

TEACHER PROFESSIONAL DEVELOPMENT AND LEARNING OUTCOMES IN THE 21ST CENTURY

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Abstract

Teacher professional development can be defined as those processes and activities designed to enhance the professional knowledge, skills and attitudes of teachers. Sophisticated forms of teaching are now needed to develop student competencies such as deep mastery of content, critical thinking, complex problem solving, effective communication and collaboration and self-efficacy. Effective professional development is needed to help teachers learn and refine instructional strategies required for these skills. This has become a top priority worldwide. Research has noted that many professional development initiatives appear ineffective in supporting changes in teachers' practices and student learning. All rounded student development no longer refers to intellectual growth only but involves mastery of various skills such as critical thinking, problem solving, communication and collaboration. In order to effectively foster the development of 21st century skills in learners, teachers themselves must have at least a good command of skills and be well prepared in their own capacity to impart such skills to students. The current study therefore seeks to highlight the various skills and capacities that teachers need to maximize their potential in cultivating students' 21st century skills. The findings of this study may help directors and managers of learning institutions address challenges of teacher professional development in order to improve the 21st century learning outcomes.

Key Words: *Teacher Professional Development, Transformative Learning Theory, Learning Outcomes, 21st Century skills*

1.1 Introduction and Background to the Study

Professional development of teachers is a lifelong process which begins with the initial preparation that teachers receive and continue to receive until retirement. The importance of teacher professional development stems from the fact that teachers are the most important change agents in the education system (AbdulRab, 2023). Dewi et al. (2024) also assert that teacher professional development is a key factor in improving education quality and students' learning outcomes. Teacher professional development according to OECD (2010) 'is a body of systematic activities to prepare teachers for their job including initial training, induction courses, in-service training and continuous professional development within school settings. The need for professional development includes among other factors, expanding knowledge domain of subjects, changing pedagogy, increasing involvement of media use of Information and Communication Technology (ICT), enactment of policies and schemes and meeting demands of a society and nation. Teacher professional learning is of increasing interest as a critical way to support the increasingly complex skills students need to learn in order to succeed in the 21st century. Sophisticated forms of teaching are needed to develop student competencies such as deep mastery of challenging content, critical thinking, complex problem solving, effective communication and collaboration, and self-direction. In turn, effective professional development (PD) is needed to help teachers learn and refine the instructional strategies required to teach these skills. However, research has noted that many professional development initiatives appear ineffective in supporting changes in teachers' practices and student learning. Accordingly, there is need to discover the features of effective professional development. Effective PD can be defined as structured professional learning that results in changes to teacher practices and improvement in student learning outcomes.

Teacher professional development is a very important factor for improving teachers' beliefs and practices, students' achievement and educational reforms. Many studies have investigated different aspects of teacher professional development. According to DeMonte (2013), teacher professional development can improve teacher subject knowledge and skills and strengthen practices in the classroom. Teachers are therefore the most effective factor in an educational system. The more professional knowledge teachers have, the higher the levels of students' achievement. Teacher professional development is also considered as one of the significant methods for addressing instruction and student outcomes (Borko & Putnam, 1995; Yoon, et al., 2007). According to Villegas Reimers (2003), when the goal is to increase students' learning and to improve their performance, the professional development of teachers should be considered a key factor, and this at the same time must feature as an element in a larger reform. Teacher professional development can be thought of as a process designed to enhance the quality of teaching.

Soe (2018) asserted that teachers who have completed teacher professional development should implement more effectively than those who have not completed teacher professional development such as: teacher training, teacher induction program and mentoring program. In addition, ongoing professional development for teachers is required to keep them in touch with the rapid educational changes and demands. Chu et al. (2017) contended that teachers' professional development helps them meet new expectations to facilitate the development of 21st century skills in student-centered learning. Research presents a number of strategies that may help teachers acquire 21st century skills. In his conclusion, Yue (2019) posited that effective teacher professional development methods can address teacher learning and practice. These methods include among others: need assessment of TPD, peer-mentoring, building collaboration, creating positive school culture, developing 21st century skills, developing instructional strategies for active learning, embedding core values, continual professional development, undertaking research-based projects and integrating ICT in teaching. The current study therefore intends to highlight the various skills and capacities that teachers need to maximize their potential in cultivating students' 21st century skills.

