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Teachers' Characteristics and Technological Efficacy in Applying the Standard-Based Curriculum in Ghana: A Mixed-Method Study

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ABSTRACT

This study explores the influence of teacher characteristics on technological self-efficacy within the context of Ghana's standard-based curriculum. Utilizing an explanatory sequential mixed-method design, surveyed 280 in-service teachers. Quantitatively, the study found teacher-student interaction characteristics and humanistic and justice characteristics as closely dominated teacher characteristics. As well, these dimensions significantly predicted various aspects of teachers' technological self-efficacy. Qualitatively, the study established how these characteristics are manifested in teachers' classroom practices, highlighting the importance of interactive methods and empathy in fostering student engagement and technological competence. The findings underscore the need for tailored professional development programs that address varying levels of technological self-efficacy among teachers. The study concludes that enhancing teachers' technological self-efficacy requires a holistic approach, integrating technical skills with humanistic values to create inclusive and effective learning environments.

Keywords: technological self-efficacy, teacher-student interaction, humanistic teaching, standard-based curriculum, educational technology, professional development

INTRODUCTION

In recent years, Computer-Supported Collaborative Learning (CSCL) has attracted growing attention across disciplines because of its potential to facilitate both individual and group learning (Lock & Redmond, 2021; Solimeno et al., 2008; Zheng et al., 2019). This trend is reinforced by the rapid evolution of cloud-based and simulation technologies, which have been shown to revolutionize open learning and collaborative educational practices (Papadakis et al., 2023). Alongside broader technological advancements, digital tools have become central to the global educational landscape (Alam, 2021; Altbach et al., 2019; Collins & Halverson, 2018). For instance, the integration of augmented reality and cloud technologies demonstrates how digital innovation can unlock new opportunities for teaching and learning, enabling immersive and interactive classroom experiences (Papadakis et al., 2023).

Consequently, teachers are expected not only to accept and appreciate these tools but also to develop the competence to apply them effectively in their classrooms. This expectation reflects the concept of technological efficacy—teachers' belief in their ability to use technology confidently and with minimal difficulty (Ruggiero & Mong, 2015). Within Bandura's self-efficacy theory, efficacy refers to individuals' beliefs in their capability to perform specific tasks or achieve desired outcomes, shaping how they think, feel, stay motivated, and behave (Bandura, 1978; Bandura & Wessels, 1997). A moderate to high level of self-efficacy is therefore essential for educators to approach technological challenges with confidence and resilience. At the same time, issues such as self-report bias and variability in response rates to technology-focused surveys among teachers (Lavidas et al., 2022) must be considered, as these factors can shape how technological efficacy is reported and understood in different contexts.

Complementing these findings, recent technological education scholarship advocates for a synergistic integration of digital tools including cloud technologies, augmented reality, and simulation platforms to optimize teaching and learning experiences (Papadakis et al., 2023b). Such technologies have been shown to enhance teachers' creativity, improve instructional efficiency, and strengthen assessment practices when aligned with competency-based curriculum principles (Carney, 2022). Yet, within Ghana's higher and basic education systems, the full pedagogical potential of these innovations remains underutilized due to variations in teachers' technological self-efficacy, age, experience, and access to support systems (Gabriel-Wettey et al., 2025). Understanding these teacher-related characteristics is thus vital to determining how effectively educators can leverage technology to actualize the learner-centered goals of the SBC. By exploring these dynamics through a mixed-method approach, this study contributes empirical insights into the interplay between teacher competence, technological efficacy, and curriculum implementation in Ghana's evolving educational landscape.

Amid ongoing curriculum reforms, teachers are expected to integrate technology efficiently into their instructional practices (Williams et al., 2023). Gordon et al. (2022) argue that today's educational environment requires teachers to continuously develop skills, knowledge, and dispositions to succeed in digitally enriched classrooms. Similarly, Hodges et al. (2020), Webb et al. (2021), and Williams et al. (2020) emphasize that navigating rapid educational change demands adaptability, particularly in integrating technology and responding to unexpected disruptions. To meet these demands, teacher preparation programs and in-service training must prioritize the development of technological self-efficacy in ways that directly support classroom application. Recent evidence also shows that students' intentions to adopt artificial intelligence applications for academic purposes are shaped by similar dynamics of confidence, perceived usefulness, and institutional culture (Lavidas et al., 2024). These findings reinforce the need for educators to cultivate not only technological competence but also the efficacy required to embrace new tools as they emerge.

Although technological efficacy is vital, the level of efficacy teachers possess determines how fully they apply digital tools in practice. Research shows that teachers with high technological efficacy demonstrate

confidence in using a wide range of tools to enhance learning. For example, Coşkun and Zeybek (2023) found that high school teachers in Turkey with strong Technological Pedagogical Content Knowledge (TPACK) also reported higher levels of technological efficacy. These teachers seamlessly integrated technology into lessons, which improved both instructional strategies and student engagement. Their study revealed a positive, medium-level correlation between TPACK and self-efficacy, suggesting that teachers who are confident in their technological abilities are better prepared to use digital tools effectively in the classroom.

Conversely, in a similar study in Tanzania, Njiku et al. (2022) found that mathematics teachers generally exhibited a moderate level of technological efficacy. The study revealed that while these teachers were comfortable using technology for routine tasks, they were less confident in applying it to enhance student-centered learning. The findings indicated that factors such as gender, professional development, and prior training in technology integration significantly influenced levels of technological efficacy. Male teachers and those who had received specific training in technology integration were more likely to report higher levels of technological efficacy compared to their counterparts (Njiku et al., 2022). Similarly, research by Farjon et al. (2019) highlighted that pre-service teachers often display moderate technological efficacy, particularly when they are still in the early stages of learning how to incorporate technology into their teaching. The study found that pre-service teachers' self-efficacy in technology use was positively influenced by their attitudes toward technology and the extent of their prior experience with it. However, without ongoing support and practice, these moderate levels of efficacy could hinder their willingness to adopt more advanced technological tools in their future classrooms (Farjon et al., 2019).

Likewise, a study conducted by Gomez et al. (2022) highlighted that teachers with low technological efficacy often struggle with incorporating technology into their teaching. These teachers tend to rely on traditional teaching methods and are less likely to participate in professional development opportunities related to technology. The study emphasized the importance of targeted professional development programs that address the specific needs of teachers with low technological efficacy, helping them build both confidence and skills in using technology (Gomez et al., 2022). Another study by Durak (2019) explored the relationship between teachers' technology integration self-efficacy and their actual use of technology in the classroom. The findings indicated that teachers with low self-efficacy were less likely to engage in technology-rich instructional practices. This group of teachers often cited barriers such as lack of confidence, fear of failure, and limited institutional support as reasons for their low technological efficacy (Durak, 2019).

