), imagination (24.2%), idea generating (23.4%), analyze deigns or pictures (19.2%), to say 'why' (14.5%), think alternatively (12.9%), reflecting students thought (12.2%), mind maps to think (11.2%), completing project based task (8.8%), creating writing activities (8.7%), gathering opinions (7.4%), debate (3.8%), drawing and questioning (3.8%). Those strategies show that quite a lot of teachers see the importance of involving students in teaching to become creative thinkers. These techniques help to be a creative thinker. One teacher ($CreT_{128}$) mentioned, *"In my class, I told my students to say why this happen."*

But 13.6% of teachers responded that they had "no idea" of good design strategies for creative thinking skill. One teacher ($CreT_{323}$) mentioned, *"I follow the text, no thinking about whether it creative skills or not."*

A very tiny amount (< 1%) referred to less common, approaches (such as "peer exchange," "connecting activities," and "expression"), likely representing creative practices.

4.4.3 Strategies for Problem Solving

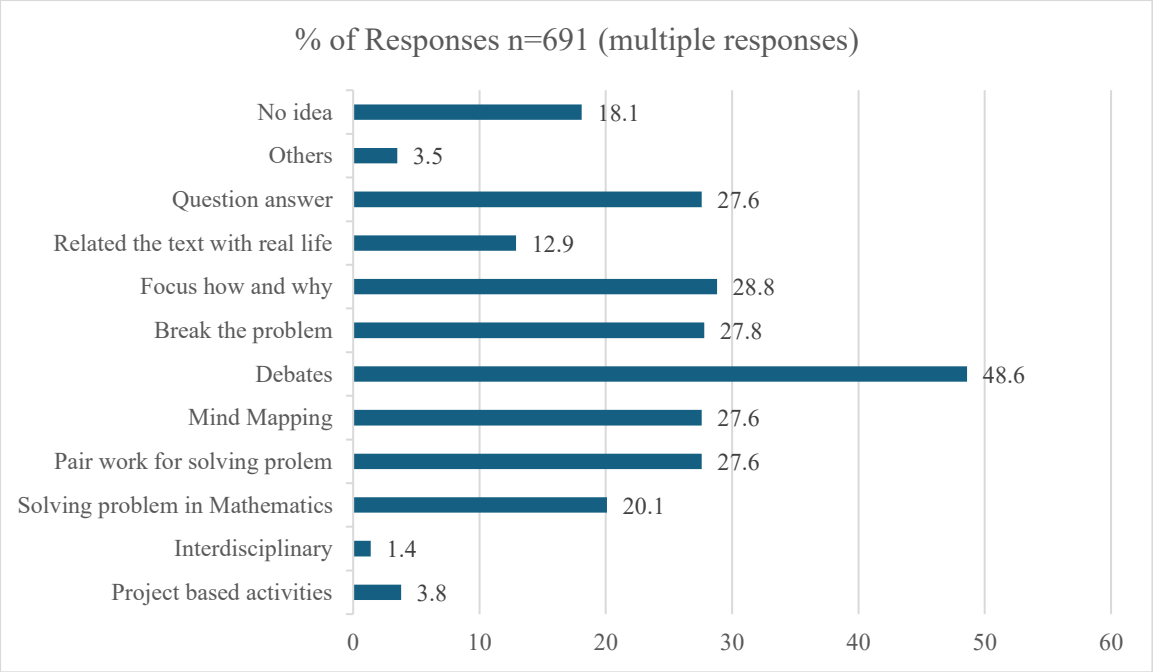


Figure-03: Strategies set by teacher for problem solving skill

Figure-3 shows that the highest reported use were debate (48.6%) and the other said that focus how and why (28.8%), question answer (27.6%), break the problem (27.8%), mind mapping (27.6%), pair work for solving problem (27.6%), solving problem in Mathematics (20.1%), related the text with real life (12.9%), project based activities (3.8%), interdisciplinary (1.4%). Those strategies show that teachers try involving students in learning problem solving skill. These techniques help to be skilled in problem solving. One teacher (PS_{55}) mentioned, *"I usually use Think-Pair-Share in my class to solve the problems."*

But 18.1% of teachers responded that they had "no idea" of good design strategies for problem solving skill. One teacher (PS_{77}) mentioned, *"During teaching I am not careful enough to think about the skills. I mainly teach the textbook."*

A very tiny amount (< 1%) referred to less common as others, approaches (such as "think-pair-share," "explaining and reasoning," and "reflection"), likely representing creative practices.

4.4.4 Strategies for self-management

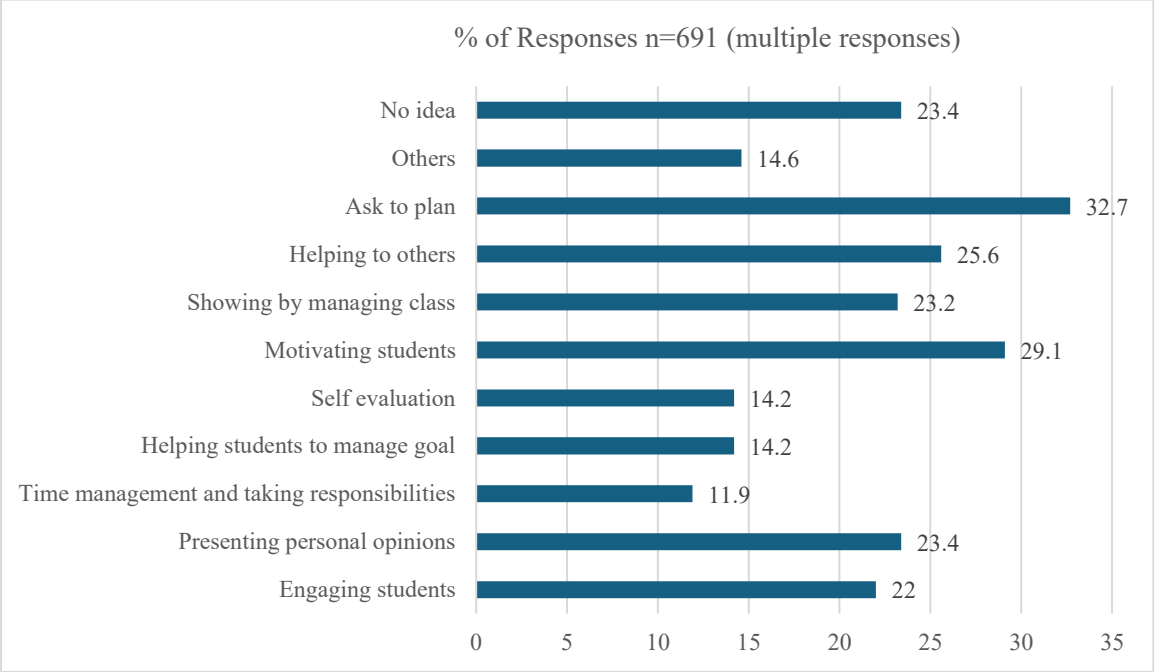


Figure- 04: Strategies set by teachers for self-management

An examination of self-management design strategies indicates that specific patterns are evident in the ways that teachers encourage student autonomy and classroom control. The most often reported strategy was ask to plan (32.7%) of the responses and the others are motivating students (29.1%), helping to others (25.6%), presenting personal opinions (23.4%), showing by managing class (23.2%), engaging students (22%), self evaluation (14.2%), helping students to manage goal (14.2%), time management and taking responsibilities (11.9%). These strategies show that teachers involves students in learning self management skill. One teacher (SM_{105}) mentioned, *"I motivate the students for class management or class planning."*

But 23.4% of teachers responded that they had "no idea" of designing strategies for self management skill. One teacher (SM_{114}) mentioned, *"There is a little scope to practice self-management skill so I try to complete the syllabus."*

A very tiny amount (< 1%) referred to less common, approaches (such as "role play," "create materials," and "audio video support"), likely representing creative practices.

4.4.5 Strategies for decision making:

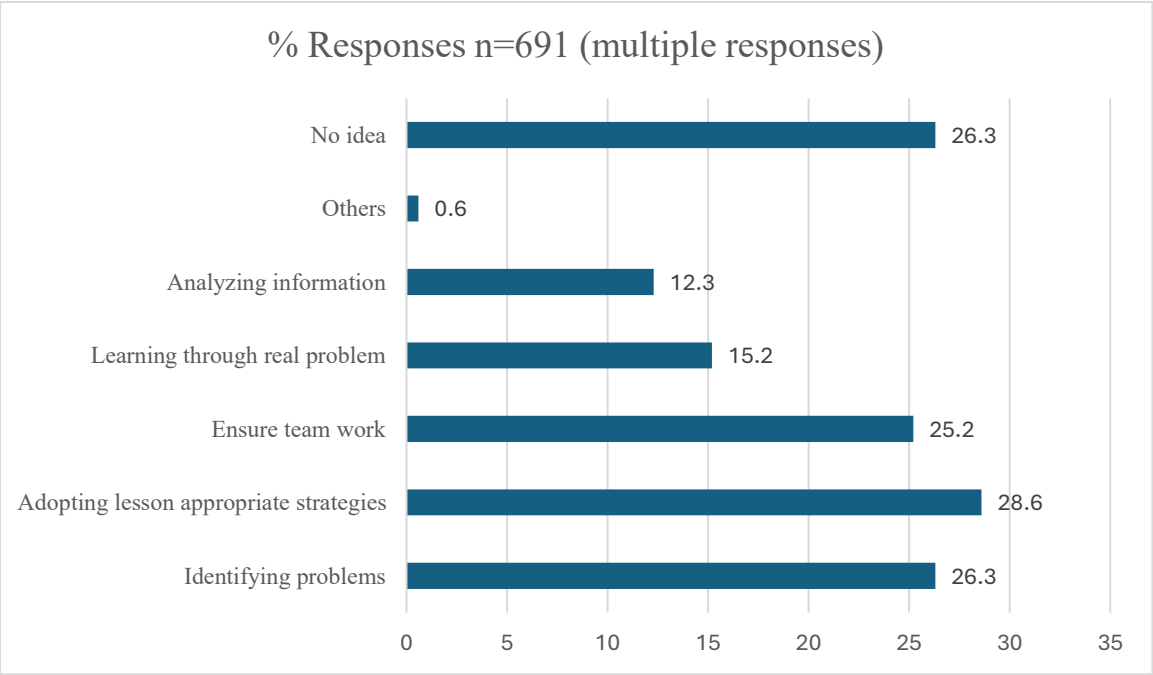


Figure-05: Strategies set by teacher for decision making skill

Figure-3 shows that the highest reported use was adopting lesson appropriate strategies (28.6%) and the other said that identifying problems (26.3%), ensure team work (25.2%), learning through read problem (15.2%), analyzing information (12.3%). These strategies promote decision making skill. One teacher (PS_{450}) mentioned, *"Actually I tried to use group work in my class. I think it will be helpful for developing decision making skill."*

