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**Review Article**

# A Theoretical Framework for Training Science Teachers in the 21st Century to Enhance Social Accountability in Poor Communities

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**Abstract**

Some scholars have accepted social accountability as a framework, through which the needs of communities could be in all education systems. However, there are considerable differences in the needs of communities in resource restrained communities compared with well resources communities. Consequently, there is a need for a specific theoretical framework which will inform curriculum design for science teacher training in resource restrained communities. In such a framework, the researcher proposes the adoption of citizenship education as the philosophical basis for social accountability in education. Such as education should integrate knowledge orientation, reality orientation, and an inquiry orientation for the selection of content and planning the sequence of learning experiences. It should also reflect the citizenship-centered ideology as a central principle of the curriculum. The researcher believes that a curriculum that is based on this framework could facilitate the adoption of social transformation and social accountability.

**Keywords**

Citizenship education; Curriculum ideologies; Social reconstruction; Social accountability; Theoretical framework

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## Introduction

School science curricula and education systems around the world continuously undergo reforms which attempt to introduce education that prepares learners for the challenges of the 21st century. For example, Hoeg and Bencze (2017) suggest that the need to improve the global and local socio-scientific and economic competitiveness of the students and their countries should inform curriculum reform. Such curriculum reforms could ensure that contemporary scientific discoveries related to STEM education are integrated into the new curriculum (Pietarinen, Pyhältö & Soini, 2017). Furthermore, education reform could ensure the standardization of teaching and learning, content, and learning outcomes and ensure that the curriculum adopts modern educational philosophies (Porter, Fusarelli & Fusarelli, 2015). Ultimately, science curriculum reform is generally informed amongst others by a view that "education is the most powerful weapon you can use to change the world" (Mandela, 2003). Consequently, governments and societies, in general, are continually exploring curriculum reforms, which are aimed at "redressing the inequalities and injustices caused by the [colonial] regime policies" (Bantwini, 2010, p. 84). The primary aim in this regard is to 'cleanse' the curriculum of content, pedagogy and other aspects which were integrated into education by colonial governments which used education as a weapon for oppression (Mnguni, 2018).

While scholars welcome curriculum reforms, one wonders whether science teachers are adequately prepared for their evolving role, not only as facilitators of the construction and acquisition of 21st-century knowledge but also their role as agents of change. Researchers (e.g., Mnguni, in press) have argued for social accountability to be the framework guiding the practices of science teacher training institutions. Social accountability in this regard holds a promise for a better education that responds to the needs of communities. However, there is a dearth of knowledge regarding an educationally recognizable theoretical framework that could ensure that pre-service science teachers are not indoctrinated with knowledge, skills, perceptions, and attitudes of their lecturers but are allowed to reconstruct their own world, using transformative knowledge, skills, and attitudes.

Scholars define social accountability within the context of education as a willingness and ability to adjust education systems to the needs of communities (Lindgren & Karle, 2011; Ventres, Boelen & Haq, 2018). Given the growing dominance and interest in the subject, one wonders whether social accountability as a framework could lead to the production of science teachers required, especially in the rural developing world. Notably, discussions around social accountability tend to focus at an institutional level rather than an individual student level. Additionally, much research on social accountability has focused on medical education rather than science teacher education. Boelen (2008) contends, for example, that in this century, training institutions will be gauged by their capacity to anticipate the kind of

professionals required by evolving social contexts. Given this, in this article, the author explores social accountability as a framework for science teacher training curricula. He also presents a theoretical framework that could ensure that pre-service science teachers have sufficient skills and knowledge for their emerging role as agents of change. He bases his views on the hypothesis that socially accountable institutions will not necessarily produce socially accountable graduates. While this hypothesis is not tested empirically in this article, the author does present a theoretical framework that could guide the curriculum for the training of socially accountable science teachers.