Having discussed the levels of technological self-efficacy among teachers, it is important to note that these varying levels have significant implications for professional practice. Teachers' characteristics serve as conduits for their technological self-efficacy, influencing how effectively they can apply technological tools and resources. In the context of this study, teacher characteristics include teacher–student interactions, the application of humanistic and justice-oriented values, and familiarity with the teaching profession. These descriptions of teacher characteristics are consistent with scholarly views, which emphasize that teacher attributes encompass a broad set of professional competencies that enable educators to facilitate student learning and development effectively. Such characteristics include the ability to design and deliver instructional experiences tailored to diverse learner needs and capacities, supported by a strong commitment to planning and preparation (Seferoğlu, 2004; Yaratan & Muezzin, 2016).

Extant literature posits that positive teacher–student interactions are fundamental to developing a conducive learning environment and play a crucial role in enhancing teachers' technological self-efficacy. A study by Barni et al. (2019) underscores the importance of interpersonal relationships in the classroom, noting that teachers who establish strong, supportive relationships with their students tend to feel more confident in their teaching abilities, including the use of technology. Teachers who value and prioritize positive interactions are also more likely to adopt technological tools that strengthen these interactions. This increased confidence, fostered by

positive teacher–student relationships, was associated with higher perceived ease of use and greater performance expectations in integrating technology into teaching practices (Barni et al., 2019).

Similarly, Shahzad and Naureen (2017) found that teachers' self-efficacy, including their technological self-efficacy, is significantly influenced by their ability to manage classroom interactions effectively. Teachers who perceive themselves as competent in managing student behavior and fostering positive classroom dynamics are more inclined to adopt and use technological tools to facilitate learning. This suggests that effective teacher–student interactions not only enhance overall teaching efficacy but also directly contribute to teachers' confidence in using technology, thereby improving their technological self-efficacy (Shahzad & Naureen, 2017).

The application of humanistic justice, which is characterized by fairness, empathy, and respect in the classroom equally impacts teachers' technological self-efficacy. According to Kwok et al. (2025), teachers who practice humanistic justice are more likely to view technology as a valuable tool for promoting equity and inclusiveness in education. Such teachers often demonstrate higher technological self-efficacy because they believe technology can help them implement fair and just teaching practices more effectively. The study suggests that when teachers are committed to humanistic values, they are more motivated to overcome technological barriers and more confident in their ability to use technology to enhance student learning outcomes (Benevene et al., 2020).

Furthermore, the application of humanistic justice is linked to social influence and support—both key components of technological self-efficacy. Teachers who prioritize justice and fairness in their classrooms are more likely to seek and receive support from colleagues, administrators, and students when adopting new technologies. This social support reinforces their confidence and perceived ease of use of technological tools, thereby enhancing their overall technological self-efficacy (Kwok et al., 2025). Teachers' familiarity with the teaching profession, including their experience and professional knowledge, is another critical factor influencing technological self-efficacy. Experienced teachers who are well-versed in pedagogical strategies and classroom management tend to have higher levels of technological self-efficacy, as they can draw on their expertise to integrate technology more effectively. Durak (2019) found that teachers with more years of experience and a deeper understanding of the teaching profession reported greater confidence in their ability to use technology. These teachers perceived technology as a complementary tool that could enrich existing teaching practices, leading to higher performance expectations and greater ease of use (Durak, 2019).

Moreover, Shahzad and Naureen (2017) observed that teachers who were more familiar with the teaching profession were better able to adapt to new technologies and incorporate them into their instructional strategies. This adaptability is closely tied to technological self-efficacy, as teachers who are comfortable with change and innovation in their profession are more likely to feel confident in using technology. Their professional familiarity also enables them to navigate challenges related to technology integration, reinforcing their belief in their ability to successfully employ technological tools to achieve educational goals (Shahzad & Naureen, 2017).

Taken together, the literature clearly links key teacher characteristics such as teacher–student interactions, the application of humanistic justice, and familiarity with the teaching profession—to technological self-efficacy. This connection is supported by studies like those of Barni et al. (2019) and , which demonstrate that positive teacher–student relationships and a commitment to fairness and equity can enhance teachers' confidence in using technology. However, while the literature highlights the influence of teacher characteristics, it pays limited attention to contextual factors such as the availability of resources, institutional support, and cultural attitudes toward technology. These factors can significantly affect the extent to which teachers develop and sustain technological efficacy. For instance, in resource-constrained environments, even teachers with high self-efficacy may struggle to integrate technology effectively due to inadequate infrastructure or a lack of institutional support.

In addition, much of the literature predominantly focuses on individual teacher characteristics, such as self-efficacy, without adequately considering the broader systemic and institutional conditions that either facilitate or hinder the development of technological efficacy. There is a need for a more holistic approach that incorporates factors such as school leadership, professional development opportunities, and policy frameworks that shape teachers' efforts to integrate technology. While the literature acknowledges the presence of teachers with low and moderate levels of technological efficacy, it does not provide an in-depth analysis of the specific barriers these teachers face or the interventions that could support them. Studies by Gomez et al. (2022) and Durak (2019) suggest that targeted professional development can enhance technological efficacy, but there remains a lack of detailed discussion on how such programs should be structured and implemented, particularly for teachers starting from a lower baseline of efficacy.

THEORETICAL FRAMEWORK

This study draws on Bandura's Self-Efficacy Theory and the TPACK framework to explain how teacher characteristics shape technological self-efficacy within the implementation of Ghana's Standards-Based Curriculum (SBC). Bandura (1997) identified four primary sources of self-efficacy: mastery experiences, vicarious experiences, social persuasion, and physiological and emotional states. In the context of Ghana's SBC, these sources take on distinctive meanings: mastery experiences occur as teachers successfully integrate digital tools into competency-based lessons; vicarious experiences emerge through observing colleagues using interactive platforms in resource-constrained settings; social persuasion operates through peer collaboration and district-led capacity-building workshops; and emotional states, such as confidence or anxiety toward ICT integration, are often shaped by infrastructural realities and school leadership support.

Teacher characteristics (e.g., teaching experience, educational qualification, prior ICT training, and age) interact with these self-efficacy sources in dynamic ways. For instance, teachers with prior ICT training derive stronger mastery experiences, while younger teachers, who are often more digitally fluent, benefit more from vicarious learning through peer demonstration. Conversely, senior teachers may rely more on social persuasion and institutional encouragement to overcome technological apprehension. These patterns highlight how individual attributes mediate teachers' engagement with Ghana's reform-oriented SBC, a contextual nuance that deepens our understanding of self-efficacy development beyond Western-centric educational systems.

The TPACK framework (Mishra & Koehler, 2006) complements this psychological lens by demonstrating how technological self-efficacy underpins teachers' ability to integrate technology, pedagogy, and content knowledge. Within Ghana's competency-based reform, teachers are expected to use technology not merely as an instructional aid but as a medium for inquiry-based, learner-centred teaching. The present study contributes originally by linking the psychological mechanisms of self-efficacy (Bandura, 1977) with the instructional competencies outlined in TPACK, showing that enhanced self-efficacy strengthens teachers' capacity to enact the SBC's pedagogical ideals.