But 26.3% of teachers responded that they had "no idea" to practice decision making skill of the students. One teacher (DM_{11}) mentioned, *"I don't get any instructions in the training how to address decision making skills in the classroom."*

4.4.6 Strategies for communication skill

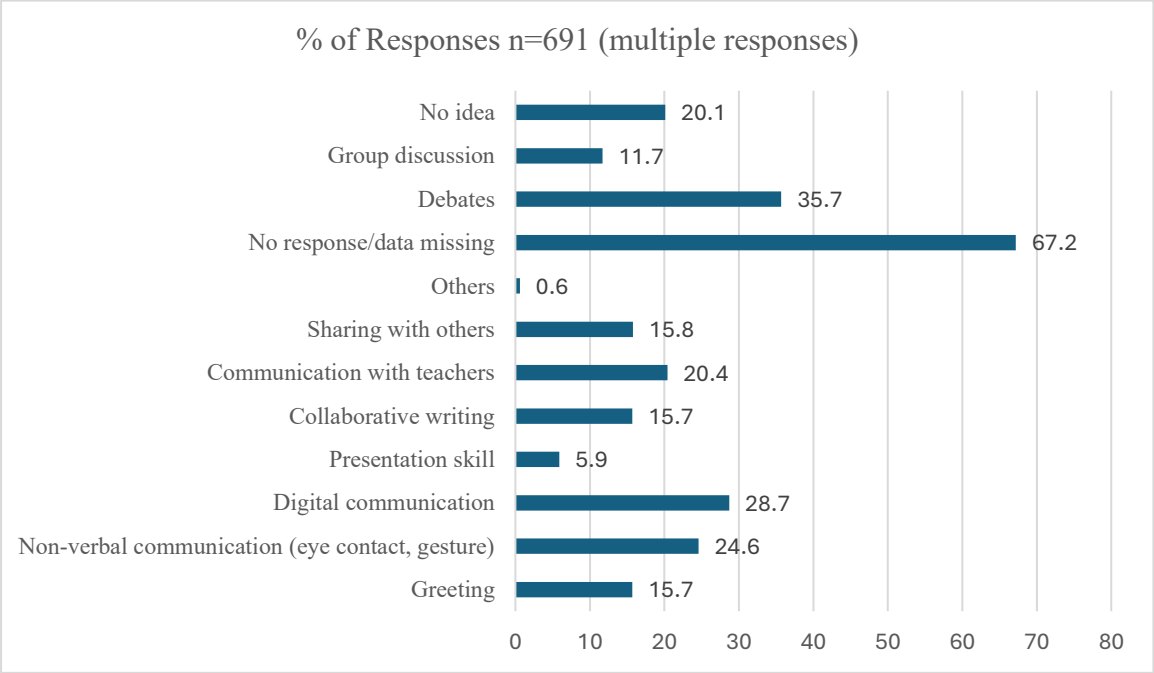


Figure-06: Strategies set by teacher for communication skill

The study of communication skill design and delivery approaches by the teachers showed a bias towards traditional or interactive classroom mode of delivery. The most commonly reported answer was not given (67.2%) and may indicate missing data, or generalist attitudes without overt specialization. However, group discussions and debates was particularly well accepted, with 245 answers (11.7%), of which 35.7% of the participants referred to debates. It indicates that dialogic learning is perceived as important by a considerable number of teachers for the purpose of enhancing communication. There were also 20.4% responses and 28.7% cases that referred to the communication with others and digital communication, which suggests that communication is one of the key components of learning communication skills.

Greetings represent 15.7% and non-verbal communication gestures such as looking (eye contact) and gestures with 24.6% indicating the priority also given by teachers when using corporeal language, indicators of participation of the students. Presentation skills (5.9%), group discussion (11.7%), sharing with others (15.8%), and collaborative writing (15.5%) were indicated the users' structured performance-based activities for developing communication skills.

20.1% of responses were categorized as "No idea", indicating some teachers did not know or were not confident in how to articulate their approach to communication skills. 'Other responses' (which included some distinct/rare responses such as parent participation or dialogic teaching or calling students by name) accounted for less than a percent of responses (0.6%).

4.4.7 Strategies for Employability Skill

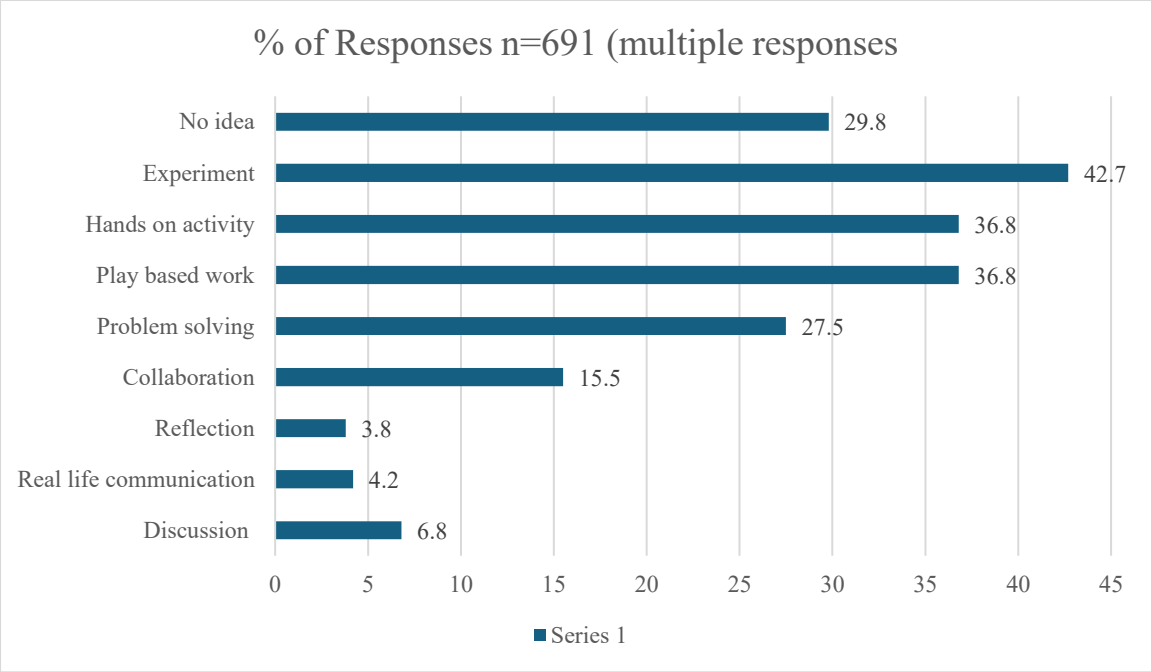


Figure-07: Strategies set by teacher for life and livelihood skill

Figure-7 shows that the highest reported use were experiment something in class (42.7%) and the other said that hands-on activities (36.8%), play-based work (36.8%), problem solving (27.5%), collaboration (15.5%), reflection (3.8%), discussion (6.8%), and real life communication (4.2%). These strategies promote life and livelihood skill. One teacher (LS_{170}) mentioned, *"I hands-on and play based activities in my class."*

Interestingly, 29.9% response was "No idea", which might indicate confusion or lack of planed approach among some teachers. One teacher (LS_{18}) mentioned, *"Reality is I don't know what 21st century skills are. So, I have no idea about it."*

4.4.8 Strategies for collaboration skill

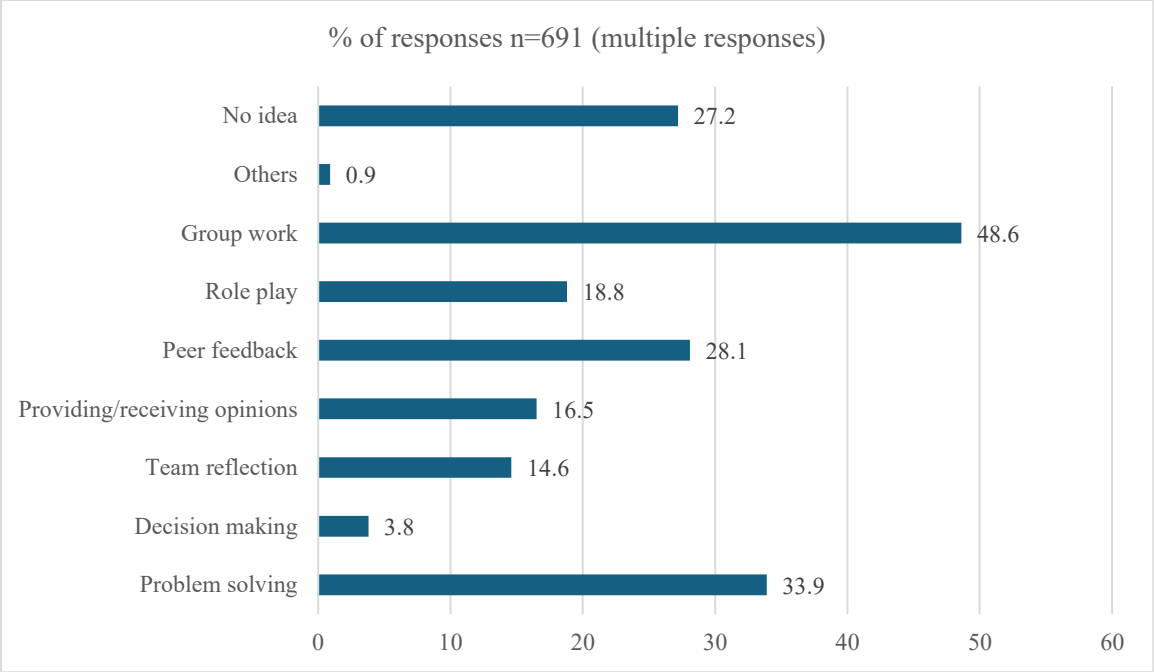


Figure-08: Strategies set by teacher for collaboration skills

Figure-8 shows that the highest reported use was group work (48.6%) and the other said that problem solving (33.9%), peer feedback (28.1%), role play (18.8%), providing/receiving opinions (16.5%), team reflection (14.6%), decision making (3.8%), and others (0.9%). These strategies enhance cooperation skill among the students. One teacher (CoS_{411}) mentioned, *"I group work, peer feedback in my class."*