1.2 Rationale

Teacher professional learning is of increasing interest as a critical way to support the increasingly complex skills students need to learn in order to succeed in the 21st century. Studies show that sophisticated forms of teaching are needed to develop student competencies such as deep mastery of challenging content, critical thinking, complex problem solving, effective communication and collaboration, and self-direction. In turn, effective professional development (PD) is needed to help teachers learn and refine the instructional strategies required to teach these skills. The current study therefore seeks to highlight the various skills and capacities that teachers need to maximize their potential in cultivating students' 21st century skills.

1.3 Statement of the Problem

Research has noted that many professional development initiatives appear ineffective in supporting changes in teachers' practices and student learning. This is because success in the 21st century is represented in the ability to communicate, share and use information to solve complicated problems. Teachers must have the ability to adapt and be innovative in response to new requirements and changing circumstances. According to Schleicher (2012), they require the ability to mobilize and expand the power of technology to create new knowledge in the expansion of human capacity and productivity. Because of the changes in the demand for skills in the 21st century, teachers themselves need to acquire new competencies in order to effectively teach 21st century skills to their students. A quick search in the existing literature yields a less than satisfactory result for professional development specifically designed for 21st century skills teaching, especially for in-service teachers. The current study therefore intends to highlight the various skills and capacities that teachers need to maximize their potential in cultivating students' 21st century skills.

1.4 Research Questions

The study reviewed literature guided by the following research questions:

1. What are the elements of effective professional development for 21st century skills?
2. How can institutions create conditions for effective professional development?
3. What are the implications for policy and practice?
4. What strategies can be put in place to develop teachers' 21st century skills?

1.5 Theoretical Framework

The study was guided by transformative learning theory founded by an American sociologist, Jack Mezirow in the late 1970's. Since its finding, this learning theory has changed how the world understands and approaches adult education. Transformative learning theory is defined as 'the process of effective change in a frame of reference' (Baldino, 2023). It is a theory that explains how adults receive, process and use new information to review the world around them. Baldino (2023) asserts that within transformative learning theory, there are four processes of learning and ten phases of transformational learning. The four processes of learning explain four ways in which adults can process new experiences. The first is elaboration on existing point of view. In this scenario, adults have a new experience or seek out evidence that expands or intensifies their point of view. A good example to illustrate this is; if a U.S citizen were to travel to a European country and receive a beverage without ice, they would use that new experience to solidify their belief that other nations are inferior. The second process is establishing new points of view. This is when adults take new situations and use them to create new beliefs that are aligned with their existing biases. For example, if the same US traveler now experiences even more foreign customs, they then use this new knowledge to add more points of view about the inferiority of other nations.

The third process is transformation of existing points of view. This is when transformation becomes possible. In this process adults have a new experience that leads them to reevaluate their beliefs about their existing point of view. The fourth and final process is the transformation of the habit of mind. In this process adults become deeply aware of their biased habit of mind and through self-assessment and critical evaluation, they transform their habit of mind. For adults to reach this learning process, they must have experiences that don't comfortably fit their current frame of reference.

The ten phases of Mezirow transformative learning include, disorienting dilemma. This is the first phase where an individual has an experience that does not align with their existing beliefs, values or expectations. For example, an employee who always thought that remote work was for the lazy is unexpectedly required to work from home. The second phase is self-examination. Following a disorienting experience, individuals evaluate their beliefs and values, realizing that their points of view are not the only points of view. The third phase is assessment of assumptions. In this phase, the individual will critically evaluate their former assumptions, recognizing that they may have been wrong.

Recognition of shared transformation is the fourth phase. An individual begins to realize they are not the only ones experiencing this transformation and therefore find comfort in the shared transformational experience they now have with others. The fifth phase is the exploration of new roles or actions. Still unsure of how to proceed, adult learners will begin to try on new roles or actions that account for their new beliefs. Creating a plan of action is the sixth phase. The learner recognizes they have more to learn and therefore set a specific plan in action to accomplish their new goals. The seventh phase is acquisition of knowledge and skills for implementing the plan. After realizing there is more to learn, adult learners take action and acquire the knowledge and resources they need to move forward in their earning or lives. This is followed by trying out the plan which is the eighth phase. The adult learner will experiment new points of view or habits of mind, testing for effectiveness.