Importantly, the integration of these frameworks extends their application beyond theoretical alignment. The findings from this study provide context-specific insights that inform teacher professional development and educational policy. For example, training programs can be designed to deliberately incorporate mastery experiences (e.g., hands-on ICT workshops), foster peer modelling through professional learning communities, and strengthen social persuasion via mentorship and leadership support. Additionally, recognizing that infrastructural disparities across Ghana affect the emotional and motivational dimensions of self-efficacy underscores the need for differentiated policy support such as targeted ICT resource allocation, regionally responsive training schedules, and ongoing coaching models that align with teachers' varied contexts.

THE STUDY CONTEXT

The implementation of the new standard-based curriculum in Ghana presents both opportunities and challenges for educators, particularly in the context of integrating technology into classroom practices. As part of the global south, Ghana faces significant barriers to the effective adoption of educational technology due to limitations in resources and institutional support (Baidoo-Anu et al., 2024). Despite these challenges, the standard-based curriculum mandates that teachers must be proficient in using technological tools to enhance their lesson delivery, necessitating a high level of technological efficacy (Agbofa et al., 2023; Apau, 2021; Asante et al., 2024; Ayebi-Arthur et al., 2020). However, existing studies suggest that many teachers struggle with this aspect of the curriculum implementation due to inadequate training, insufficient infrastructure, and a lack of continuous professional development opportunities (Mahama, 2022).

Moreover, while teachers' technological efficacy is recognized as a critical determinant of successful curriculum implementation, the extent to which teachers' characteristics—such as teacher-student interactions, application of humanistic justice, and familiarity with the teaching profession—affect their technological self-efficacy remains underexplored. Teachers who are proficient in these characteristics may be better equipped to integrate technology into their teaching, yet there exists limited empirical evidence on how these factors influence their readiness and ability to meet the demands of the standard-based curriculum. Again, the successful implementation of Ghana's Standard-Based Curriculum (SBC) fundamentally depends on teachers' technological efficacy and pedagogical adaptability in integrating digital tools into classroom instruction. In the context of 21st-century learning, digital competence has become a critical dimension of teacher professionalism, influencing how effectively educators design, deliver, and assess learner-centred instruction. Recent research underscores that digital transformation in education requires teachers to possess both technological proficiency and pedagogical innovation (Papadakis et al., 2023a). In their study on computer simulation and cloud-based smart technologies, Papadakis and colleagues emphasize that technology-enabled open learning environments foster deeper student engagement and critical thinking when teachers are digitally confident and well-trained. This aligns with Ghana's education reform agenda, which prioritizes technology-enhanced pedagogies as a means of promoting creativity, problem-solving, and competency-based learning outcomes (Ekumah, 2025). However, several studies within Ghanaian classrooms reveal inconsistencies between policy aspirations and classroom realities, often attributing low technological efficacy to limited professional development, infrastructure constraints, and teacher attitudes toward innovation (Ekumah, 2025).

Given these gaps, there exists an urgent need to examine how teachers' characteristics influence their technological efficacy in applying the standard-based curriculum in Ghana. To frame our analysis of how teacher characteristics affect technological efficacy in implementing the Standards-Based Curriculum (SBC) in Ghana, this study is guided by Bandura's Self-Efficacy Theory (Bandura, 1997) and the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006). Bandura's theory emphasizes that individuals' beliefs in their ability to accomplish tasks are shaped by mastery experiences, vicarious learning, social persuasion, and emotional states (these are factors influenced by personal characteristics such as age, experience, and prior training). The TPACK framework complements this by highlighting that effective curriculum delivery with technology requires the integration of technological, pedagogical, and content knowledge. Together, these theories underscore how teacher characteristics serve as a foundation for building technological self-efficacy, which is essential for the successful application of the SBC. The findings will contribute to the development of targeted interventions aimed at enhancing teachers' technological efficacy and supporting the successful implementation of the standard-based curriculum in Ghana. The study was guided by the following questions:

- Which teachers' characteristic was dominant in their professional practice in the midst of the standard-based curriculum?

- Which teachers' technological self-efficacy was dominant in their professional practice in the midst of the standard-based curriculum?
- What is the level of teachers' technological self-efficacy in the midst of the standard-based curriculum?
- What are the influences of teachers' characteristics dimensions and their technological self-efficacy dimensions in the midst of the standard-based curriculum?
- What is the influence of teachers' characteristics (composite) and their technological self-efficacy (composite) in the midst of the standard-based curriculum?

METHOD

The researchers were pragmatically informed and employed an explanatory sequential mixed-methods design (Edmonds, 2016; Fetters et al., 2013). This design provides a buffer for the limitations inherent in both quantitative and qualitative approaches. The study followed three steps. In the first step, quantitative data were collected from a sample of 280 in-service teachers (male = 154, female = 126) in the Wa Municipality of Ghana (confidence level = 98%, margin of error = 2%). Although these procedures enhanced representativeness within the municipality, the researchers acknowledge that restricting the sample to a single municipality constrains the generalizability of findings. Ghana's diverse socio-cultural and infrastructural contexts, ranging from resource-rich urban centres to under-resourced rural districts, may shape teacher characteristics and access to technology differently. Therefore, the study findings should be interpreted as context-specific insights that reflect patterns within the selected municipality rather than as definitive generalizations for all Ghanaian schools. In selecting the respondents, multistage sampling was applied across educational circuits and schools within the municipality, using cluster, stratified-proportionate, and simple random techniques (Patten & Newhart, 2018; Patten et al., 2018). Although these procedures enhanced representativeness within the municipality, we acknowledge that reliance on a single municipality may introduce sampling bias, limiting the generalizability of the findings to other regions of Ghana with different socio-cultural and infrastructural contexts.

The quantitative tools were adapted versions of Yaratan and Muezzin's (2016) teachers' characteristics scale (3 dimensions, 36 items: teaching profession, teacher–student interaction, and humanistic and justice characteristics; $\alpha = .874$) and Raphael and Mtebe's (2017) educational technological self-efficacy scale (4 dimensions, 19 items: performance expectation, perceived ease of use, social influence, and support; $\alpha = .909$). Data were analyzed using descriptive and multivariate statistical procedures (Field, 2018; Hahs-Vaughn & Lomax, 2020). While several regression results reached statistical significance, the explained variance was modest. Therefore, findings are interpreted cautiously, emphasizing practical tendencies rather than strong causal claims.

In the second step, qualitative data were collected through semi-structured interviews with 15 in-service teachers drawn from the quantitative sample. Although convenience sampling was employed at this stage, the interview protocol was derived from key quantitative findings to enhance complementarity. Thematic analysis followed Clarke et al.'s (2015) six-step procedure. Beyond describing teacher perspectives, the analysis sought to interpret patterns by linking teacher–student interactions and humanistic values to established theories of self-efficacy and teacher professional identity. This interpretive lens provided a richer understanding of why these characteristics exert influence on teachers' technological efficacy.

Finally, the results from both strands were integrated to provide a contextualized interpretation of how quantitative trends connect with qualitative themes. This integration offered a nuanced explanation of the findings while acknowledging methodological boundaries related to sampling, modest effect sizes, and the descriptive depth of the qualitative strand.