Interestingly, 27.2% response was "No idea", which might indicate confusion or lack of planed approach among some teachers. One teacher (CoS_{03}) mentioned, *"We don't receive any training or instructions for applying 21st century skill."*

4.4.9 Strategies for global citizenship skill

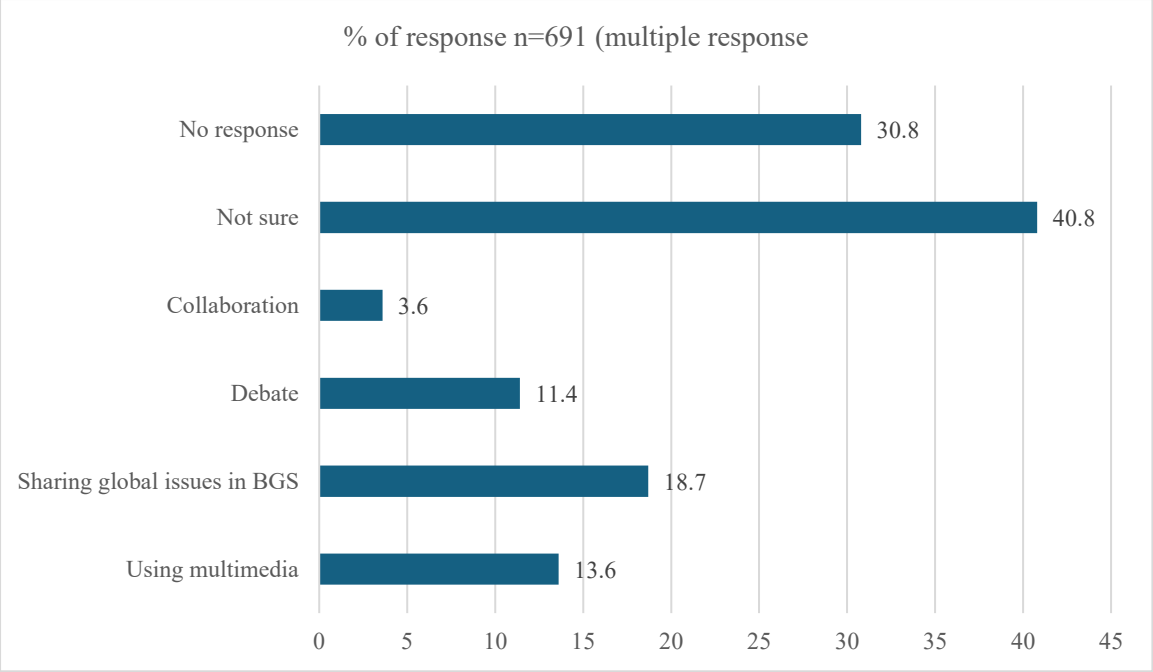


Figure-9: Strategies set by teacher for global citizenship

Figure-9 shows that the highest reported they are not sure (40.8%) about global citizenship and the other said that collaboration (3.6%), debate (11.4%), sharing global issues in BGS (18.7%), using multimedia (13.6%). These strategies are helpful to develop global citizenship skill. One teacher (GCS_{20}) mentioned, *"I tried to use global issues during Bangladesh and Global Studies period."*

But 30.8% of teachers don't respond regarding global citizenship skill. One teacher ($GCS2_{49}$) mentioned, *"I first time heard about global citizenship skill."*

4.4.10 Strategies for literacy and numeracy skill

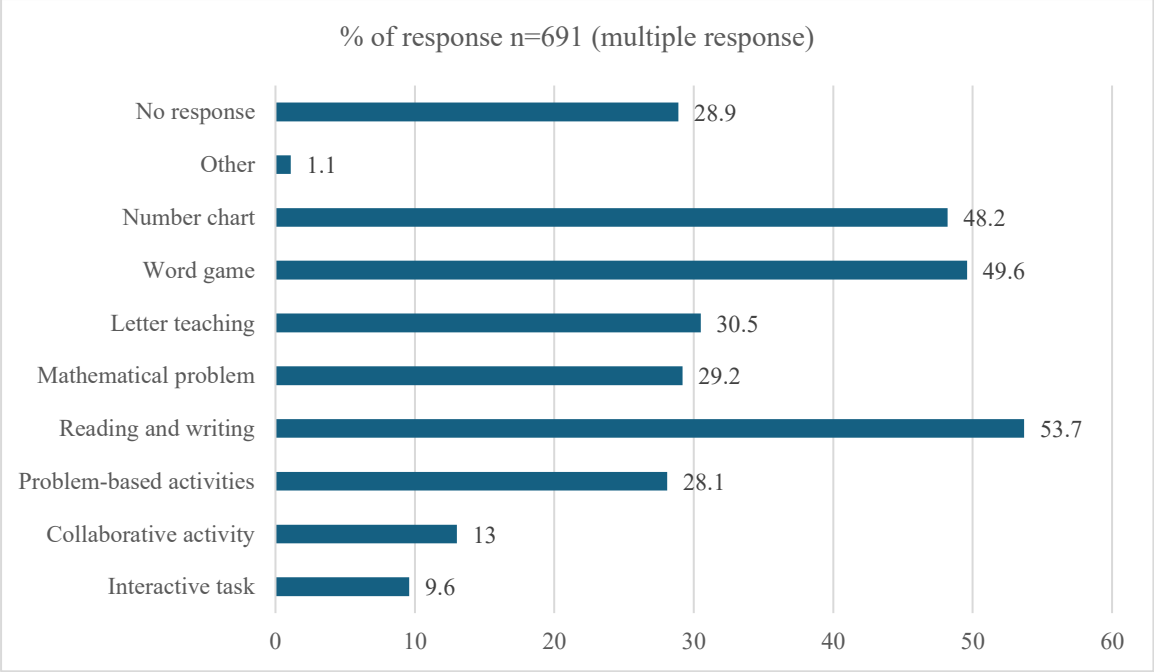


Figure-10: Strategies set by teacher for literacy and numeracy skill

Figure-10 shows that the highest reported that they use reading and writing activities from the textbook (53.7%) and the other said that word game (49.6%), number chart (48.2%), letter teaching (30.5%), mathematical problem (29.2%), problem-based activity (28.1%), collaborative activity (13%). These strategies are helpful to develop literacy and numeracy skill. One teacher (GCS_{20}) mentioned, *"I tried to use global issues during Bangladesh and Global Studies period."*

But 28.9% of teachers don't respond regarding literacy and numeracy skills. One teacher (LNS_{180}) mentioned,

"I number card, word card, picture card while teaching letters or numbers."

4.4.11 Strategies for Digital Literacy skills

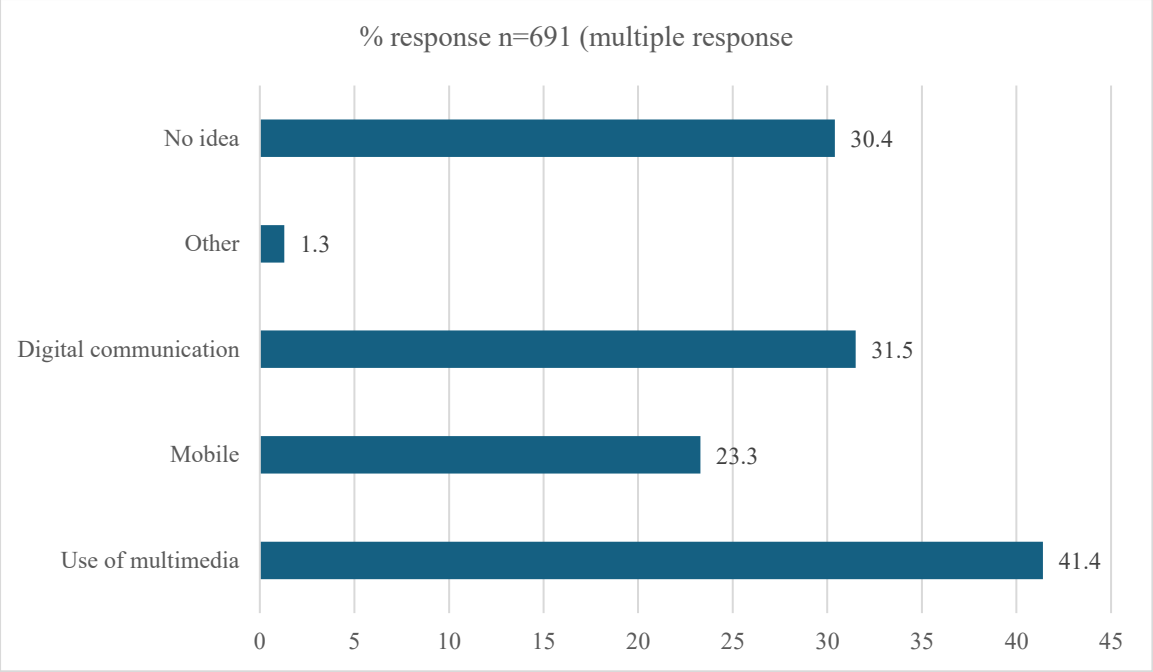


Figure-11: Strategies set by teacher for digital literacy skill

Figure-11 shows that the highest reported they are using multimedia (41.4%) and the other said that digital communication (31.5%), mobile (23.3%), others (1.3. One teacher (*GCS*$_{20}$) mentioned, *"I use multimedia while teaching science."*

But 30.4% of teachers responded that they don't have any idea regarding digital literacy skill.