**The Role of Science Teachers in Resource-constrained Communities**

Science teachers in resource-constrained communities face unique challenges compared to their first world counterparts. They work under less resourced facilities and in poverty-stricken environments (Chen, Evans, Anand, et al., 2004; Wray & Richmond, 2018). Furthermore, the quality in life in some of these communities is deteriorating as the 'gap between the rich and poor gets wider and wider.' It is for this reason that countries such as South Africa are introducing policies, including education policies, which seek to ensure standardized access to resources and services for all citizens, irrespective of their socioeconomic status (Donohue & Bornman, 2014). This is primarily because research has shown that poverty, behavior, and ill-health are intertwined (Wagstaff, 2002). Poverty has been found to correlate with high fertility, low household income, unmanageable health care costs, and illiteracy (Eastwood & Lipton, 1999). For example, a study has shown that the spread of HIV in developing countries, such as those in sub-Saharan Africa, is associated with high-risk behavior, stigma, and discrimination, poor sexuality education, as well as the violation of human rights, all which occur in higher rates amongst the illiterate and the poor (Donovan & Ross, 2000).

Consequently, the role of science teachers in these communities goes beyond mere teaching, to include giving guidance, being accessible, positive, committed, trustful, and self-assured in order to support their learners and communities (Van der Heijden, Geldens, Beijaard, & Popeijus, 2015). The reason for this is that a high number of HIV/AIDS-affected learners grow up without one or both parents (Campbell, Andersen, Mutsikiwa, Madanhire, Nyamukapa, & Gregson, 2016). Consequently, the role of the school is expanded beyond teaching to "substituting families" (Campbell et al., 2016, p. 2). In the broader context of the role of teachers, therefore, conditions under which teachers function require a reconceptualization of teacher training in order to prepare them for their context-specific roles.

Given the apparent link between education and social problems, the current researcher believes that science teacher education should prepare future science teachers for their roles as agents of change. For instance, science teachers should be able to engage communities in facilitating social reconstruction, such as the

transformation of risk behaviors concerning health problems. While some may argue that this is not the science teachers' direct problem, one cannot ignore the fact that in most impoverished communities, society regards science teachers as change agents with significant authority at a social level.

**Social Accountability**

Green-Thompson (2013) poses some interesting questions regarding the practice of teaching in education. "How do we work; what do we do; and, what difference do we make?" he asks arguing that educational institutions need to respond to the needs of the communities in which they operate. He further contends that the product of education should be agents of transformation. These views are based on the call for social accountability in education. The World Health Organization (1995) defines social accountability as "directing education, research and service activities towards addressing the priority concerns of the community, region, and nation they have the mandate to service" (Frenk et al., 2010, p. e60). Therefore, to expand on Green-Thompson's (2013) questions, institutions of science teacher training ought to: *who* do we produce, *who* do we want to produce, and, what must we do to produce such a *person*.

In response to the above questions, Van Heerden (2013) argues that scholars must ensure that the education and training of science teachers are aligned with the need of the society. To this end, colleagues in medical education have heeded this call with a sense of urgency. For example, the Health Professions Council of South Africa (HPCSA), which is a statutory body responsible for undergraduate training of medical doctors in South Africa concluded that the training of health care professionals must follow competency-driven instructional design (Van Heerden, 2013). This will allow graduates to be able to work optimally in inter-disciplinary and trans-professional teams. For this to occur, however, training institutions should utilize and share open educational resources, and be willing to engage with other stakeholders in the health and education systems to optimize collaboration.

Given these views, the current researcher argues that science teacher education should adopt a similar framework by ensuring that there is a precise alignment between science teacher training, the learner's needs, and the community's needs. In the light of this, the pertinent question then is: what would curricula that foster social accountability among science teachers constitute? In this regard, the researcher believes that it is imperative to have a theoretical framework that could be used as a guide to ensuring that education fosters social reconstruction. This framework is proposed below. While existing literature forms the basis for this framework, the framework itself is a novel synthesis.

**The Theoretical Framework for Social Accountability**

Curriculum theory refers to a way of developing and analyzing curriculum using historical, present, and future perspective and then providing ways of viewing the curriculum in a present context (Schiro, 2008). During curriculum development, therefore, researchers need to engage in theorizing, where they develop curriculum theory to assist with curriculum research and development as well as ways of conceptualizing the curriculum (Schiro, 2008). Pinar (2004) argues that each subject (module or course) needs to have a specific curriculum theory (or theories) that guide the course of curriculum development which will guide research and development for the curriculum concerning content selection, instructional design, and assessment. Consequently, a curriculum that fosters social accountability ought to be based on a theoretical framework, which addresses the nature of the intended graduate, philosophical position, rationale, and ideology of the curriculum. These aspects are discussed below.