The ninth phase is building increased competence and self-confidence. The adult learner becomes more confident in their new beliefs and values as they use them in new situations. The final phase is reintegration on the basis of new perspectives. This last phase of transformative learning theory is when the individual fully incorporates their new and developed frame of reference into their lives and relationships. Understanding how adults learn is critical. Mezirow's learning theory therefore has an influence on how adults should be taught in endless capacities, including work place education and training, college classrooms, self-improvement and mental health services.

1.5.1 Application of Transformative Learning Theory in Adult Education

According to NewDemocracy Foundation (1994) ideal conditions of learning are also the ideal conditions of education. The education of adults involves both instrumental and communicative learning. Learning in both may be transformative but each of these learning domains require different educational interventions. Most adult education has been devoted to a description of how to facilitate instrumental learning with its clearly defined needs and learning tasks, anticipated learning outcomes, behavioral objectives, competency-based education and measurable learning gains. None of these considerations are necessarily relevant to the communicative learning domain. Here the emphasis is on critical reflection of assumptions supporting our beliefs, discourse to validate our beliefs and reflective action upon the insights, resulting from the transformation of meaning structures. This process calls for a redefinition of needs assessment, learning objectives, instructional methodology and evaluation.

Reflective action often involves overcoming situational knowledge and emotional constraints. Action in transformative theory means making a decision and not necessarily an immediate behavior change. Transformative learning which involves sociolinguistic perspectives will result in learners being motivated to take collective social action to change social practices, institutions or systems. Transformative action may also address change in oneself and the way one learns. Education for communicative competence involves cultivating the learners' ability to negotiate meanings and purposes instead of passively accepting the social realities defined by others.

Education should actively assist those already going through transformations in learning and may precipitate transformative learning as well. Educators can also facilitate reflective action by helping adult learners overcome

situational knowledge or emotional constraints. Transformative learning is central to what adult education is all about. Adult development means the progressive realization of an adult's capacity to fully and freely participate in rational dialogue to achieve a broader, more discriminative permeable and integrative understanding of his/her experience as a guide to action.

2.1 Review of Related Literature

According to Njui (2018), the need for effective teacher professional development has continued to attract the attention of educators. Research reports show a positive link between teacher professional development, teaching practices and student outcomes. Literature reviewed in this section was guided by 4 research questions: What are the elements of effective professional development for 21st century skills? How can institutions create conditions for effective professional development? What are the implications for policy and practice? What strategies can be put in place to develop teachers' 21st century skills?

2.1.2 Elements of Effective Professional Development

The Learning Policy Institute (2017) asserted that there are seven widely shared features of effective professional development. These include content focus, active learning, collaboration, use of models and modelling, coaching and expert support, feedback and reflection and sustained duration. Random studies done by Institute of Education Sciences (2017) provided evidence that Professional Development (PD) programs on improving teachers' content knowledge and their knowledge about content specific pedagogy can produce significant gains in teachers' knowledge. The studies however showed that improving teachers' knowledge did not translate into improvement in student achievement.

The other element is active learning. This provides teachers with opportunities to get hands on experience designing and practicing new teaching strategies. In PD models featuring active learning, teachers often participate in the same style of learning they are designing for their students using real examples of curriculum, student work and instruction. A good example is reading apprenticeship, an inquiry-based PD model designed to help high school biology teachers integrate literacy and biology instruction in their classrooms. Teachers in the program practice classroom routines that will help to build student engagement and student collaboration, such as "think-pair-share", jigsaw groups and text annotation. Reflection and other metacognitive routines such as thin-aloud and reading logs for science investigations are also used in PD sessions (Greenleaf et al., 2011).

Collaboration is another element of effective professional development. High quality professional development creates space for teachers to share ideas and collaborate in their learning, often in job-embedded contexts that relate new instructional strategies to teachers, students and classrooms. By working collaboratively, teachers can create communities that positively change the culture and instruction of their entire grade level, departments, school and/ or district (Lara-Alecio et al., 2012).

Coaching and expert support involve sharing of expertise about content and practice focused directly on teachers' individual needs. Experts may share their specialized knowledge as one on one coaches in the classroom, as facilitators of group workshops or as remote mentors using technology to communicate with educators. They may include master teachers or coaches based in universities or professional development organizations (Powell et al., 2010)

High-quality professional learning frequently provides built in time for teachers to think about, receive input on and make changes to their practice by facilitating reflection and soliciting feedback. Feedback may be offered as teachers analyze lesson plans, demonstration lessons or videos of teacher instruction, which also provides opportunities for reflection about what might be refined and reinforced. These activities are frequently undertaken in the context of coaching session or workshop but they must also occur among peers (Landry et al., 2009).