RESULTS

Phase One: Quantitative Analysis

Table 1 presents the results from the quantitative aspect of the study, beginning with descriptive assumptions. The assumptions presented in **Table 1** provide a comprehensive statistical overview of various variables related to teachers' characteristics and technological self-efficacy. The mean, standard deviation (SD), skewness, and kurtosis values offer insights into the central tendency, variability, and distribution shape of the data, which are essential for understanding the data's normality and potential implications for further analysis. The "Teacher Characteristics Composite" (M=115.90, SD = 18.60) indicates a relatively high average level of teacher characteristics within the sample. The skewness of -1.44 suggests a significant negative skew, indicating that the distribution is left-skewed, with a longer tail on the left side, meaning that more teachers have scores above the mean. The kurtosis value of 3.41 indicates a leptokurtic distribution, characterized by a sharper peak and heavier tails than a normal distribution, implying that most teachers' scores are clustered around the mean with few extreme values. The "Teacher Technological Self-Efficacy Composite" (M=71.99, SD = 14.33), reflects a moderate level of technological self-efficacy among teachers. The skewness value of -0.66 indicates a slight negative skew, suggesting that the distribution leans towards higher scores, although it remains relatively symmetrical. The kurtosis value of 0.63 suggests a slightly platykurtic distribution, indicating lighter tails and a flatter peak compared to a normal distribution, which suggests a relatively even spread of scores around the mean.

Table 1. Descriptive Assumption

Variable	Mean	SD	Skewness	S.E.	Kurtosis	S.E
Teacher Characteristics Composite	115.90	18.60	-1.44	.15	3.41	.29
Teacher-Student Interaction (TSI)	41.16	7.39	-0.29	.15	5.46	.29
Humanistic & Justice (H&J)	39.64	8.43	0.79	.15	8.25	.29
Teaching Profession (TP)	35.10	6.19	-1.47	.15	2.70	.29
Technological Self-Efficacy Composite	71.99	14.33	-0.66	.15	0.63	.29
Performance Expectancy (PE)	16.23	3.59	-1.37	.15	1.38	.29
Perceived Ease of Use (PEOU)	15.08	4.32	2.03	.15	20.10	.29
Support (SUP)	14.54	4.18	-0.76	.15	-0.40	.29
Social Influence (SI)	11.12	2.80	-0.83	.15	0.14	.29

For the "Teacher-Student Interaction Characteristics," (M=41.16, SD = 7.39), suggesting moderate teacher-student interaction characteristics. The skewness value of -0.29 indicates a near-normal distribution with a slight left skew, while the kurtosis value of 5.46 points to a highly leptokurtic distribution, meaning that scores are tightly clustered around the mean with more extreme values than a normal distribution would predict. The "Humanistic and Justice Characteristics of Teachers" (M=39.64, SD = 8.43), reflecting a moderate level of these characteristics. The skewness value of 0.79 suggests a positive skew, indicating that the distribution is right-skewed, with more scores on the lower end. The kurtosis value of 8.25 further indicates a highly leptokurtic distribution, suggesting that the scores are concentrated around the mean with a significant number of extreme values. The "Characteristics Related to the Teaching Profession" (M= 35.10, SD = 6.19), indicating a moderate level of these characteristics among teachers. The skewness value of -1.47 reveals a substantial negative skew, with the majority of the scores falling above the mean. The kurtosis value of 2.70 suggests a slightly leptokurtic distribution, indicating a sharper peak and heavier tails than the normal distribution. "Performance Expectancy" (M=16.23, SD = 3.59), which is relatively high. The skewness of -1.37 indicates a negative skew, suggesting that more teachers have higher performance expectancy. The kurtosis of 1.38 suggests a slightly leptokurtic distribution, implying that the distribution is somewhat more peaked with heavier tails than the normal distribution. The "Perceived Ease of Use" (M= 15.08, SD = 4.32), indicating a moderate level of perceived ease of use among the sample. The skewness value of 2.03 suggests a strong positive skew, indicating that many scores are lower, with fewer scores at the higher end. The kurtosis value of 20.10 points to a highly leptokurtic distribution, implying that the majority of the scores are concentrated around the mean with few extreme values. The "Support" (M=14.54, SD = 4.18), suggesting moderate perceived support among the teachers. The skewness of -0.76 indicates a slight negative skew, with more scores above the mean. The kurtosis of -0.40 indicates a platykurtic distribution, which is flatter with lighter tails than a normal distribution, suggesting a more uniform spread of scores. Finally, "Social Influence" (M=11.12, SD = 2.80), reflecting a relatively lower level of perceived social influence. The skewness of -0.83 suggests a slight negative skew, meaning more scores are above the mean. The kurtosis value of 0.14 indicates a distribution that is nearly normal, with the peak and tails resembling those of a normal distribution.

RQ1: Which Teachers' Characteristic was Dominant in Their Professional Practice in the Midst of the Standard-Based Curriculum?

The focus of the question was to establish the dominant characteristics of teachers as they engage their students. In answering this question, 36 items measured on a four-point scale were used, where means and standard deviations were used to analyse the data. In **Table 2**, means (M) and standard deviations (SD) values were provided for the various dimensions of teacher characteristics. With this, "teacher-student interaction characteristics dimension (M=41, SD=7.39) emerges as the dominant characteristic. This dimension has the highest mean score of 41.16, with a standard deviation of 7.39, indicating that, on average, teachers in the sample place a strong emphasis on interactions with students as part of their professional characteristics. Again, the teachers' humanistic and justice characteristic dimension (M=39.64, SD=8.43) follows closely. This suggests that teachers also value fairness, empathy, and respect in their interactions with students, though this dimension is slightly less dominant than teacher-student interactions.

Table 2. Dominant Teacher Characteristic Dimension

Dimensions	Mean	SD
Teacher-Student Interaction Characteristics	41.16	7.39
Characteristics related to the Teaching Profession	35.10	6.19
Humanistic and Justice Characteristics of Teachers	39.64	8.43

Table 3. Dominant Teacher Technological Self-Efficacy

Dimensions	Mean	SD
Performance Expectancy	16.23.	3.59
Perceived Ease of Use	15.08	4.32
Social Influence	11.13	2.80
Support	14.54	4.18

Lastly, the teachers' characteristics related to the teaching profession dimension (M=35.10, SD=6.19) have the lowest, indicating that while still important, this dimension is perceived as slightly less critical compared to the other two dimensions.

RQ2: Which Teachers' Technological Self-Efficacy was Dominant in Their Professional Practice in the Midst of the Standard-Based Curriculum?