**Characteristics of an Ideal Science Teacher**

The researcher believes that an ideal science teacher in a resource-constrained environment needs to be competent in at least six areas. Borrowing from the work of Frank (2005) in medical education, the researcher proposes that science teachers need to be education experts who can play an active role as communicators, collaborator, managers, education advocates, researchers and professionals (Figure 1).


**Figure 1.**

*The Roles and Competencies of a Science Teacher (adapted from Frank, 2005)*

As an *education expert*, science teachers need to possess a defined body of knowledge, pedagogical skills, science process skills and professional teacher attitudes, which are directed to effective teaching and learning (Berliner, 2004; Frank, 2005). This means science teachers ought to be able to collect and interpret information, make appropriate educational decisions, and carry out relevant educational interventions. As *communicators* science teachers must be able to facilitate and promote community and learner-centered communication through shared decision making and effective dynamic interactions with learners, families, caregivers, other professionals, and other essential individuals (Frank, 2005; Khan, Khan, Zia-Ul-Islam, & Khan, 2017). In this role teachers could develop competencies which are essential for effective teaching which could create rapport and trust required for delivering information, striving for mutual understanding, and facilitating a shared plan of the education and development of the learner and transformation of the community. As *collaborators*, science teachers must be able to work in partnership with others who are appropriately involved in the education sector (Frank, 2005; Gentry, 2012; Miller & Burden, 2007). This role is increasingly vital in a modern multi-disciplinary and multi-professional environment.

Consequently, science teachers ought to be able to collaborate effectively with learners, families, and interprofessional teams of expert educators for the provision of education and scholarship. As *managers*, science teachers are expected to interact with their work environment as individuals, as members of teams or groups, and as participants in the education system locally, regionally or nationally (Dicke, Elling, Schmeck, & Leutner, 2015; Frank 2005; Gore & Begum, 2012). Science teachers function as managers in their everyday activities, involving co-workers, resources, and organizational tasks. Thus, science teachers need to be able to prioritize, effectively execute tasks collaboratively with colleagues, and make systematic choices when allocating scarce educational resources. Another essential role of science teachers in resource-constrained environments is that of *education advocates*. Here science teachers ought to recognize their duty and ability to improve the overall education outlook of their learners and communities they serve (Duckworth & Maxwell, 2015; Frank 2005). Therefore science teachers ought to be able to identify advocacy activities as necessary for the individual learner, for populations of learners and communities (Van der Heijden, Geldens, Beijaard, & Popeijus, 2015). Individual learners need science teachers to assist them in navigating the education system and accessing the appropriate educational resources on time. Communities and societies need science teachers' specialized expertise to identify and collaboratively address broad education issues. At this level, education advocacy involves efforts to change specific practices or policies on behalf of those served. As *researchers*, science teachers are expected to engage in a lifelong pursuit of mastering their domain of expertise (Frank, 2005; Mertler, 2009). As lifelong learners, science teachers must recognize

the need to be continually learning and model this for others. Through their scholarly activities, they contribute to the creation, dissemination, application, and translation of knowledge. They also facilitate the education of their students, communities, colleagues, and others. As *professionals*, science teachers have a unique societal role as people who are dedicated to the educating and caring of others (Frank, 2005; Lopes, 2009). Teachers are, therefore required to master a complex body of scientific knowledge and skills, as well as the art of teaching. Additionally, science teachers are guided by codes of ethics and a commitment to educational principles that embrace attitudes, behaviors, integrity, altruism, personal well-being, that support the development of the learners and their communities. These commitments form the basis of a social contract between a science teacher and society.