The last element according to Learning Policy Institute (2017) is sustained duration. Effective professional development provides teachers with adequate time to learn practice, implement and reflect upon new strategies that facilitate changes in their practice. As a result, strong PD initiatives typically engage teachers in learning over weeks, months or even academic years rather than in short one-off workshops (Desimone, 2009)

2.1.3 Conditions for Effective Professional Development

The quality of a PD initiative's implementation has implications for its overall effectiveness in enhancing teacher practice and improving student learning. Research has shown that willing teachers are sometimes unable to implement PD practices due to obstacles that are beyond their control (Buczynski & Hansen, 2010). Even the best designed PD may fail to produce the desired outcomes if it is poorly implemented due to barriers such as: inadequate resources including necessary curriculum materials; lack of shared vision about what higher quality instruction entails; lack of time for implementing new instructional approaches during school day or years; failure to align state and local policies towards a coherent set of instructional practices, dysfunctional school cultures and inability to track and assess the quality of professional development (Tooley & Connally, 2016).

Implementing PD also requires responsiveness to the specific needs of teachers and learners and to the school and district contexts in which teaching and learning will take place. These types of common obstacles to PD should be anticipated and planned for during both the design and implementation phases of PD.

2.1.4 Implication for Policy and Practice

According to Darling-Hammond et al. (2017), examples of PD that have been successful in raising student achievement can help policymakers and practitioners better understand what quality teacher professional learning looks like. To support and incentivize the kind of evidence-based PD, policy makers can adopt standards for professional development to guide

the design, evaluation, and funding of professional learning provided to educators. These standards might reflect the features of effective professional learning outlined above. Policy makers can also evaluate and redesign the use of time and school schedules to increase opportunities for professional learning and collaboration, including participation in professional learning communities, peer coaching and observations across classrooms, and collaborative planning. Policy makers can regularly conduct needs assessments using data from staff surveys to identify areas of professional learning most needed and desired by educators. Data from these sources can help ensure that professional learning is not disconnected from practice and supports the areas of knowledge and skills educators want to develop. Policy makers can also identify and develop expert teachers as mentors and coaches to support learning in their area(s) of expertise for other educators.

There can be integration of professional learning into the school improvement initiatives, such as efforts to implement new learning standards, use student data to inform instruction, improve student literacy, increase student access to advanced coursework, and create a positive and inclusive learning environment. Policy makers may also provide technology-facilitated opportunities for professional learning and coaching, using funding available to address the needs of rural communities and provide opportunities for intra-district and intraschool collaboration. They can provide flexible funding and continuing education units for learning opportunities that include sustained engagement in collaboration, mentoring, and coaching, as well as institutes, workshops, and seminars.

Well-designed and implemented PD should be considered an essential component of a comprehensive system of teaching and learning that supports students to develop the knowledge, skills, and competencies they need to thrive in the 21st century. To ensure a coherent system that supports teachers across the entire professional continuum, professional learning should link to their experiences in preparation and induction, as well as to teaching standards and evaluation. It should also bridge to leadership opportunities to ensure a comprehensive system focused on the growth and development of teachers.

2.1.5 Strategies to develop Teachers' 21st Century Skills

The ultimate aim of teacher professional development is to improve teaching practice. In this regard, collaborative inquiry learning is often regarded as a way of encouraging shifts in teaching practice in terms of self-improvement and class room behavior (Bray, 2002; Hughes & Ooms, 2004). Inquiry based professional development is no different from inquiry-based projects undertaken by students. Teachers are required to draw on resources from the literature and experience of their own or their colleagues to guide inquiry in a sustained and reflective manner (Butler & Schnellert, 2012). Such inquiry should be carried out over a period of time. This feature makes inquiry programs superior to workshops and seminars as the latter are usually not coherent and lack depth to provide ongoing support for implementation of new pedagogies (Sandholtz, 2012). In the inquiry, teachers may address common issues of teaching and learning to sustain educational reforms and then collectively come up with solutions to the concerns identified (Malakolunthu, 2013).