The focus of the question was to establish the dominant technological self-efficacy of teachers as they engage their students. In answering this question, 19 items measured on a four-point scale were used, where means and standard deviations were used to analyse the data. In **Table 3**, mean and standard deviation (SD) values are provided for the dimensions of teacher technological self-efficacy. In this, Performance Expectancy" emerges as the dominant dimension (M=16.23, SD=3.59), indicating that, on average, teachers in the sample have a strong expectation that using technology will enhance their performance in the classroom. Again, support follows as the next most prominent dimension (M=14.54, SD=4.18). This suggests that teachers also perceive a significant level of support—whether from peers, administration, or other resources—in their use of technology, although it is slightly less dominant than performance expectancy. Furthermore, perceived ease of use is another critical dimension (M=15.08, SD=4.32), indicating that teachers generally find technology relatively easy to use, though there exists some variability in their experiences. Finally, social influence has the lowest (M=11.13, SD=2.80), suggesting that while social influence—such as the encouragement or expectations of colleagues or the school environment—does play a role in technological self-efficacy, it is perceived as less influential compared to the other dimensions.

RQ3: What is the Level of Teachers' Technological Self-Efficacy in the Midst of the Standard-Based Curriculum?

The aim of the question was to establish the levels of technological self-efficacy among teachers. In answering the question, a 19-item scale, measured on a four-point Likert scale was used. The data gathered were analysed using frequencies and percentages. **Table 4** presents the results. The results presented in **Table 4** reflect the distribution of participants across three levels—lower, moderate, and high. Out of a total sample size of 280 participants, 98 individuals (35.0%) fall into the lower-level category.

Table 4. Levels of Technological Self-Efficacy

Levels	Frequency	Percent
Lower Level	98	35.0
Moderate Level	95	33.9
High Level	87	31.1
Total	280	100.0

This indicates that over a third of the participants perceive themselves, or are perceived, to be at a lower level in the measured characteristic, suggesting a significant proportion of the sample may require additional support or development.The moderate level category comprises 95 participants, accounting for 33.9% of the total sample. This nearly one-third proportion indicates that these participants exhibit an intermediate level of the characteristic in question, reflecting a balanced, though not exceptional, competence or confidence. The high-level group includes 87 participants, representing 31.1% of the sample. This suggests that nearly one-third of the participants are operating at a high level, demonstrating strong competence or confidence in the area being assessed. Taken together, the distribution of respondents across the three levels is relatively even, with a slight majority at the lower level. The percentages indicate a diverse range of abilities or perceptions among the participants, with a somewhat larger group requiring further development or support. This balance among the levels highlights the variability within the sample and underscores the importance of targeted interventions to elevate those at the lower end while continuing to support those at moderate and high levels.

RQ4: What are the Influences among Teachers' Characteristics Dimensions and Their Technological Self-Efficacy Dimensions in the Midst of the Standard-Based Curriculum?

The aim of this question aimed to ascertain the dimensional influences of teachers' characteristics and their technological self-efficacy dimensions.

Table 5. Multivariate Tests

Effect		Value	F	Hypo df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.067	4.94	4.000	273.000	.001	.067
	Wilks' Lambda	.933	4.94	4.000	273.000	.001	.067
	Hotelling's Trace	.072	4.94	4.000	273.000	.001	.067
	Roy's Largest Root	.072	4.94	4.000	273.000	.001	.067
Teacher-Student Interaction Characteristics	Pillai's Trace	.043	3.04	4.000	273.000	.018	.043
	Wilks' Lambda	.957	3.04	4.000	273.000	.018	.043
	Hotelling's Trace	.045	3.04	4.000	273.000	.018	.043
	Roy's Largest Root	.045	3.04	4.000	273.000	.018	.043
Characteristics related to the Teaching Profession	Pillai's Trace	.022	1.56	4.000	273.000	.184	.022
	Wilks' Lambda	.978	1.56	4.000	273.000	.184	.022
	Hotelling's Trace	.023	1.56	4.000	273.000	.184	.022
	Roy's Largest Root	.023	1.56	4.000	273.000	.184	.022
Humanistic and Justice Characteristics of Teachers	Pillai's Trace	.136	10.74	4.000	273.000	.000	.136
	Wilks' Lambda	.864	10.74	4.000	273.000	.000	.136
	Hotelling's Trace	.157	10.74	4.000	273.000	.000	.136
	Roy's Largest Root	.157	10.74	4.000	273.000	.000	.136

a. Design: Intercept + Teacher-Student Interaction Characteristics + Characteristics related to the Teaching Profession + Humanistic and Justice Characteristics of Teachers, b. Exact statistic

In performing the analysis, the multiple multivariate regression was used. **Table 5** presents the multivariate test results. From **Table 5**, The multivariate tests assess the overall effect of the independent variables (teacher-student interaction characteristics, characteristics related to the teaching profession, and humanistic and justice characteristics of teachers) on the combined dependent variables (performance expectancy, perceived ease of use, social influence, and support). The results indicate statistically significant effects across the tests, including Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root, for the overall model. For the intercept, the multivariate tests (Pillai's Trace = .067, Wilks' Lambda = .933, Hotelling's Trace = .072, Roy's Largest Root = .072) show significant effects, $F(4, 273) = 4.94$, $p = .001$, with a partial eta squared ($\eta^2 = .067$), suggesting that about 6.7% of the variance in the combined dependent variables is accounted for by the intercept.

The effect of teacher-student interaction characteristics on the combined dependent variables is also significant, [$F(4, 273) = 3.04$, $p = .018$, with a partial eta squared ($\eta^2 = .043$)]. This indicates that approximately 4.3% of the variance in the dependent variables is explained by teacher-student interaction characteristics. The characteristics related to the teaching profession did not show a statistically significant multivariate effect, [$F(4, 273) = 1.56$, $p = .184$, with a partial eta squared ($\eta^2 = .022$)], suggesting minimal impact on the combined dependent variables. For humanistic and justice characteristics of teachers, the multivariate tests revealed significant effects, [$F(4, 273) = 10.74$, $p < .001$, with a partial eta squared ($\eta^2 = .136$)], indicating that about 13.6% of the variance in the combined dependent variables is attributable to these characteristics. To probe the results further on the extent to which each independent variable impacts the dependent variable individually. **Table 6** presents the results. From **Table 6**, it is realised that the corrected model significantly predicted performance expectancy [$F(3, 276) = 54.46$, $p < .001$, $\eta^2 = .372$], indicating that 37.2% of the variance in performance expectancy is explained by the independent variables. Specifically, teacher-student interaction characteristics [$F(1, 276) = 8.63$, $p = .004$, $\eta^2 = .030$], and humanistic and justice characteristics of teachers [$F(1, 276) = 42.02$, $p < .001$, $\eta^2 = .132$] were significant predictors, with humanistic and justice characteristics having a stronger influence. For perceived ease of use, the corrected model was also significant, [$F(3, 276) = 14.79$, $p < .001$, $\eta^2 = .138$], accounting for 13.8% of the variance.