4.5 Challenges for Teaching 21st Century Skills

4.5.1 Challenges in Applying Critical thinking

Based on the frequency count of the challenges to apply critical thinking skill, the responses converge on some dominant themes. The most frequently named challenge cited by nearly 99.9% of teachers is student engagement in classroom attendance and pair/group work. This reveals a pedagogical obstacle of great importance in which teachers have difficulties building an active and favorable environment to apply critical thinking skill in the classroom. A short distance away are case factors of teacher preparedness such as teacher/limited pedagogical content knowledge, objections to critical thinking teaching methods, and social/contextual issues combined that account for over 95.7% of cases. These suggest that some teachers might lack confidence in, be unprepared for or be culturally impeded to implement Critical Thinking skill practices.

Nearly 57.9% of respondents reported lack of resources (i.e., training, funding, TLM) and nearly 35.9% of the responses mentioned time constrain i.e. class duration, no time for preparation, resource development, back-to-back period, staff limitation as well as staff gap, are a good challenge for it. Some of the responses (9.1%) mentioned textbook issues. Interestingly, if about 12% chose 'No idea', apart from no consideration or knowledge associated with critical thinking skill. Conclusion taken together, the provided information suggests that not only teacher preparedness but also institutional support, curricular leeway, and cultural alignment all have important implications for enabling successful critical thinking skill implementation in classrooms.

Table-05: Challenges of applying critical thinking:

Challenge Theme	**Frequency (N-691)**	**Percent (%)**
Lack of Engagement (Group Work/pair work, classroom attendance)	690	99.9
Preparedness (teacher/limited pedagogical content knowledge)	661	95.7
Lack of Resources (Training, Budget, TLM)	400	57.9
Time Constraints (class duration, no time for preparation, resource development, back to back period, staff limitation as well as staff gap)	248	35.9
No Idea (Blank or Don't Know Responses)	85	12.3
Textbook Scope Issue	63	9.1
Other Minor Challenges (scattered responses)	83 (remaining)	12.0

4.5.2 Challenges in Applying Creative thinking

The category 'Challenges in Applying Creativity' provides insight into the obstacle for academics to integrate creativity in teaching practice in a way that is useful. 73.1%% responses mentioned that classroom control concerns is one of the big challenge for creative activities in the classroom. According to CT_{33}, *"In my class, it's very difficult to maintain classroom control if I add some creative activities."* 43.3%, 40.1%, and 37.2% responses mentioned time constraints, lack of confidence and limited resources respectively are the challenges for apply creative thinking skill in the classroom. Some of the responses (27.4%) said that they didn't willing to apply creative thinking skills as they consider mistake as weakness. 13.6% responses have 'No idea' how to apply creative thinking skill in the classroom. The last group of other responses (all less than 1 percent each) refers to everything from student lack of attention, lack of participation, personal problems, the

inclusion of students with special needs, and pressure on curriculum. Such small responses, while individually rare, add up to a spectrum that reflects the complexity of educator environments and the need for regionally specific considerations in edtech innovation.

Table-06: Challenges of Creativity Practice

Challenge Theme	**Frequency (N-691)**	**Percent (%)**
Classroom control concerns	505	73.1
Time constraints	299	43.3
Lack of Confidence	277	40.1
Limited Resources	257	37.2
Resistance to Creativity (mistake as weakness)	189	27.4
No Idea	94	13.6
Other Minor/Scattered Challenges (teacher feels insecurity) (each <1%)	107 (approx.)	15.5

4.5.3 Challenges in Applying problem solving skill

The frequency analysis of challenges to the application of problem-solving skills demonstrates clustering of responses about different themes. 37.8%, 37.3%, 35.5%, 31.8%, and 27.9% responses faced challenges like group work problems, lack of confidence, time constraints, lack of students concentration, and insufficient resources respectively. 26.0% responses mentioned that students hesitate to attempt solutions. Some of the responses (18.2%) mentioned that unequal participation i.e. dominant students take over, are also another problem to apply this skill in the classroom. According to PS_{266}, *"If I give any task to solve a problem, advanced students solve quickly and slower students can't do."*

Notably, 15.8% of participants replied 'no idea,' suggesting a lack of understanding as to how to think or even categories barriers to teaching problem-solving.

The remaining responses state (about 17.4%) random other minor problems such as absent students, overcrowded classrooms, unskilled teachers and unsupportive parents. While each of these is relatively uncommon, they collectively illustrate the complexity and diversity of classroom situations in which doing mathematics is expected to occur.

Table-07: Challenges in problem solving

Challenge Theme	**Frequency (N-691)**	**Percent (%)**
Group Work Problems	261	37.8
Lack of Confidence	258	37.3
Time Constraints	245	35.5
Lack of Concentration	220	31.8

Insufficient Resources	193	27.9
Student-Level Challenges (Students hesitate to attempt solutions)	180	26.0
Unequal Participation: Dominant students take over	126	18.2
No Idea (Unspecified Conceptual Gap)	109	15.8
Minor Scattered Responses (Each <1%)	~120	~17.4

4.5.4 Challenges in Applying self-management skill

It is very challenging to establish reflection of self-management skill at students' home, the teachers (65.27%) said students have limited opportunities to practice what they have learnt at school. The teachers (45.59%) said that for practicing self-management skills are a biggest challenge because of time management at each period. Goal setting is another problem for the teachers (27.64%). Teachers (22.29%) also said that students are not aware regarding self-management skills. Some of the teachers (16.35%) mentioned that teachers don't feel any accountability to teach students self-management skill. Some of the teachers (14.18%) said that norms at school and home are totally different, most of the students come from low economic status family. Even 15.63% teachers mentioned that they don't have any idea regarding practicing self-management skills with the students.

Table-08: Challenges in Self-management

Challenge Theme	**Frequency (N-691)**	**Percent (%)**
Limited Reflection (no opportunity student practice)	437	65.27
Time Management	315	45.59
Goal Setting	191	27.64
Inconsistent Modeling (every teacher dissimilar practice)	147	21.27
Unawareness	154	22.29
Accountability	113	16.35
No idea	108	15.63
Norms (self-management challenging at home)	98	14.18
Minor Scattered Issues (each <1%)	~105	<1% each

4.5.5 Challenges in Applying Decision Making Skill

The respondents responded that the major challenges teachers face in applying decision-making skills in classrooms are primarily student-related and pedagogical in nature. The most significant barrier is student resistance to decision-making (31.98%), indicating a tendency toward dependence on teacher-directed instruction. Time constraints (25.90%) and difficulty managing group activities (23.15%) further limit the implementation of complex, discussion-based tasks. A notable proportion of teachers (22.72%) reported lacking clear understanding of how to teach decision-making skills, highlighting a professional development gap. Additional challenges include lack of real-life relevance (18.67%), weak student critical reflection (17.51%), insufficient information for informed decisions (14.04%), and difficulty balancing task complexity with student ability (13.17%). Assessment of decision-making processes (11.29%) and minor systemic issues such as infrastructure constraints also contribute. Overall, the findings suggest that strengthening teacher capacity, promoting learner autonomy, and providing structured pedagogical guidance are essential for effectively integrating decision-making skills into classroom practice.

Table-09: Challenges in Decision Making

Challenge Theme	**Frequency (N-691)**	**Percent (%)**
Student Resistance to Decision-Making	221	31.98
Time Constraints for Complex Tasks	179	25.90
Difficulty in Managing Group	160	23.15
No Idea / Lack of Understanding	157	22.72
Lack of Real-Life Relevance	129	18.67
Student Lack of Critical Reflection	121	17.51
Insufficient Information for Informed Decisions	97	14.04
Balancing Decision Complexity with Student Abilities	91	13.17
Difficulty Evaluating Decision-Making Processes	78	11.29
Scattered Minor Challenges (e.g., infrastructure, parent support, etc.)	82 (approx.)	~11.87%

4.5.6 Challenges in Applying Communication Skills

The respondents responded that the most prominent challenges teachers face in applying communication skills are student reluctance (32.85%) which means students are unwilling to talk; this may be learner reticence, apprehension, shyness or demotivation to talk, closely followed by classroom management issues (32.27%), and lack of student concentration (30.25%). These findings suggest that learner engagement and behavioral management are the dominant barriers to effective classroom communication. Time constraints (27.50%)

also significantly limit teachers' ability to communicate interactively, while no idea responses (23.30%) and unspecified or blank responses reflect either uncertainty or limited awareness about communication challenges. Structural and contextual barriers such as language barriers (21.71%), lack of feedback (20.69%), and cultural barriers (14.91%) further hinder effective interaction between teachers and students. Although technology challenges (5.35%) appear comparatively low, they still indicate emerging digital communication difficulties. Everything else comes down, along the line, to a whole host of specific concerns—students who are scared, are staying away, or whose parents are indifferent; material concerns like overcrowding and the absence of IT material. While none of the experiences were reported by more than 1% of respondents, these are the complex day-to-day realities of educators.

In summary, the development of communication skills is influenced – by the psychological factors on the part of the learner and – by systemic structural factors and any intervention needs to be targeted at both levels: for the students – to be motivated and engaged and for teachers – to be able to navigate through the cultural, linguistic, and managerial challenges.