One benefit of teachers' collaborative inquiry efforts is their increased attempt to problem-solve. Through teachers' concerted efforts, they engage in conversations that examine the causes and impact of instructional problems such as classroom dynamics and student-teacher conduct. Teachers' patterns of thinking are progressively oriented towards problem solving, with discussions and diagnostic viewpoints supported by examples and evidence which lead to new angles and possibilities to solve problems. Having gained first-hand experience in collaborative inquiry, teachers can evaluate their relevant skills and knowledge to their students, as various inquiry cycles have shown (Butler & Schnellert, 2012).

Support for teacher inquiry programs is essential to facilitate fruitful professional development. Both the support for the collaborative inquiry process and for an inquiry environment are highly relevant (Nelson & Slavit, 2008). The former refers to facilitative processes that create room for teachers to discuss their inquiry path and progress along an inquiry circle, for example, through adoption of protocols to structure collaborative data analysis. These measures may strengthen teachers' abilities to challenge existing beliefs with a critical eye. The latter involves reinforcement from external stakeholders such as school, district or state initiatives, and established norms of collaboration or experts invited from outside the school.

The other strategy is to partner with universities. Schools and universities often join hands in the quest for developing teachers 21st century skills. Collaboration of this type may be organized in different forms. Small-scale subject-specific activities may be more suited to projects with less funding while this is also possible for a series of professional development events aiming for ongoing critical reflection on challenging contents (Sandholtz, 2001). Such kind of collaboration is mutually beneficial. Academic researchers play a leading role in the integration of theory and practice by offering their expertise on theoretical knowledge so that teachers may refine their practical skills (Baumfield & Butterworth, 2007).

Formal training courses is the other strategy. These courses should serve the purpose of enhancing teachers' capacity to adopt to changes required in 21st century teaching. The courses should be held over a period of time to allow teachers to have the time needed to digest what they have learnt. Such courses include university organized in-service professional development programs exploring task-based learning, making use of portfolio development. Other courses may include instructing teachers on how to integrate the technique of digital story telling into the classroom. These courses guide teachers step-by-step through the process of implementing the pedagogy, providing them with the necessary knowledge, skills as well as chances to share them with colleagues at work.

Another strategy is to have teacher communities (Kariuki et al., 2024). Peer support in form of teacher communities is another way to engage teachers in the professional development of 21st century skills. In teachers' communities, teachers with common goals in areas such as teaching and problem solving can exchange ideas on classroom practice and student learning, develop and share teaching materials, observe one another teach when possible and offer advice that helps

members of the community learn new ways of teaching. Most professional communities focus on the concept that collaboration among teachers promotes teacher learning, which in turn improves their teaching and student learning. The success of teacher communities however depends heavily on teacher willingness to openly share and discuss their teaching dilemmas and uncertainties with one another which in general strengthens teachers' ability to collaborate, in addition to gaining insights via discussions.

3.1 Methodology

The approach used for this paper was a desk review of published works from Rand Corporation Asia society- partnership for global learning and research gate data bases. Information was also retrieved from Learning Policy Institute Research Brief; European Journal of Education Studies; World Journal of Education; Research on Humanities and Social Sciences; African Journal of Education and Adult Education Quarterly; JSTOR among other sources. The search for accurate data pertinent to the topic both published and unpublished data were systematically conducted. The paper examined literature in the following areas: how to teach 21st century skills; assessing 21st century skills; building the capabilities to teach 21st century skills; elements of effective professional development; creating conditions for effective professional development; implications for policy and practice in institutions and strategies to develop teachers 21st century skills. The paper finally discussed study findings, drew conclusions and presented recommendations.

4.1 Findings and Discussions

The development of competencies known as 21st century skills is receiving increasing attention as a means of improving teacher instructional quality which, in turn, leads to effective 21st century learners. Trilling and Fadel (2009) argued that it is necessary to prepare students with life-long learning skills both in work and lives. The following discussion will be limited to 21st century skills that many teachers are particularly lacking: information technology literacy, information literacy, media literacy as well as digital collaboration skills. Information technology (IT) literacy is the most fundamental among the set of digital literacies. IT literacy is the first skill teachers must acquire in order to master all the three skills under the umbrella of digital literacy. This is because the search for and organization of information is largely supported by technology nowadays, as well as the creation and utilization of media (Barone, 2012; Safar & AlKhezzi, 2013; cited in Chu et al., 2017, p.111). There is an increasing trend for technology integration in the classroom, requiring teachers to incorporate technology into their pedagogy (Kopcha, 2012; Wilson & Christie, 2010; cited in Chu et al., 2017, p.111).