Humanistic and justice characteristics of teachers again emerged as a significant predictor [$F(1,276) = 12.16$, $p = .001$, $\eta^2 = .042$], while the other predictors were not significant. The model predicted social influence significantly, [$F(3, 276) = 24.12$, $p < .001$, $\eta^2 = .208$], explaining 20.8% of the variance. Both teacher-student interaction characteristics [$F(1, 276) = 5.81$, $p = .017$, $\eta^2 = .021$] and humanistic and justice characteristics [$F(1, 276) = 8.46$, $p = .004$, $\eta^2 = .030$] were significant predictors. Support is significantly predicted by the model as well, [$F(3, 276) = 13.73$, $p < .001$, $\eta^2 = .13$] with 13% of the variance explained. humanistic and justice characteristics [$F(1, 276) = 4.54$, $p = .034$, $\eta^2 = .016$] was the only significant predictor. To provide more insights into the direction and magnitude of the effects of each independent variable on the dependent variables, the parameter estimates were examined. **Table 7** presents the results.

For performance expectancy, teacher-student interaction characteristics ($B = .099$, $p = .004$) and humanistic and justice characteristics ($B = .160$, $p < .001$) had significant positive effects. Regarding perceived ease of use, humanistic and justice characteristics ($B = .121$, $p = .001$) significantly predicted this outcome, with other predictors being non-significant. Also, social influence was significantly influenced by teacher-student interaction characteristics ($B = .071$, $p = .017$) and humanistic and justice characteristics ($B = .063$, $p = .004$). For support, humanistic and justice characteristics ($B = .072$, $p = .034$) significantly predicted support, while teacher-student interaction characteristics did not.

Table 6. Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean2	F	Sig.	Partial Eta Squared
Corrected Model	Performance Expectancy	1337.69	3	445.895	54.46	.000	.372
	Perceived Ease of Use	721.51	3	240.502	14.79	.000	.138
	Social Influence	455.96	3	151.987	24.12	.000	.208
	Support	632.77	3	210.922	13.73	.000	.130
Intercept	Performance Expectancy	61.60	1	61.600	7.52	.006	.027
	Perceived Ease of Use	202.38	1	202.384	12.44	.000	.043
	Social Influence	67.35	1	67.347	10.69	.001	.037
	Support	180.24	1	180.236	11.73	.001	.041
Teacher-Student Interaction Characteristics	Performance Expectancy	70.64	1	70.636	8.63	.004	.030
	Perceived Ease of Use	32.47	1	32.474	1.996	.159	.007
	Social Influence	36.61	1	36.606	5.81	.017	.021
	Support	58.15	1	58.149	3.78	.053	.014
Characteristics related to the Teaching Profession	Performance Expectancy	29.56	1	29.561	3.61	.058	.013
	Perceived Ease of Use	16.27	1	16.272	1.00	.318	.004
	Social Influence	24.24	1	24.244	3.85	.051	.014
	Support	30.47	1	30.469	1.98	.160	.007
Humanistic and Justice Characteristics of Teachers	Performance Expectancy	344.04	1	344.041	42.02	.000	.132
	Perceived Ease of Use	197.72	1	197.724	12.16	.001	.042
	Social Influence	53.33	1	53.328	8.46	.004	.030
	Support	69.79	1	69.791	4.54	.034	.016
Error	Performance Expectancy	2259.69	276	8.187			
	Perceived Ease of Use	4489.61	276	16.267			
	Social Influence	1739.15	276	6.301			
	Support	4240.88	276	15.366			
Total	Performance Expectancy	77340.00	280				
	Perceived Ease of Use	68903.00	280				
	Social Influence	36805.00	280				
	Support	64034.00	280				
Corrected Total	Performance Expectancy	3597.37	279				
	Perceived Ease of Use	5211.11	279				
	Social Influence	2195.11	279				

Support	4873.64	279

a. R Squared = .372 (Adjusted R Squared = .365)

b. R Squared = .138 (Adjusted R Squared = .129)

c. R Squared = .208 (Adjusted R Squared = .199)

d. R Squared = .130 (Adjusted R Squared = .120)

Table 7. Parameter Estimates

DVs	Parameter (IVs)	B	S. E	t	Sig.	98.75% Confidence Interval		P E S
						Lower Bound	Upper Bound	
Performance Expectancy	Intercept	2.99	1.089	2.74	.006	.249	5.725	.027
	Teacher-Student Interaction Characteristics	.099	.034	2.94	.004	.014	.183	.030
	Characteristics related to the Teaching Profession	.081	.043	1.90	.058	-.026	.189	.013
	Humanistic and Justice Characteristics of Teachers	.160	.025	6.48	.000	.098	.222	.132
Perceived Ease of Use	Intercept	5.415	1.535	3.53	.000	1.555	9.274	.043
	Teacher-Student Interaction Characteristics	.067	.047	1.41	.159	-.052	.186	.007
	Characteristics related to the Teaching Profession	.060	.060	1.00	.318	-.091	.212	.004
	Humanistic and Justice Characteristics of Teachers	.121	.035	3.49	.001	.034	.209	.042
Social Influence	Intercept	3.123	.955	3.27	.001	.721	5.526	.037
	Teacher-Student Interaction Characteristics	.071	.029	2.41	.017	-.003	.145	.021
	Characteristics related to the Teaching Profession	.074	.037	1.96	.051	-.021	.168	.014
	Humanistic and Justice Characteristics of Teachers	.063	.022	2.91	.004	.009	.117	.030
Support	Intercept	5.110	1.492	3.43	.001	1.359	8.861	.041
	Teacher-Student Interaction Characteristics	.089	.046	1.95	.053	-.026	.205	.014
	Characteristics related to the Teaching Profession	.082	.059	1.41	.160	-.065	.230	.007
	Humanistic and Justice Characteristics of Teachers	.072	.034	2.13	.034	-.013	.157	.016

RQ5: What is the Influence of Teachers' Characteristics (composite) and Their Technological Self-Efficacy (composite) in the Midst of the Standard-Based Curriculum?

The question sought to establish the composite prediction of teachers' characteristics on their technological self-efficacy. To make this possible, simple linear regression was performed, and the results are presented in **Table 8**. In **Table 8**, a linear regression analysis was conducted to examine the influence of teachers' characteristics on technological self-efficacy. The results of the regression indicated that teachers' characteristics significantly predicted technological self-efficacy, [F (1, N−2) =122.77, p<.001; (B = .553, t = 11.08, p<.001)]. In this case, the model explained 30.6% of the variance in technological self-efficacy among teachers. While this indicates a meaningful relationship, the modest explained variance highlights the role of other unmeasured influences, such as institutional leadership, peer collaboration, or infrastructural adequacy, that may further explain teachers' technological confidence. Consequently, the results suggest teacher characteristics may be associated with technological self-efficacy within the specific socio-cultural and infrastructural context of the Wa Municipality. Therefore, diverse educational settings, where differences in school resources, digital access, and local teaching cultures could yield different strengths or directions of relationships. However, it is important to note that the interpretations offered are cautious and inferential, intended to highlight relationships rather than establish causation in this study.