Table-10: Challenges in Communication skill

Challenge Theme	Frequency (N-691)	Percent (%)
Student Reluctance	227	32.85
Classroom Management Issues	223	32.27
Time Constraints	190	27.50
Lack of Student Concentration	209	30.25
Language Barrier	150	21.71
Lack of Feedback	143	20.69
Cultural Barriers	115	14.91
Technology Challenges	103	5.35
Overemphasis on Written Communication	37	21.56
No Idea	149	23.30
Generic/Unspecified or Blank Responses	161	32.85
Minor Scattered Challenges (each <1%)	~50	~7.24%

4.5.7 Challenges in Applying Life Skills

A large number of respondents responded that the most prominent challenges teachers face in applying life skills in classrooms are lack of student engagement (32.4%); This may reflect a situation in which too many students could not be inspired or perceive the

relevance of life skills due to the mismatch with their life realities, social or cultural resistance (31.1%), suggesting that motivational barriers and community attitudes significantly affect implementation. A substantial proportion of teachers also reported no idea (27.9%) how to teach life skills in the classroom, indicating deficient training or curriculum vagueness, reflecting uncertainty or insufficient conceptual clarity about life skills education itself. Structural constraints are similarly evident, with lack of resources (27.5%) and curriculum constraints (26.6%) indicating systemic and institutional barriers. Additionally, diverse student needs (21.6%) highlight difficulties in adapting life skills instruction to varied ability levels and backgrounds. In contrast, comparatively fewer teachers identified difficulty in assessing life skills (7.7%), suggesting that foundational understanding and contextual challenges outweigh technical evaluation concerns. The presence of scattered minor challenges (~13.31%) further reflects diverse but less dominant issues.

Table-12: Challenges in applying Life skills

Challenge Theme	**Frequency (N-691)**	**Percent of Cases (%)**
Lack of Student Engagement	224	32.4%
Social or Cultural Resistance	215	31.1%
No Idea	193	27.9%
Lack of Resources	189	27.5%
Curriculum Constraints	184	26.6%
Diverse Needs (Students' different ability levels, etc.)	149	21.6%
Difficulty Assessing Life Skills	53	7.7%
Scattered Minor Challenges (each <1%)	~92	~13.31%

4.5.8 Challenges in Applying Cooperation Skills

In short, that reason for an inability to implement cooperability is research data supporting this aspect of the group dynamic teachers experience in their regular classrooms. This was followed by the issue of number of group conflicts/arguments (34.2%) indicating interpersonal tensions that undermine cooperative learning environments. Unequal participation (30.8%), which revealed that some students take charge of groups and others do not participate or are indifferent, is also critical.

Student Resistance and Time Limitations (29.7%) were another commonly selected obstacle, cited by 29.7% of respondents in each case. These findings suggested that inadequate learning units and efficiency of scheduling are two causes of the problem for

making cooperative learning effect. But up to 26.3% of teachers just don't know how to teach this – a testament for training or conceptualization.

Communication problems (25.9%) mainly stem from linguistic and social differences, mostly in multilingual and intercultural contexts, where such obstacles are often difficult to avoid. Problems of 'control in the classroom' (15.6%) and of balancing roles in group work (12.2%) appeared to be central even for accommodating group work as a pedagogical affordance.

Smaller hindrances in the aggregate (<1% each), but collectively of much greater representation (15.2%), reflect the complex, varying circumstances of teachers' classrooms: The missing student; the lost way; the unready teacher; exceptional needs group, and unsupportive family. There are also social disparities: poverty, linguistic diversity and religious or racial rifts that indirectly can hinder the capacity to cooperate.

Table-13: Challenges in Applying Cooperation skills

Challenge Theme	**Frequency (N-691)**	**Percent (%)**
Group Conflicts / Quarrels	236	34.2%
Unequal Participation	213	30.8%
Student Reluctance	205	29.7%
Lack of Time	205	29.7%
No Idea	182	26.3%
Communication Barriers	179	25.9%
Classroom Management Challenges	108	15.6%
Balancing Roles in Group Activities	84	12.2%
Minor Scattered Issues (each <1%) i.e. student absenteeism, unprepared teachers, unsupportive family, poverty, linguistic/religious diversity	~105	<1% each 15.2%

4.5.9 Challenges in Applying Global Citizenship Skills:

The findings revealed that teachers faced both conceptual and structural barriers in applying Global Citizenship skills in classrooms. The most dominant challenge is 'No idea/Don't know' (36.2% of cases), indicating substantial conceptual ambiguity and limited clarity in teacher preparation and curriculum guidance regarding global citizenship education. Structural constraints are equally significant, as lack of student engagement (32.9%) and lack of resources such as materials and budget (32.9%) suggested inadequate institutional support for delivering globally oriented, interactive learning experiences. Contextual

diversity further complicates implementation: cultural barriers (25.6%) and linguistic barriers (21.9%) reflected challenges in addressing multicultural classroom realities and fostering inclusive dialogue around global values. Additionally, lack of ICT skills (19.7%) highlights teachers' limited capacity to leverage digital platforms that connect learners to global perspectives. The abstract nature of global citizenship concepts (11.4%) also makes it difficult for teachers to translate broad, theoretical ideas into practical classroom activities. While minor scattered challenges account for a small proportion (<1% each), they point to contextual issues such as exam orientation and social biases. Overall, the data suggest that insufficient conceptual understanding, limited resources, and contextual diversity collectively hinder effective integration of Global Citizenship skills in schools.

Table-14: Challenges in applying Global Citizenship skills

Challenge Theme	Frequency (N)	Percent (%)
No idea / Don't know	250	36.2%
Lack of Engagement	227	32.9%
Lack of Resources (Materials, Budget)	227	32.9%
Cultural Barrier	177	25.6%
Linguistic Barrier	151	21.9%
Lack of ICT Skills	136	19.7%
Abstract Concept Difficulty	79	11.4%
Minor Scattered Challenges (<1% each)	71	<1% each

4.5.10 Challenges in Applying Literacy and Numeracy

The analysis of responses (N = 691) revealed that teachers faced multiple and layered challenges in applying literacy and numeracy skills in classrooms. The most frequently identified structured challenge was varied skill levels (35.6%), indicating difficulty in addressing diverse student competencies within the same classroom. Closely related, reading and word recognition problems (31.4%) highlighted foundational literacy gaps that hindered effective numeracy and broader academic learning. A significant proportion of respondents reported time constraints (27.2%), suggesting overloaded curricula or insufficient instructional time to provide targeted support. Additionally, student disengagement (20.0%), attendance issues (22.1%), and poverty (12.4%) point to socio-economic and motivational barriers affecting learning continuity and participation. Concerns about contextual relevance (18.4%) suggested that some curriculum contents may not align with students' lived realities or linguistic backgrounds. Remarkably, 29.4% reported 'no idea or unclear responses', indicating conceptual or pedagogical uncertainty among teachers, while a high rate of unlabelled/blank responses (39.1%) may reflect non-response or limited clarity about the issue. Minor isolated challenges (each <1%) further demonstrate scattered operational difficulties: lack of concentration, attention distractions,

unskilled staff, no use of technology and lack of cooperation from parents (all < 0.5%) that together form a much more detailed picture of micro-level disruptions.

Table-15: Challenges in Applying Literacy and Numeracy skills

Challenge Theme	Frequency (N-691)	Percent (%)
No idea / unclear responses	203	29.4%
Varied Skill Levels (Reading and others)	246	35.6%
Contextual Relevance (inappropriate content)	127	18.4%
Unlabelled/blank (likely non-response error)	270	39.1%
Time Constraints	188	27.2%
Disengagement	138	20.0%
Reading and Word Recognition Problems	217	31.4%
Attendance Issues	153	22.1%
Poverty	86	12.4%
Minor/Isolated Challenges (each < 1%): e.g., lack of training, support, interest	~65	< 0.5% each

4.5.11 Challenges in Applying Digital Literacy Skills

Analysis of the data (N = 691) showed that the most significant challenges in applying digital literacy skills are infrastructure- and access-related. Technical problems (43.7%), including device malfunction, electricity shortages, and unstable internet connectivity, rank highest, followed closely by lack of access (42.1%), indicating major systemic gaps in digital infrastructure. Capacity-related issues are also substantial: limited experience (30.1%), lack of training (27.2%), and 'no idea' (28.2%) suggested insufficient teacher preparedness and conceptual clarity about digital literacy. Additionally, security concerns (18.5%) reflected growing awareness of online safety, privacy, and cyber risks in digital learning environments. Beyond these primary themes, a large proportion of respondents (~57.7%) reported other interconnected challenges such as disinterest, inadequate ICT knowledge, lack of devices, limited parental support, absenteeism, and weak accountability mechanisms.

Table-16: Challenges in applying digital literacy skills

Challenge Theme	Frequency (N-691)	Percent (%)
Technical Problems (Devices, Electricity, Internet)	302	43.7%
Lack of Access	291	42.1%
Limited Experience	208	30.1%
No Idea	195	28.2%
Lack of Training	188	27.2%
Security Concerns	128	18.5%
Other Challenges (Disinterest, Lack of Knowledge, Lack of ICT Knowledge, Lack of Devices, Parents Not Supportive, Absenteeism, No Accountability, etc.)	~399	~57.7%

4.5.12 Overall Challenges for Applying the 21st Century Skills

Analysis of the data (N = 691) revealed that the most significant barriers to implementing 21st century skills were systemic and socio-environmental rather than purely pedagogical. Lack of parental awareness (47.5%) appears as the leading constraint, indicating weak home–school alignment in supporting skills such as critical thinking, creativity, and collaboration. Structural limitations follow closely, including lack of resources (45.2%), infrastructural problems (44.1%), and technological barriers (42.3%), suggesting that schools often lack the physical and digital ecosystems required for skills-based learning. Human capacity challenges were also prominent, with lack of professionalism (43.3%), inadequate classroom size (41.5%), curriculum constraints (41.2%), and insufficient monitoring (39.7%) reflecting institutional rigidity and limited instructional flexibility. Meanwhile, notable proportions reporting lack of knowledge (22%), lack of ICT knowledge (21.7%), and no accountability (20.5%) indicate gaps in teacher readiness and governance structures. Secondary but meaningful challenges such as student absenteeism (17.7%), and security concerns for doing something new or innovative (17.4%) highlight contextual and socio-cultural barriers. Overall, the findings suggest that embedding 21st century skills was constrained by an interconnected web of parental disengagement, infrastructural deficits, professional capacity gaps, and systemic policy limitations, requiring a comprehensive reform approach rather than isolated interventions.