According to Christensen and Knezek (2008), teachers progress through various stages of technology adoption, beginning with being alert to the possibilities of technology implementation for both personal purposes and letting students acquire IT literacy in their everyday learning. This awareness eventually brings about routine utilization of technology. Furthermore, with appropriate training and support, they advance to more creative usage of technology for teaching and learning (cited in Chu et al., 2017, p.111). Teachers' beliefs in IT and confidence in their own IT skills are two major attitudinal obstacles towards effective technology integration in their teaching (Bhalla, 2012; Kopcha, 2012; cited in Chu et al., 2017, p.112). Chu et al. (2017) stated that, "If teachers feel uncomfortable with the use of technological tools or are apprehensive that they may not be qualified to teach using IT, they are less likely to incorporate technology into their teaching, resulting in less interaction between students and technology" (p.112).

According to Cortez et al. (2009), to develop and sharpen one's skills of collaborating with peers and becoming a team player, one very effective way is to learn through experience to collaborate with fellow classmates in activities that encourage social interaction. Collaborative learning replaces the teacher's traditional role of the teacher to a facilitator (Chu et al., 2012). With this change in the teacher's role from a knowledge deliverer to a mediator of students' knowledge development, new tools and pedagogies are needed to appropriately support students' acquisition of collaboration and communication skills. In order for collaboration not to become a waste of time and thus lead to failure to complete the task, teachers need to take the necessary measures to ensure adequate and effective communication between students on the chosen collaborative platform. (Rummel & Spada, 2005; cited in Chu et al., 2017, p.115).

In the view of Law et al. (2008), to integrate 21st century skills into the current teaching content, teachers have to be open to ongoing professional development. It does not suffice for teachers to only focus on routine practice of instruction in their respective classrooms and disregard other teachers. In addition to keeping track of their own professional learning, it is beneficial that teachers share their knowledge with colleagues in a community of practice, engage in reflections of their own teaching, be ready to take risks and foster trust within the community of practice. Scholars have proposed that such a relationship among teachers can be built with the assistance of technology and collaboration with other educators. After introducing 21st century skills that many teachers are particularly lacking and therefore need to adopt, we come to the section that discusses the strategies or methods through which teachers can develop such skills. Yue (2019) stated that, "Teacher professional development integrates 21st century skills into teaching. For instance, integrates cross-cultural understanding skills into literature class, practices critical thinking and problem-solving skills in management class. Strategies of teacher professional development should be cohesive and coherent with 21st century skills." (pp. 252-254). The following methods can strengthen teacher professional development for 21st century education.

According to Yue (2019), mentoring invests the best practice and brings appropriate tools in teacher professional development. There is a need to introduce experienced teachers who use effective methods to educate teachers and develop their 21st century skills into professional work." (p. 120). These courses may cope with different aspects of 21st century skills, and are held over a period of time to allow teachers the time needed to absorb what they have learned into professional development. Peer-mentors can act as advisors and consultants to help teachers with prior experience and nurture teachers with self-management, communication and leadership skills. Peer-mentors know the teachers who can design beneficial training to guide them on how to teach 21st century skills and how to stimulate student learning (p. 253).

Collaboration can take different forms, such as: teacher networks, team-based, learning community and peer coaching. Depending on job-embed professional development, in their groups teachers can discuss together, exchange different opinions, learn from each other to achieve the same goal. Moreover, teachers develop themselves by collaborating with other colleagues with same goals on student performance and achievement of 21st century skills (Yue, 2019, p. 254). A study done in Kenya by Kariuki and Itegi (2020) established that teachers' participation in collaborative activities such as peer coaching, team teaching, sharing and lesson observation have a positive influence on learner achievement.

The ultimate aim of teacher professional development is to improve teaching practice. In this regard, inquiry learning is often recognized as a way of encouraging shifts in teaching practice in terms of self-improvement and classroom behavior (Bray, 2002; cited in Chu et al., 2017, p.117).

According to Chu et al. (2017):

Inquiry based professional development is no different from inquiry-based projects undertaken by students: teachers are required to draw on resources from the literature and experience of their own or their colleagues to guide inquiry in a sustained and reflective manner, and such inquiries are carried out over a period of time (pp. 117- 118).