Phase Two: Qualitative Analysis

The study revealed that teacher-student interaction characteristics emerged as the dominant teacher characteristic followed closely by humanistic and justice characteristics of teachers. The significance of these findings is further underscored by the multivariate regression analysis, where both teacher-student interaction characteristics and humanistic and justice characteristics were significant predictors of several dimensions of technological self-efficacy, including performance expectancy, social influence, and support. Given these findings, a qualitative follow-up was conducted to explore the underlying reasons why teacher-student interaction characteristics and humanistic and justice characteristics were particularly influential. Using the Clarke's et al. 2015) procedure, the qualitative aspect of the study generated three themes: interactive and supportive teaching practices, empathy and fairness in the classroom, and challenges and confidence in technological use.

Interactive and Supportive Teaching Practices

One of the dominant themes that emerged from the qualitative data is the emphasis on interactive and supportive teaching practices. Teachers frequently mentioned the use of interactive methods such as multimedia presentations, role-playing, and group work to engage students.

Table 8. Regression Results

	Unstand. Coef.		Stand. Coef.							
Model	B	S. E	Beta	t	Sig.	p	F	R	R2	Adj R2
(Constant)	22.56	4.52		4.99	.000	.000	122.77	.553	.306	.304
TC	.426	.038	.553	11.08						

a. Dependent Variable: Technological Self-Efficacy *TC= Teachers' Characteristics

For instance, one teacher noted, “I create a welcoming and conducive environment for the students... I integrate videos, simulations, virtual tours, interactive maps, and other multimedia resources into lessons to make learning more engaging and accessible” (Teacher 3). This approach aligns with the quantitative finding that teacher-student interaction characteristics were the most prominent teacher characteristic. The qualitative data support the idea that these interactive methods are crucial for fostering student engagement and enhancing the effectiveness of teaching, which in turn bolsters teachers' technological self-efficacy.

Empathy and Fairness in the Classroom

Another significant theme is the application of humanistic values such as empathy and fairness in teaching. Teachers described efforts to understand students' needs and provide equitable support, particularly when dealing with technology. One respondent shared, “I put my students in various groups to enable them to have access to the few ICT tools available in the school... I spent extra time supporting my students who struggle with ICT tools” (Teacher 10). This theme resonates with the quantitative finding that humanistic and justice characteristics had a strong influence on several dimensions of technological self-efficacy, including perceived ease of use and support. Teachers’ commitment to fairness and support appears to play a critical role in their ability to effectively integrate technology into their teaching practices.

Challenges and Confidence in Technological Use

The qualitative data also highlighted varying levels of confidence and capability among teachers in using technology, which underscores the need for continuous professional development. Teachers expressed both confidence in familiar tools and challenges with newer technologies. As one teacher mentioned, “It really boosts my confidence and also enhances my teaching effectively... but some tools are difficult and require training” (Teacher 7). This aligns with the quantitative findings that showed the influence of teacher characteristics on technological self-efficacy, particularly in areas like performance expectancy and perceived ease of use. The need for additional training and support is evident as teachers navigate the complexities of integrating technology into the standard-based curriculum.

Integration of Quantitative and Qualitative Findings

The integration of these qualitative insights with the quantitative data reveals a comprehensive picture of how teacher-student interactions and humanistic values significantly contribute to teachers' technological self-efficacy. The quantitative analysis identified teacher-student interaction characteristics as the dominant factor, which the qualitative data further explained by showing how these interactions are implemented in practice. Similarly, the importance of humanistic and justice characteristics in the quantitative results is reinforced by the qualitative findings, which detail how empathy and fairness are critical in supporting students, particularly in the use of technology.

DISCUSSION

The study’s findings provide useful insights into the role of teacher characteristics within the framework of the Standards-Based Curriculum, particularly their association with technological self-efficacy. The quantitative analysis identified teacher–student interaction characteristics as the most dominant attribute, recording the highest mean score among the dimensions examined. This finding suggests that interactions between teachers and students may play a central role in shaping effective teaching practices. Teachers in the study emphasized the importance of engaging with students and employing a variety of methods to foster interactive learning environments. This emphasis resonates with earlier research, such as Barni et al. (2019), which illustrates how positive teacher–student relationships can support teachers’ confidence in integrating technology. Although the regression results were modest in explanatory power, they nonetheless point to the practical significance of teacher–student interactions as a factor influencing technological efficacy.

Beyond teacher–student interactions, the study also found that teachers' humanistic and justice-oriented characteristics were significantly related to several aspects of technological self-efficacy, including performance expectancy, perceived ease of use, social influence, and support. This dimension encompasses values such as fairness, empathy, and respect. The association observed in this study is consistent with findings by , who argue that teachers committed to humanistic values are more likely to perceive technology as a means of creating inclusive and equitable classrooms. While our data support the relevance of this link, the modest effect sizes suggest that the explanatory power of these characteristics should be interpreted with caution. Instead of viewing them as strong causal predictors, they may be better understood as contributing tendencies that interact with other contextual and structural factors in Ghanaian schools.

The distribution of technological self-efficacy levels among teachers (35.0% low, 33.9% moderate, and 31.1% high) further highlights the variability within the teaching population. These results indicate that while a segment of teachers were confident and capable of using technology effectively, a substantial proportion may require targeted support to build their competence. This reinforces calls by Gomez et al. (2022) for professional development interventions tailored to teachers' specific efficacy levels. Given the modest explanatory models in this study, these proportions should be interpreted as indicative rather than representative, underscoring the importance of replication in varied Ghanaian contexts.

The multivariate analyses suggested that both teacher–student interaction and humanistic and justice characteristics are important factors in explaining technological self-efficacy, though their effects remain modest. This indicates that while fostering student engagement and humanistic values appears beneficial, these are unlikely to be the sole determinants of teachers' confidence in using technology. Other unmeasured factors, such as infrastructural resources, institutional leadership, or broader socio-cultural influences, may also play significant roles. The findings, therefore, extend existing studies (Durak, 2019; Shahzad & Naureen, 2017) but must be read within the limits of modest variance explained.

The results align conceptually with Bandura's Self-Efficacy Theory and the TPACK framework, which together highlight the interplay of personal mastery, social support, and contextual opportunities in building teachers' technological confidence. Teachers with prior ICT training and longer years of service tended to report higher self-efficacy, consistent with mastery experience as a key determinant. Younger or more digitally oriented teachers also benefited from vicarious experiences, where observing peers enhanced their sense of efficacy. These patterns illustrate how individual and social factors interact to influence efficacy beliefs. However, given the modest effect sizes observed, our findings are best understood as indicative illustrations of these theoretical principles rather than as definitive evidence.

Taken together, the study contributes to understanding the role of teacher characteristics in Ghana's SBC reforms by highlighting possible pathways through which interactional and humanistic values relate to technological self-efficacy. Yet, the generalizability of these findings is constrained by the single-municipality sample and the limited explanatory power of the models. Rather than making broad claims, this study positions its findings as context-specific insights that suggest avenues for professional development and further research. Specifically, ICT training programs that emphasize mastery-based learning, peer observation, and constructive feedback may enhance teachers' technological self-efficacy, but future studies with broader samples are necessary to test the robustness of these recommendations.