Table-17: Overall Challenges

Challenge Theme	Frequency (N-691)	Percent (%)
Lack of Parental Awareness	328	47.5
Lack of Resources	312	45.2
Infrastructural Problems	305	44.1
Lack of Professionalism	299	43.3
Technological Barriers	292	42.3
Inadequate Classroom Size	287	41.5
Curriculum Constraints	285	41.2
Insufficient Monitoring	274	39.7
No Idea	152	22.0
Lack of Knowledge	152	22.0
Lack of ICT knowledge	150	21.7
No accountability	142	20.5
Student absenteeism	122	17.7
Security concern (for doing innovative something, guardian may not allow)	120	17.4

4.5.13 Suggestions for Mitigating Challenges

This table shows the variety and frequency of ideas offered by respondents to address the challenges of integrating 21st century skills within curricula. The majority (73.8%) of suggestions for change were nonspecific, suggesting there is either no clear vision of what can be improved or a comprehensive perception of what can be improved.

Regarding organized forms of support, aspects of professional development were the most commonly suggested (57.2%), where there was a clear focus on the importance of training, mentorship, and pedagogical growth to develop teachers. Following closely were parent involvement (49.9%) and curriculum flexibility (37.4%), which indicated the significance of family participation and customizable instructional material.

Lack of funding (28.0%) suggested systemic financial limitations, while collaboration (33.0%) referred to the need for closer collaboration between schools, communities and other key actors. One in five (22.2%) of the respondents said they do not know what to do about the problems, indicating confusion, lack of training or apathy.

Some smaller but more varied (classroom resources, teacher recruitment, attendance, infrastructure and accountability) were sprinkled throughout low-frequency responses.

These provide context specific information and also give micro-level understanding of the gaps in the educational attainments at localized level.

Table-18: Suggestion for overcoming challenges

Suggestion Theme	Frequency (N-691)	Percent (%)
Professional Development	395	57.2%
General/Unspecified Suggestions	509	73.8%
Curriculum Flexibility	258	37.4%
Increased Funding	193	28.0%
Parent Engagement	344	49.9%
Collaborative Networks	228	33.0%
No Idea	153	22.2%
Other (e.g. monitoring, training, infrastructure, etc.)	115	15.8% (combined small items)

Variation of 21 century skills concept in terms of demographic characteristics

Variation of 21st century skills concept in terms of Designation, Gender, School Grade and School Location:

Following the large-scale T-test analysis over four main categorical variables - Designation, Gender, School Grade, and School Location - for 14 competencies commensurate with the competencies and two or more local schools, a number of interesting observations can be made with regards to the variability of teachers' perceived understanding/practice of 21stcentury competencies.

First, in the construct areas of Pedagogical Knowledge (1.2) and Technology Use (2.2), there were not any statistically significant differences based on any of these demographic characteristics, indicating an equal level of understanding relative to the foundational understanding across each group of teachers. However, Knowledge Integration (3.2) was significantly differently by School Location ($p = 0.023$) suggesting that urban teachers

might have more interdisciplinary teaching opportunities as a result of better resources and collaborative facilities.

In relation to Critical Thinking (4.2), it was observed a relevant difference in School Grade (p = 0.044). This could be interpreted as meaning that their teachers (primary teachers) are likely to facilitate them more in the critical thinking process compared to the primary students. On the other hand, Creativity (6.2), Self-Management (8.2) and Problem Solving (10.2) did not differ between any of the groups, indicating the same focus on or training in these skills regardless the profession.

For Decision Making (10.5), School Grade correlated significantly (p = 0.020), again suggesting that older teachers may be faced with a wider range of decisions, be they curricular or administrative. In the case of Communication Skills (11.2); Designation (p = 0.036) and School Location (p = 0.000) was found significant indicating that positions having leadership responsibilities (such as head teachers) and urban educational setting may provide more enhanced communication means and higher level of expectations.

A clear trend is also observed with Life Skills (13.2), Cooperation (15.2), Global Citizenship (17.2), Literacy & Numeracy (19.2), and Digital Literacy (21.2). All were significantly different by School Location with p values between 0.0 to 0.1. That's a pretty stark rural-urban split. It is reasonable to assume that urban teachers have more opportunity for organized programming, access to ICT equipment and for participation in global learning networks and cooperative practices, as opposed to their rural counterparts, who may be more constrained by infrastructural and systemic aspects.

On the whole, School Location is a predominant demographic correlate for levels of advanced and integrated skills. On the other hand, Designation and Gender are of marginal interest and only sometimes relevant in certain skills. School Grade impacts several cognitive mental faculties such as decision making and critical thinking.

These results make the case for context-aware training regimes. Reconcile the urban-rural divide in skills Support to prepare people in digitally excluded areas to use technology, and support for collaborative teaching, greater awareness of the world in a rural school context is needed. These interventions may be useful in promoting an equitable uptake of skills in different educational contexts.

Table-19: Variation of concept in terms of Designation, Gender, School Grade and School Location

Competency Code & Name	p (Designation)	p (Gender)	p (School Grade)	p (School Location)
1.2 Pedagogy	0.380	0.070	0.397	0.189
2.2 Technology Use	0.584	0.132	0.730	0.064

3.2 Knowledge Integration	0.814	0.358	0.632	0.023
4.2 Critical Thinking	0.476	0.158	0.044	0.514
6.2 Creativity	0.439	0.538	0.419	0.315
8.2 Self-Management	0.720	0.271	0.867	0.506
10.2 Problem Solving	0.396	0.710	0.508	0.003
10.5 Decision Making	0.447	0.654	0.020	0.703
11.2 Communication	0.036	0.763	0.949	0.000
13.2 Life Skill	0.624	0.348	0.523	0.003
15.2 Cooperation	0.307	0.682	0.786	0.000
17.2 Global Citizenship	0.056	0.646	0.341	0.000
19.2 Literacy & Numeracy	0.040	0.284	0.975	0.000
21.2 Digital Literacy	0.164	0.289	0.246	0.000

Difference in terms of Academic Qualification

The bar diagram shows a juxtaposed view of the self-perceived competencies of the teachers in various levels of educational qualifications, namely, SSC, HSC, Hon's (pass course) and Masters, in terms of the percentage of teachers according to three categories, that is, Sufficient, Partial and Not sufficient. A clear trend is that teachers with higher qualifications, and in particular those with a Master's degree and above, have a higher rate of feeling to have knowledge in the practice way, and to judge themselves as Sufficient in all 14 skills. On the other hand, teachers of SSC and HSC academic background are more likely to perceive themselves as "Partial" or "Not Sufficient" indicating their less confidence on preparedness. Ton's degree holders are somewhere in the middle as somewhat skilled individuals. This is particularly true in the domains of pedagogy, use of technology, decision-making, and communication. The overall pattern is the overriding positive relationship between academic qualification and self-reported competence, with the advanced education and continual professional development being key instruments to ensure teacher capacity-building and bridging the competence divide over the qualification levels.

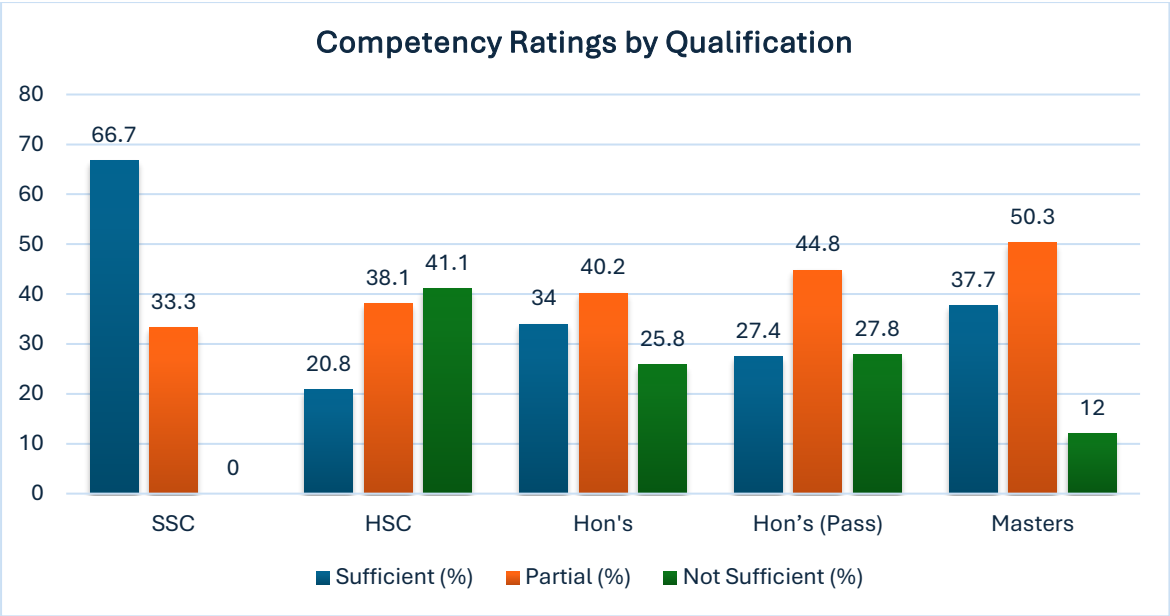


Figure-12: Competency Rating by Educational qualifications

However, the results of the Kruskal-Wallis analysis on the teachers' competencies with different educational qualification level is somewhat mixed. The Competences of Pedagogy, Technology Use, Critical Thinking, Self-Management, and Decision-Making did not present statistically significant differences suggesting a homogeneous understanding over these abilities for the level of qualification. But strong differences were detected for some more advanced/ integrative competencies like Knowledge Integration ($p = 0.002$), Communication ($p = 0.003$), Life Skills ($p = 0.007$), Global Citizenship ($p = 0.001$), Literacy & Numeracy ($p = 0.044$), and Digital Literacy ($p = 0.001$). The evidence from the findings indicates that teachers with higher degrees (Master's) have higher awareness and self-assessment of their proficiency in cross-disciplinary, digital, and global competencies. This suggests the importance of targeted professional development for teachers with less formal education, in those areas most in need of 21st century teaching integration and global understanding.