In the view of Deni and Malakolunthu (2013), one benefit of teachers' collaborative inquiry efforts is their increased attempts to problem-solve. Through teachers' concerted effort, they engage in conversations that examine the causes and impact of instructional problems. Teachers' patterns of thinking are progressively oriented towards problem solving, with discussions and diagnostic viewpoints supported by examples and evidence, which lead to new angles and possibilities to solve problems (Chu et al., 2017, p.118).

Teacher Communities Peer support in the form of the teacher communities is another way to engage teachers in the professional development of 21st century skills. In teacher communities, teachers with common goals in areas such as teaching and problem solving can exchange ideas on classroom practice and student learning, develop and share teaching materials, observe one another teach when possible, and offer advice that helps members of the community learn new ways of teaching (Lomos et al., 2011; Little, 2012; cited in Chu et al., 2017, p.120).

According to Levine (2010), most professional communities focus on the concept that collaboration among teachers promotes teacher learning, which in turn improves their teaching and student learning. This is supported by Mitchell et al. (2024) who confirmed that it has been used successfully at a small scale with support from university-based researchers and teacher educators. Little (2012) pointed out that the success of teacher communities however depends heavily on teachers' willingness to openly share and discuss their teaching dilemmas and uncertainties with one another which in general strengthens teachers' ability to collaborate, in addition to gaining insights via discussions.

According to Yue (2019), "Information communication technology can be applied in teacher professional development. Online forum produces a platform for teachers to communicate with each other to share training experience of 21st century skills together and learn from peers. Peer-mentors can use video in training teachers." (p.255).

According to Chu et al. (2017), "Formally structured courses are organized, often by higher education institutes, to serve the purpose of enhancing teachers' capacity to adapt to changes required in 21st century teaching."(pp. 119-120). The researchers pointed out that "These courses guide teachers step-by-step through the process of implementing the pedagogy, providing them with the necessary knowledge and skills, as well as chances to share them with colleagues at work (p. 120). These courses may cope with different aspects of 21st century skills, and are held over a period of time to allow teachers the time needed to absorb what they have learned.

5.1 Conclusion and Recommendations

There are great demands placed on teachers in the 21st century from the aforementioned findings and discussions. Teachers must enable their students meet the rapidly changing demands of the 21st century job market. In conclusion, teacher professional development and education in the 21st century requires teachers to be high-level knowledge workers who are constantly developing their professional knowledge. Today, teacher professional development programs should be designed to equip teachers with critical thinking and problem-solving skills, communication and collaboration, cross-cultural understanding, creativity and innovation, information literacy, media literacy, technology literacy and ICT literacy skills.

The study makes the following recommendations to different stakeholders:

There is need to link professional development to school goals, student learning and teaching practice: Professional development should support teachers across the entire professional continuum starting from pre-service to in-service training. All elements of professional development including training, teacher networks and collaborative inquiry should be linked to and aligned with school goals and student learning.

Align professional development with education reforms: Professional development should be systematically structured and aligned with 21st century reforms in education. This entails embracing reforms such as technology integration in learning and teaching; use of constructivist pedagogy, differentiated teaching and assessment; emphasis of formative assessment, standards driven education, interdisciplinary education and systems thinking in order to empower teachers with 21st century skills.

Invest in technology for effective professional development: The government should prioritize technology installation in learning institutions to acknowledge it as the key driver of 21st century education. It should further emphasize the need to train teachers in technology skills to enable them to effectively integrate technology in instruction.

Embrace lifelong professional development: Education planners should put in place systematic structures for lifelong professional development to continually empower teachers with skills that enable them offer relevant quality education that is responsive to the needs of the changing society.

Network with institutions offering professional development: Learning institutions should network with local and international institutions offering structured and systematic professional development to borrow best practices in order to improve the quality of teaching and learning. This could enable learning institutions across the globe to align with the 21st century standards-based education.

Prioritize areas of professional development: Learning institutions should identify and focus on one or two instructional priority areas at a time with input from the teachers/faculty to make professional development simple and effective. They should also communicate these priorities and expectations to all staff before implementation for ownership purpose.

Provide feedback: Professional development should make provision for constant feedback to help teachers monitor implementation of instructional skills. Feedback is significant in enhancing mastery of skills.

Formulate and enforce policy on professional development: Policymakers should adopt standards for professional development to guide its design, evaluation and funding. They should also work with school administrators to evaluate and re-design the use of time and school schedules to increase opportunities for professional learning and collaboration such as participation in professional learning communities, peer coaching and observations across classrooms, and collaborative planning.

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