CONCLUSION

This study offers a comprehensive examination of how teacher characteristics influence technological self-efficacy within the Standards-Based Curriculum framework. The findings underscore the critical role of teacher–student interactions in fostering effective teaching practices and strengthening technological self-

efficacy. Teachers who actively engage students through interactive methods are better equipped to integrate technology into their teaching, thereby improving both their own efficacy and student learning outcomes.

The study also highlights the significant impact of humanistic and justice-oriented characteristics such as fairness, empathy, and respect on technological self-efficacy. Teachers who embody these values not only feel more confident in using technology but also employ it more effectively to support the diverse needs of learners. This suggests that fostering such characteristics is vital for building inclusive and equitable educational environments where technology can be maximized to its full potential. The analysis further revealed variation in technological self-efficacy levels among teachers. While some are confident and proficient in integrating technology, others require additional support. The distribution across low, moderate, and high levels points to the need for differentiated professional development programs that address teachers' specific levels of competence.

Finally, the study confirmed that both teacher–student interaction and humanistic and justice characteristics are significant predictors of technological self-efficacy, with the latter demonstrating a particularly strong impact. This indicates that improving technological self-efficacy requires not only technical training but also the cultivation of interpersonal skills and ethical values that foster positive classroom dynamics and equitable teaching practices.

RECOMMENDATIONS

Given the variability in technological self-efficacy among teachers, it is recommended that professional development programs be tailored to address the specific needs of teachers at different levels of efficacy. These programs should focus on both technical skills and the development of interpersonal and humanistic values that support effective teaching and learning.

Schools in Ghana should prioritize creating environments that encourage positive teacher-student interactions. This can be achieved through training that equips teachers with strategies for engaging students and creating inclusive classroom dynamics. Emphasizing the importance of these interactions can enhance teachers' confidence in using technology and improve overall educational outcomes. To fully leverage the benefits of technology in education, it is essential for teachers to promote teaching practices that are grounded in fairness, empathy, and respect. The Ghana Education Service should provide resources and support to help teachers develop these characteristics, which have been shown to significantly influence technological self-efficacy.

In organising professional development programs for teachers, special attention should be given to teachers who fall into the lower levels of technological self-efficacy. Targeted interventions, such as mentoring, peer support, and hands-on training, can help these teachers build confidence and competence in using technology, thereby improving their ability to meet the demands of the standard-based curriculum. When organizing training programs for teachers in Ghana by the Ghana Educational Service, such programs should not only focus on the technical aspects of using educational technology but also integrate discussions around ethical use, inclusivity, and justice. By embedding these values into technology training, teachers can be better prepared to use technology in ways that promote equity and enhance learning for all students.

PRACTICAL IMPLICATIONS

Guidance counsellors can help teachers overcome technology integration challenges. They can help instructors manage their careers to meet the demands of the standard-based curriculum and stay effective and flexible in the classroom. The study found that humanistic and justice-based traits affect instructors' technological efficacy, suggesting that guidance counsellors might help teachers build strong, empathic

relationships with students. Counsellors can help instructors integrate technology while maintaining equity and justice.

Counsellors can help teachers maintain their mental health while introducing technology into their curriculum. To ensure educators' mental health as they adjust to new professional obligations, stress management, coping techniques, and reflective practices may be used. Educational institutions should offer individualised coaching and counselling for instructors' emotional and technical needs. These programs should emphasise student engagement, equity, and empathy while developing humanistic teaching skills and technology expertise.

Schools should include assistance and counselling in their professional development programs to help educators cope with technology's psychological and emotional effects. Counsellors may offer classes and individual sessions on emotional resilience, career planning, and stress management. Educational institutions should promote mental health programs with regular therapy and guidance. These measures should help instructors balance technological integration with their emotional and psychological well-being to prevent exhaustion and promote a healthy work environment.

Limitations of the Study

Despite its contributions, this study is not without limitations. First, the sample was drawn from a single municipality in Ghana, which may limit the generalizability of the findings to other regions with different socio-cultural and educational contexts. Future research could broaden the scope by including multiple municipalities or districts to capture a more diverse set of teacher experiences. Second, the study relied on self-reported measures of technological self-efficacy. While such measures are widely used in educational research, they are subject to biases such as social desirability and self-perception errors, which may affect the accuracy of responses. Triangulating self-report data with classroom observations or performance-based assessments in future studies would provide a more robust evaluation of teachers' technological efficacy. Finally, the cross-sectional design of the study limits the ability to make causal claims about the relationship between teacher characteristics and technological self-efficacy. Longitudinal or experimental research designs could provide stronger evidence regarding the directionality and causal mechanisms underlying these relationships.

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Ethical Considerations

This study was conducted in accordance with established ethical standards for research involving human participants. This study followed the University of Education, Winneba Institutional Review Board (UEW-11-24), which reviewed and cleared the study protocol prior to data collection. All procedures followed the principles of the Declaration of Helsinki regarding voluntary participation, respect for persons, and protection of confidentiality (World Medical Association, 2025). Participation was entirely voluntary, and informed consent was obtained from all teachers before data collection. Participants were assured that their responses would remain confidential, anonymized, and used solely for research purposes. They were also informed of their right to withdraw from the study at any stage without penalty. No identifying information was included in the reporting of results, and data were stored securely in password-protected files accessible only to the research team. Although the primary participants were in-service teachers, some of whom may be considered a vulnerable group in research due to potential concerns about job security or hierarchical pressure within the education system, specific safeguards were implemented. These included (a) ensuring that participation was unrelated to institutional evaluation or supervision, (b)

explicitly clarifying that their employment status would not be affected by participation or non-participation, and (c) providing multiple opportunities for questions before and during the consent process. By building these safeguards into the study, the research team worked to minimize any risk of undue influence or perceived coercion. To ensure data protection and confidentiality, the study adhered to both the Ghana Data Protection Act (Act 843, 2012) and the principles of the General Data Protection Regulation (GDPR) applicable to international research collaborations (Kwaa-Aidoo & Baah, 2025). All electronic data were anonymized, password-protected, and stored on encrypted drives accessible only to the research team. During qualitative interviews, pseudonyms were used to safeguard participants' identities, and any identifiable contextual information was removed during transcription. Additionally, the study followed the Good Reporting of a Mixed Methods Study (GRAMMS) framework (O'Cathain et al., 2008) to ensure transparency and coherence in integrating quantitative and qualitative components.

Data Availability

The data is available and can be shared upon a formal request from the authors through the corresponding author.

Competing Interest

The authors of this paper have no competing interests to declare.

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Author Contribution

SOB conceptualized the study, led the research design, and coordinated data collection. IM contributed to the theoretical framework, methodological rigor, and critical review of the manuscript, with particular emphasis on educational policy and curriculum implementation. BMA supported data analysis, especially the quantitative components, and contributed to the interpretation of findings. TA was responsible for the qualitative data collection and analysis and contributed to drafting sections of the manuscript. PMA assisted with instrument development, data validation, and manuscript editing. All authors reviewed, revised, and approved the final manuscript and agreed to be accountable for all aspects of the work.

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APPENDIX A. Graphs for Test of Assumptions