Given the significance of the above competencies, the author argues that the above competencies (Figure 1) must form the core functions of science teaching in the 21st century. For teachers to develop these competencies; however, science teacher training must go beyond prioritizing the development of pedagogical content knowledge to include the development of these competencies to promote social reconstruction through teachers as agents of change.

**Philosophical Position**

With social accountability emerging as a theme in education, another related theme is citizenship education. Citizenship education refers to the use of education to prepare students for their roles in society as citizens (Kerr, 1999; Mnguni, 2018; Waghid, 2002). In citizenship education, the focus is on the development of decision-making, reflective thinking, reflective inquiry (Mnguni, 2018; Waghid, 2002) and the application of knowledge so that students have sufficient knowledge and skills to study social norms and their causes and then drive social transformation where necessary. It is for this reason that Ichilov (1998) argues that citizenship education is critical in contexts where societies are facing an uncertain future such as is the case in the resource-constrained communities, particularly those from the developing world.

Waghid (2002) argues that education has to prepare students to use knowledge and skills to "critically examine how one's personal and theoretical commitments serve as resources for generating particular constructions of meaning in particular contexts, meanings one would probably not have thought about." Therefore, through citizenship education, students would engage critically in social dialogue and continuously reflect on themselves and societies and then deconstruct and reconstruct attitudes and behaviors (Waghid, 2005).

Based on the above synopsis, the researcher argues that institution-specific social accountability alone will not yield social transformation in science teacher training; instead, a focus on student-specific citizenship education is necessary. Science teacher training, therefore, must equip pre-service science teachers adequately for

their emerging new roles as change agents within the philosophical paradigm of citizenship education.

**Rationale for Curricula**

A rationale for the curriculum is the theory-laden justification for the selection of particular content, instructional design, and sequence of presenting the content (Mnguni, 2018). This justification ought to stipulate *i)* predetermined subject matter, *ii)* a planned sequence of learning experiences *iii)* certifiable completion *iv)* the institution of learning *v)* socialization and *vi)* social benefits of the students, faculty and the community at large (Mnguni, 2018; Waks, 2003). There has been criticism; however, as most curricula do not explicitly incorporate social benefits and socialization of students components and leave these to the influence of the hidden curriculum (Mnguni, 2018; Waks, 2003). This is the space which social accountability is attempting to address, which could bridge the gap between the school and societies in which they exist. The implication for education, therefore, is that curriculum designers need to stipulate *social benefits* and how *socialization* of student will occur through their curriculum. This is important because the graduate student science teacher is a human being, who will work with humans. Moreover, therefore, social interactions are inevitable and must be addressed in the curriculum.

The rationale for a curriculum is also based on the orientation of the curriculum (Mnguni, 2013). There are three notable examples in this regard, namely, knowledge-oriented curriculum, reality-oriented curriculum, and an inquiry-oriented curriculum. In a knowledge-oriented curriculum, students are trained to master founding knowledge and modes of inquiry that form the basis of the respective discipline (Mnguni, 2013). Knowledge in this regard is seen as objective and independent of human interference. This is evident in various undergraduate programs in fields such as mathematics, physics, and chemistry. Scholars who favor reality-oriented curricula argue against a knowledge-oriented curriculum as they believe that curricula should be informed by the social, cultural, and personal contexts of the students (Mnguni, 2012). In support of this view, other scholars argue that learning should be student-centered through hands-on experiential learning (e.g., Dewey, 2013; Fiore, Metcalf, & McDaniel, 2007). He further indicates that learning should incorporate citizenship education (Mnguni, 2018; Waghid, 2002). In a reality-oriented curriculum, therefore, knowledge is constructed and presented within the context in which students live. Related to the reality-oriented curriculum is the inquiry-oriented curriculum which proposes that learning must be centered on problem-solving activities that include questioning and hypothesis testing. Students in this instance are given *real-life* problems which act as a stimulus for the search and construction of new knowledge while fostering the development of inquiry skills.