Table-20: Differences in concept in terms of Academic Qualifications

Competency Code & Name	H-statistic	p-value	Significance
1.2 Pedagogy	3.772	0.287	Not Significant
2.2 Technology Use	3.432	0.330	Not Significant
3.2 Knowledge Integration	15.177	0.002	**Significant**
4.2 Critical Thinking	3.495	0.324	Not Significant
6.2 Creativity	7.627	0.054	Borderline

8.2 Self-Management	1.014	0.798	Not Significant
10.2 Problem Solving	2.094	0.718	Not Significant
10.5 Decision Making	1.402	0.877	Not Significant
11.2 Communication	14.071	0.003	**Significant**
13.2 Life Skill	12.038	0.007	**Significant**
15.2 Cooperation	5.197	0.158	Not Significant
17.2 Global Citizenship	18.711	0.001	**Significant**
19.2 Literacy & Numeracy	8.077	0.044	**Significant**
21.2 Digital Literacy	18.972	0.001	**Significant**

In terms of Division:

The summary table illustrates the average competency ratings across 14 educational skill domains by division, and demonstrates distinct regional variations in teacher-reported knowledge. And Dhaka teachers have on average the lowest mean scores in nearly all categories especially in creativity and technology use and therefore seem that there is a pressing need for targeted support and development in the capital. Comparatively, Barishal and Sylhet divisions have the highest average scores especially in case of digital literacy, life skills and decision making, indicating better professional confidence and exposure in these areas. Mymensingh and Rajshahi are of the middle category (moderate perceived competence with relative strength in critical thinking and problem-solving). The other digital and integrative domains have relatively balanced distributions in Khulna, Chattagram, and Rangpur (and clustered in the middle), but all lag behind the capital. Results from an ANOVA and Tukey/Scheffé post-hoc testing indicate that statistically significant ($p < 0.05$) regional differences exist and demonstrate a demand for geographically focus interventions that target teacher preparation and teacher professional development.

Table-21: Combined summery table of mean scores by division

Division	1.2 Pedagogical Knowledge	2.2 Technology Use	3.2 Knowledge Integration	4.2 Critical Thinking	6.2 Creativity	8.2 Self-Management	10.2 Problem Solving	Application of Decision-Making Skill	11.2 Communication	13.2 Life Skill	15.2 Cooperation	17.2 Global Citizenship	19.2 Literacy & Numeracy	21.2 Digital Literacy
Dhaka	1.59	1.46	1.77	1.50	1.27	1.46	1.73	3.11	1.41	1.61	1.57	1.88	1.64	1.50

Chattagram	1.64	1.57	1.68	1.58	1.75	1.75	1.82	3.10	1.64	1.76	1.78	1.97	1.76	1.81
Rangpur	1.60	1.64	1.93	1.67	1.75	1.93	2.02	3.63	1.71	2.22	1.86	2.23	1.88	2.25
Khulna	2.01	1.92	2.04	1.91	1.96	1.92	2.03	3.32	2.03	2.08	1.99	2.04	2.01	2.02
Rajshahi	2.05	2.05	2.28	2.17	2.12	2.14	2.32	3.84	2.16	2.20	2.16	2.42	2.36	2.34
Barishal	2.09	2.24	2.36	2.39	2.34	2.43	2.62	3.92	2.45	2.58	2.60	2.73	2.50	2.67
Mymensingh	2.16	2.04	2.21	2.13	2.03	2.04	2.29	4.09	2.19	2.30	2.21	2.38	2.40	2.31
Sylhet	2.30	2.27	2.34	2.30	2.28	2.49	2.54	3.47	2.35	2.62	2.51	2.68	2.35	2.36

In terms of Year of Experience:

On the other hand, the ANOVA factor examination of the impact of years of teaching experience showed that years of experience does not have a significant effect in the majority of core teaching competencies. Among 14 competencies evaluated, only in Communication Skills (11.2) a significant difference have seen statistically significant difference in terms of different experience levels ($F = 3.405$, $p = 0.017$). This indicates that teachers are more effective, with respect to expressing concepts, guiding student talk, and engaging with others, the longer they teach. Yet, on all other competency areas (Curricular Knowledge, Technological Knowledge, Critical Thinking, Problem-Solving, Digital Literacy), there were no significant differences ($p > 0.05$). This sameness can be taken to mean that just plowing on through the years in the job doesn't ensure that a teacher will become better or any more enlightened about these matters. It may reach a plateau instead of being enhanced through continuous training, exposure to innovative techniques, or self-reflection. Accordingly, teacher learning should be continued from the onset to the end of a teaching career, not just left to experience.

Table-22: Variation in of concept in terms of year of Experiences

Competency Code & Name	F-value	p-value (Sig.)	Significance
Critical Thinking	2.372	0.069	Marginal (NS)
Creativity	1.379	0.248	Not Significant
Self-Management	0.510	0.676	Not Significant
Problem Solving	1.522	0.208	Not Significant
Decision Making	1.593	0.190	Not Significant
Communication	3.405	0.017	**Significant**
Life Skills	0.871	0.456	Not Significant
Cooperation	0.338	0.798	Not Significant
Global Citizenship	0.938	0.422	Not Significant
Literacy & Numeracy	1.673	0.172	Not Significant
Digital Literacy	0.245	0.865	Not Significant

21st Century Skills Gaps

It also highlights notable barriers for teachers in teaching more advanced 21st century skills, including global citizenship, digital literacy and self-management—skills that are core to the 21st Century Skills Framework. For example, global citizenship was identified as one of the areas teachers were the least developed in, with 35.2% needing help to grasp and teach it. This is also manifested by teachers' self-reports on digital literacy, whereby 29.5% of participants indicated a need for support in acquiring greater understanding about such an invaluable skill. In addition, these findings not only highlight a mismatch between teachers' self-reported confidence in teaching these skills and actual readiness but also resonates with the 21st Century Skills Framework that emphasizes developing competence in addressing these skills to ready students for a globalized, technology-infused world. But the ambiguity around and effective teaching of these competencies, highlighted through research, serves as a barrier to unlocking what these frameworks offer.

Cognitive and Communication Skills: A Disconnect

It is also established that there is a significant gap between teachers' perceived knowledge and actual expertise on the cognitive and communication competences essential for 21st century learners. It was interesting that the teachers scored their understanding of the communication as "Good" in 44.6% while only 24.7% of them could demonstrate good application in classroom. It is a sobering prompt that, no matter how much teachers recognise abstract statements about the significance of communication and critical thinking in learning, its practical application in the classroom falls well short. The results of the data analysis indicate that teachers have knowledge of 21st century skills, but in practice do not always possess competence or “instruments” to turn this theoretical conceptual frame into teaching tool (which is a potential problem—the point considered as crucial by researchers who follow the 21st Century Skills Framework and claim it does not prepare students for reality).

Chapter 5. Key findings and Discussions

Teachers mentioned that they generally used presented problems or problems solving, visual tools within lessons, discussion, gathering opinions, offer to analyses, testing, and reflecting students thoughts, questioning, debating, science project etc to teach critical thinking skills in the classroom. Bloom (1964) said that analysis, synthesis, and evaluation justify debates, testing ideas, and reflective questioning can promote critical thinking among the students. Classroom strategies like discussion, metacognition, reflection, and gathering opinions etc. can help to be a critical thinker (Costa & Kallick, 2000). OECD (2018) links strategies like inquiry, problem solving, and reflection with critical thinking outcomes. For developing decision making skill, voting on class rules, rotating leadership roles, shared responsibility, simple consequence maps, act out situations, story ending decision etc are more prominent (Macklem, 2021; Shek, Chau & Lee, 2025). Research indicates that lesson-appropriate instructional strategies, problem identification, team-based learning, reading and interpreting problem situations, and analysis of information are effective techniques for developing students' decision-making skills by strengthening reasoning, collaboration, and reflective judgment (OECD, 2019; McLaughlin, 2014; Macklem, 2021), the findings are also the same.

Teachers responded that they used some strategies for developing creative thinking skills (e.g., solving problems, real-life problem contexts, idea generation, analyzing visuals, questioning, alternative thinking, reflection, mind maps, projects, writing, gathering opinions, debates, drawing). Though there are a lot of techniques for developing creative thinking skills like project-based & real-world problem solving, brainstorming & divergent thinking techniques, think-pair-share, open ideation, mind map, creative writing, creative reflection, expression, discussion, debate, gathering opinions, peer exchange, connecting activities, social problem solving etc. are proposed (Yamin, Permanasari, Redjeki, & Sopandi, 2020); Muhammad, & Abdallah, 2021); Rosen, Stoeffler, & Simmering, 2020).

The findings like greeting practices, non-verbal communication (eye contact and gestures), digital communication, presentation activities, collaborative writing, and interaction with teachers, sharing ideas, group discussion, and debates are effective strategies for

developing students' communication skills are also supported by many researches (Dede, 2007; CAIE, 2018; Andrade, 2016).

1. 21st century skill gaps: Global citizenship, digital literacy and self-management

The research also shows some of the areas where teachers have limited understandings about 21st century skills, with global citizenship, digital literacy and self-regulation emerging as key areas for development. For example, support to make sense of global citizenship (35.2% of teachers) and in developing digital literacy skills (29.5%) were mentioned as some of those needs. These results are consistent with a wider need to prepare teachers to teach these critical skills, given the focus on competencies beyond subject matter knowledge in the global economy and digital age.