The current researcher, however, believes that it is virtually impossible to have a curriculum that is exclusively based on either of the above foci. Instead, curricula

tend to and should be an amalgamation of various principles, depending on the objectives of that particular discipline. For instance, in first-year science teacher training, it may be necessary to have a curriculum that is predominantly knowledge–oriented where students are taught the principles of science, and theories of teaching and learning for instance. In the second year, students may be exposed to school and community settings to get an understanding of educational challenges facing their communities and how these can be prevented and managed through education. In this instance, a reality-oriented curriculum would be in place. Inquiry-oriented curricula would come in when students are expected to use basic content knowledge learned in early years to solve real-life problems during third and fourth years.

However, such an outlook rejects the role of a science teacher as someone who only facilitates the construction and acquisition of knowledge and skills, to that of a change agent. Naturally, therefore, science teacher training would change from one point of orientation to another, and at times overlaps between these. Consequently, the current researcher argues that what is essential is that at any given time, curriculum designers and science teachers have a clear understanding of the orientation of their curriculum and have specific reasons for it. Furthermore, there needs to be a well-coordinated balance between the different foci to ensure that students develop the necessary skills during each stage. The main focus, however, should always be ensuring that what happens in the teaching and learning setting is continuously linked to the community, both locally and globally, in order to ensure that the principles of social accountability are maintained. This link can be created through a suitable curriculum ideology.

**Curriculum Ideologies**

Curriculum design is a complex task, which should be able to respond to several questions, such as the following:

- What is the nature, purpose, and source of knowledge?
- Who is the primary actor during learning?
- How is readiness for learning determined?
- What is the goal of learning?
- What is the intent of learning?
- What is the role of the student during teaching and learning?
- What is the primary concern of the science teacher?
- How should learners be like at the end of the learning?
- What is the intent of teaching?
- What is the role of the science teacher during teaching and learning?
- How will the science teacher teach?
- How will science teacher effectiveness be measured?
- What is the intent of the assessment?

- How, when, and why is an assessment done?
- What is being assessed?

Answers to these questions can help determine whether the graduating student will be able to bring about relevant social transformation as required in social accountability. To this end, one of the critical aspects of curricula that determine students' behaviors and abilities is curriculum ideology. A curriculum ideology is a set of beliefs about the content, the instructional process, the assessment strategy, and the objectives of teaching and learning (Schiro, 2008).

Researchers (Mnguni, 2013; Schiro, 2008) have identified at least four ideologies relevant in education, namely, discipline-centered ideology, service-centered ideology, student-centered ideology, and citizenship-centered ideology (Table 1). In the *discipline-centered ideology*, the primary objective is transmitting discipline-specific cultural knowledge, through 'discipleship' form of teaching and learning (Cotti & Schiro, 2004). This ensures the "plurality and autonomy of academic disciplines and the associated knowledge" (Schiro, 2008). Knowledge in this ideology is classified according to various stand-alone disciplines where students are taught a discipline-specific epistemology and ontology (Schiro, 2008; Ravitch, 2000). In *service-centered ideology*, the focus is on ensuring that students can perform specific tasks when rendering a service. These tasks are often done following a predetermined step-by-step protocol with minimal room for deviation. In this service-centered ideology, faculty is responsible for identifying educational problems and the objectives which are translated into learning activities for students. In the discipline-centered and service-centered ideology, there is minimal interdisciplinary teaching and learning, and their graduates have difficulty thinking or working beyond the boundaries of their disciplines. This form of education is based on Bobbitt (Bobbit, 1918, p. 42), who argued:

> "Education that prepares for life is one that prepares for specific activities. However, numerous and diverse they may be, they can be discovered. This requires only that one go out into the world of affairs and discover the particulars of which these affairs consist. These will show the abilities, attitudes, habits, appreciations, and forms of knowledge that men need. These will be the objectives of the curriculum. The curriculum will then be that series of experiences which children and youth must have by way of attaining those objectives... that series of things which children and youths must do and experience by way of developing abilities to do the things well that make up the affairs of adult life; and to be in all respects what adults should be."