The level of teachers' preparedness for teaching global citizenship is even more alarming, given that according to UNESCO (2015) and Griffin et al. (2012), global citizenship education plays a vital role in our interconnected world. This view is reflected in the newly developed Bangladesh National Curriculum (NCF, 2021) which encourages education to reflect global perspectives, cultural sensitivity and sustainable development. Although not all teachers do need help in these areas, the large percentage of them who do is indicative that there is a lack of adequate coverage, as part of the pre-service training, surrounding aspects of the curriculum.

There were also low perceptions of understanding in digital literacy (another key component of 21st Century Skills Framework), with only 29.5% reporting that they needed support to understand this concept. The Partnership for 21st Century Skills (P21, 2009) asserts that digital literacy is critical to students' future success in a world where they must not only use digital tools but also be able to navigate and participate critically within the new environment. These findings are consistent with those of Voogt & Roblin (2012) who argue that teachers face difficulties teaching digital literacy because they lack the preparation to do so and need more resources.

In addition, self-discipline skills, essential to ensure personal responsibility and life readiness were another area of teacher misgivings. There was a 29.8% (n = 26) need for teachers to have guidance in the area of teaching self-management, an ability necessary for

students to effectively manage their learning and emotional aspects. This result refers to the work of Zhao (2012) who speaks that self-management and emotional intelligence are important aspects in teacher education, albeit often forgotten in the context of a 21st century learning environment.

2. Gaps in 21st century Skills: Global Citizenship, Digital Literacy, and Self-Management

It also highlights the significant deficit in teacher knowledge about 21st century skills, including those in global citizenship, digital literacy and self-management. For example, 35.2% of teachers said they required assistance to understand global citizenship and 29.5% reported that this was the case for digital literacy issues. These results echo a larger problem in properly training teachers to teach such vital skills, since the needs of the global economy and our digital age are emphasizing competencies even beyond fundamental knowledge.

Teachers' unreadiness in delivering global citizenship education is worrisome especially when UNESCO (2015) and Griffin, McGaw, & Care (2012) insist that education for global citizenship is inevitable in the highly interconnected world. This idea also resonates with NCF (2021) of Bangladesh, which advocates including global perspective, cultural sensibility and sustainable development in education. But the high proportion of teachers who need support in this area indicates that some dimensions of the curriculum are not well enough incorporated into teacher training.

Digital literacy, another important dimension of the 21st Century Skills Framework, received low levels of understanding as well with 29.5% of teachers reporting needing support on this topic. Digital literacy is crucial for future successes of students but also in using digital tools and participating critically in the global digital society (Partnership for 21st Century Skills -P21, 2009). This finding is consistent with that of Voogt & Roblin, (2012) which indicates that teachers have always faced challenges in teaching digital literacy due to poor training and insufficient resources.

Further, self-regulation skills for personal responsibilities and life capabilities were other aspects in which the teachers felt less prepared. 29.8% of teachers indicated a need for support to teach self-management, an ability that is crucial for students when it comes to managing their learning and regulating emotions. This result chimes with that of Zhao

(2012) who states that self-management and emotional intelligence are poorly attended to in teacher preparation, even though they are important components of 21st century learning.

3. Disconnection between Perceived and Actual Understanding of Cognitive and Communication Skills

One of the key themes that emerges from this study is the disjunction between teachers' established and reported knowledge of skills. Though 44.6% of teachers judged their comprehension as "Good," only 24.7% displayed adequate use of communication skills in teaching positions. Likewise, 41.2% of the teachers had a good understanding about critical thinking, but they were unable to use these skill in the classroom.

This mismatch highlights the distinction between theory and practice – a gap often discussed in academic writing. For example, Wenglinsky (2000) points out that teachers' ability to comprehend advanced cognitive skills is not always represented in effective teaching practices and this may be due to the lack of strategies enabling them to integrate such skill into their lessons. Along the same lines, Kennedy (2016) contends that teachers know what critical thinking is in theory but are having a problem designing learning activities that promote high-level thinking and problem solving.

Also, the results are consistent with Hattie's (2009) studies that showed there is a well-documented gap between teachers' perceived knowledge and application of knowledge in classrooms based on research. This highlights the need for a practice based in service professional development/learning of equipping teachers with practical tools and strategies to apply these skills in authentic classroom settings.

4. Regional Disparities: Urban vs. Rural Divide in Skill Development

A further important finding in this research is the gap between urban-rural teachers in their self-reported competencies. Urban teachers had significantly higher competence in digital literacy, global citizenship and problem-solving skills than rural teachers. These results seem to support the inference that as urban teachers have more resources, such as technology and professional development opportunities (cf. OECD, 2019), they can implement with higher quality.

It is well documented that rural and urban areas are very distinct from each other. Hennessy et al. (2005) also identified that teachers in schools with rural and remote locations encounter challenges of access to technology and professional development, which restrict their capacity to teach 21st century advanced skills. Urban teachers, however, have a better chance of integrating digital tools in their classrooms, as infrastructural facilities are more favorable. Thus, it is important to address these gaps to make sure all children are being adequately prepared for the 21st century regardless of where they live.

5. Professional Development: An Urgent Need for Targeted Training

The results of this study suggest that there is a distinct need for focused professional development to bridge the discrepancy between teachers perceived proficiency and their classroom practices of 21st century skills. The research finds that, even though many teachers have high levels of competence in independent components such as pedagogy and technology, the integration of such underpinning components to develop complex teaching designs is a challenge. This result is in line with that reported by Darling-Hammond et al. (2017), who assert that teachers PD must not only train on theory but also impart practical, classroom-based interventions.

Beyond general training, Griffin et al. (2012), in that training should be targeted to such areas as global citizenship, digital literacy and self-management. Since these are the areas in which teachers in the present study were found to be most in need of support, the study highlights how important it is for teachers to have at their disposal tools, resources and pedagogical approaches that allow them to integrate these competences into their teaching efficiently.

As Voogt et al., 2013) also argue that successful infusion of 21st century skills within a classroom setting requires not only systemic teacher preparation and better curricula but also teaching methods that facilitate deep learning. This study is building on the body of research highlighting the importance of professional development in order to develop teachers' content and pedagogical knowledge necessary for promoting competencies that student need in 21st century.

To progress, the educational policymakers in Bangladesh need to focus on context-specific training content which meets teachers' challenges particularly of rural areas. Aligning

teacher professional development to what the students need and teachers want could bridge the gaps identified in this study, leading eventually towards a more adaptable education system.

Chapter 6: Recommendations

The findings of the study indicate that although 21st century skills are recognized as essential for preparing students for the demands of a rapidly changing world, their integration into classroom practices remains limited and inconsistent. While policy documents and curriculum frameworks emphasize these competencies, practical implementation at the school level requires clearer guidance, structured support systems, and sustained professional development. Therefore, a set of comprehensive and actionable recommendations is proposed to ensure the systematic integration of 21st century skills into teaching-learning processes.

1. Develop Clear Guidelines and Taglines in Textbooks (TB) and Teacher Guides (TG)

Specific, practical, and user-friendly instructions should be incorporated into Textbooks (TB) and Teacher Guides (TG) to support teachers and monitors in integrating 21st century skills into daily classroom activities. These guidelines should provide concrete strategies, sample classroom activities, reflective questions, and assessment approaches aligned with key competencies such as critical thinking, creativity, collaboration, communication, digital literacy, and problem-solving.

Additionally, clear taglines, icons, or highlighted sections should be embedded within lessons to indicate where and how particular skills are being addressed. This will help teachers intentionally plan and implement skill-based activities rather than treating them as supplementary components.

2. Develop an Integrated 21st Century Skills Mechanism

A comprehensive and integrated mechanism should be established to ensure systematic development of students' 21st century skills. This mechanism should promote collaborative engagement among teachers, school leadership, monitors, guardians, and community stakeholders.

The framework may define grade-wise skill expectations, clarify stakeholder roles, and establish monitoring and feedback systems. Community-based projects and parental engagement initiatives should also be included to reinforce skill development beyond the classroom environment.

3. Provide Targeted Professional Development on 21st Century Skills

There is an urgent need for structured and focused professional development programs to strengthen teachers' capacity to integrate 21st century skills effectively. Training should provide conceptual clarity, practical classroom strategies, model lesson demonstrations, and guidance on assessing skill development.

Professional development should be continuous and supported through mentoring, peer learning, and reflective practice to ensure sustained implementation.

4. Train and Empower Monitors

Monitors should receive specialized training to effectively support and guide teachers in integrating 21st century skills into daily instruction. They should be equipped with observation tools, feedback frameworks, and mentoring strategies focused on skill development.

Empowering monitors with appropriate authority and professional knowledge will enhance accountability and ensure consistency in implementation across schools.

5. Establish Teacher Collaborative Networks at the Sub-Cluster Level

Teacher collaborative networks should be established at the sub-cluster level to create platforms for sharing best practices, lesson plans, teaching-learning materials, and innovative approaches to integrating 21st century skills.

Regular meetings, peer demonstration classes, joint lesson planning, and digital resource-sharing platforms can strengthen collective professional growth and promote sustainable reform.

6. Redesign Continuous Professional Development (CPD)

The CPD framework should be redesigned to explicitly incorporate 21st century skills. It should include model lessons, classroom videos, practical teaching-learning materials, and hands-on workshops.

A blended approach combining face-to-face sessions and online modules can enhance accessibility and sustainability. The redesigned CPD should emphasize experiential learning, reflection, and classroom application.

7. Conduct Further Research to Reform Textbooks and Teacher Guides

Further research should be conducted to reform Textbooks and Teacher Guides with explicit focus on integrating 21st century skills. This research should identify gaps in current materials and propose evidence-based revisions.

Pilot testing revised materials and evaluating their impact on student learning outcomes will ensure that instructional resources are aligned with contemporary educational needs and global competencies.

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