**Table 1**

*A Comparison of Curriculum Ideologies (adapted from Schiro 2008).*

| Components of the curriculum | Discipline-centered ideology | Service-centered ideology | Student-centered ideology | Citizenship-centered ideology |
|---|---|---|---|---|
| Purpose for knowledge | Understanding reality | Performing tasks | Actualizing oneself | Interpreting and reconstructing society |
| Nature of knowledge | Objective reality as interpreted by academic disciplines | Normative objective reality as socially interpreted | Individuals' creative meaning in response to experience | Individuals' interpretation of society's past, present, and future |
| Purpose and nature of instruction | Mastering discipline-specific knowledge for the advancement of the discipline | Understanding social principles and acquiring knowledge for providing predetermined services to society | Understanding oneself and acquiring and constructing knowledge for individual growth | Understanding social principles and acquiring and constructing knowledge for social transformation |
| Role of the student during instruction | Students viewed relation to standardized norms as they passively absorb pre-existing knowledge which transforms mindsets | Students viewed relation to standardized norms as they actively learn predetermined knowledge which transforms their behavior | Students viewed as individuals as they actively construct knowledge which transforms their mindsets | Students viewed relation to standardized norms as they actively learn emerging knowledge which transforms their mindsets and behavior |
| Role of the teacher during instruction | Accurate representor of the discipline who transmits didactic knowledge to stimulate uniformity by directly implementing | Learning supervisor who follows programmed instruction to stimulate uniformity by directly implementing the | Growth facilitator who adapts the curriculum according to students' needs in order to stimulate | Visionary and colleague who adapts the curriculum according to social concerns to effectively transfer a social vision |

| | | | | |
|---|---|---|---|---|
| | the curriculum in order to advance students in the discipline | curriculum in order to prepare students to perform tasks. | growth and diversity | by stimulating uniformity in order to prepare students for their roles as change agents |
| Purpose and nature of assessment | Used at the end of instruction to rank students for a future in the discipline through norm-referenced objective assessment | Used at the end of instruction to certify that students have acquired skills as determined through criterion-referenced objective assessment | Used during instruction to diagnose students' abilities and to facilitate growth through informal subjective diagnosis | Used during instruction to measure student progress for ability using informal subjective diagnosis |

In the *student-centered ideology*, teaching and learning are focused on the student, his interests and abilities, and students are allowed to construct their knowledge and develop skills. Teaching, therefore, is regarded as a nurturing process where science teachers are facilitators and mentors. The student-centered ideology is founded on views of researchers such as John Amos Comenius who contend that "artisans learn to forge by forging, to carve by carving, to paint by painting...let children learn to write by writing, to sing by singing, and to reason by reasoning" (Schiro, 2008). It is based on the notion that students' natural abilities and interests should be central to teaching to facilitate the growth of students by helping them develop their skills and abilities further.

*Citizenship-centered ideology*, on the other hand, borrows from the likes of Lester Frank Ward who believes that students are members of the community in which they live; who have the ability to influence and be influenced by the norms, values, and practices of their societies through intelligence and knowledge (Cotti & Schiro, 2004). Central to a citizenship-centered ideology, therefore, is the view that students must acquire knowledge and skills that will enable them to identify social ills and be able to reconstruct these into social benefits. This, however, means teaching and learning must occur in the community settings, rather than isolated university classrooms that are divorced from the community so that everyday dynamics of the society are an integral part of the curriculum. It is this form of education that the researcher proposes for science teacher training, which could lead to social

reconstruction. By immersing pre-service science teachers in the community, one would ensure that they have a good understanding and first-hand experience of social dynamics which affect their learners. These science teachers would also be forced, through both the formal and hidden curricula, to consider strategies for addressing these challenges post their training, thereby ensuring that social accountability is maintained.

**Summary: Theoretical Framework for Social Accountability: Implications for Education**

Social accountability, which could lead to social reconstruction through education requires that competent science teachers must have sufficient content knowledge and skills that will allow them to discover new knowledge and skills in addressing social and educational problems. Based on the above discourse, the proposed theoretical framework for social accountability in education (Figure 2) comprises of the following:

a) The adoption of competency-based science teacher training;
b) Citizenship education as a philosophical basis for the curriculum;
c) Integration of knowledge orientation, reality orientation and an inquiry orientation in the rationale for the curriculum; and,
d) Emphasis on citizenship-centered ideology as a central principle of the curriculum.

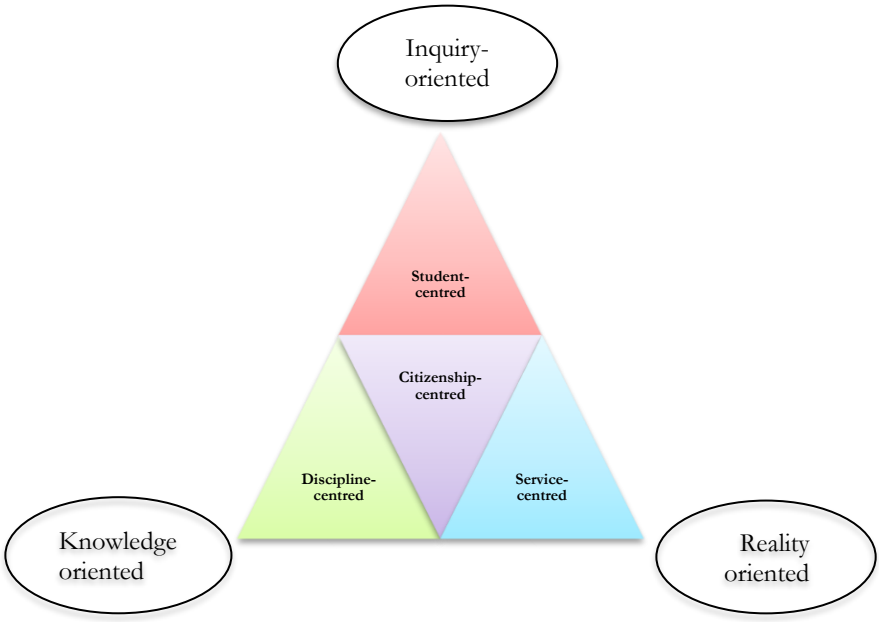


**Figure 2**

*A Theoretical for social Accountability for Science Teacher Education*

In the proposed framework, the fundamental assumption is that society has educational challenges due to psycho-socio-economic norms, values, and conditions, such as those seen in many developing countries. These challenges can be eliminated by transforming social norms and values through transformative citizenship education. The role of education institutions, therefore, should be facilitating the development of relevant competencies and teaching new knowledge and skills that could be used to transform social norms and values (Mnguni, 2012).

The researcher proposes that knowledge be expressed as scientific truth that has social value (Table 1) (Schiro, 2008). Teaching this knowledge, therefore, must be aimed at helping students have a better understanding of their societies and be able to develop strategies through which societies can be transformed. Scientific knowledge must then be integrated into the social context, by students and science teachers, in order to better understand the society's past, present, and future. Therefore, knowledge should not be taught as didactic statements but must be translated into actionable context-specific functional knowledge which is relevant to students' everyday lives.

While the role of the science teacher is critical, the researcher believes science teacher training that should student-centered. Students science teachers must participate actively with lecturers acting as colleagues who continuously adapt the curriculum according to social needs in order to facilitate behavioral change first among students and then in society. This means academic lecturers themselves should look beyond the immediate confines of the disciple and classroom but must be aware of the dynamics in the community in which the school is immersed. This can occur effectively if training of science teachers is community-based rather than 'university-based.' Academic lecturers, therefore, ought to be citizens and social reconstructors in their own right who seek to induct student science teachers in the same course by transferring their vision of social reconstruction and transformation, rather than merely transferring skills and knowledge. The assessment then becomes a subjective diagnosis of student progress against standardized norms as prescribed in the curriculum.

The researcher posits that curriculum that is based on this framework could lead to social reconstruction through social accountability; ensuring that Mandela's (2003) hope for 'education as the most powerful weapon to change the world' is realized. The researcher, however, acknowledges that this framework needs to be tested empirically; nevertheless, this article aims to present a theoretical framework which other researchers in education could explore. This given John Dewey's (2013, p. 79) argument that education should strive "to shape the experiences of the young so that instead of reproducing current habits, better habits shall be formed, and thus the future adult society be an improvement on their own."

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