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Democratic Citizenship in Mathematics Teacher Preparation in South African Universities: Contradictions in Theory and Practice

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ABSTRACT

For individuals to become democratic citizens, they need to be exposed to at least three interrelated elements: collective identity, the privileges of membership, and social rights and benefits. This study investigates how South African universities prepare mathematics teachers for democratic citizenship. Data were generated from six mathematics teacher educators and 75 second- to fourth-year student teachers majoring in mathematics education who were undergoing teacher training at three different universities. Data were gathered through interviews, observations, and document reviews. Thematic analysis was employed to analyse the data. The study findings reveal contradictions with respect to theory and practice within the mathematics education programmes at South African universities. While the programmes contribute to the formation of active citizenry through the development of democratic skills and values, together with the incorporation of social justice issues in mathematics classrooms, they also inhibit and disempower students, given that the offerings emphasize the importance of teaching and testing, as well as the acceptance or rejection of "right" answers. Based on the findings, it is recommended that educators democratise mathematics education classrooms and adopt a humanising pedagogical approach based on care, trust and respect.

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1. INTRODUCTION

Teachers play a vital role in achieving quality education at all levels. Therefore, if they are not adequately prepared to deal with matters of democratic citizenship, this might affect how they exhibit democratic skills, attitudes, and knowledge, both in their schools and in their immediate communities. Noddings (2005) argues that student teachers must learn distinctive attributes and skills in terms of mathematical content, diverse methods of instructional delivery, and develop strong awareness of democratic education during their training. It is therefore envisaged that the in-depth training of student teachers in relation to democratic citizenship will empower them to display appropriate and useful democratic knowledge and skills (Noddings, 2005). The Manifesto on Education, Values, and Democracy (Department of Education [DoE], 2001, p. 1) provides a framework based on practice, which is intended to instil and reinforce democratic values (as embodied in the constitution) in young South Africans. This pertains to all curriculum subjects and how they are taught, including mathematics. Recent changes to educational policy in developing countries (including South Africa) have confirmed the importance of democracy as a key goal of education (Harber & Mncube, 2012).

Unfortunately, what has emerged in the country's education policy post-apartheid is a conception of citizenship education characterised by inconsistency and conflicting elements that connect – yet also worryingly show a disconnect – with the ideals of a democratic society (Mathebula, 2009). Consequently, promoting a clearer understanding of the role of schools in developing democratic dispositions among young citizens is a matter of importance for all nation-states, with research suggesting that learners' experiences in schools and classrooms can help them to develop the desired attitudes (Phipps, 2010). However, several researchers (Harber, 2001; Batchelor, 2012; Zeichner, Payne & Brayko, 2014) have found that teacher education is a potential barrier for schools and educators to playing a greater role in educating young people in democratic citizenship. As a result, the research on which this article is based sought to examine how South African universities prepare mathematics teachers with regard to fostering democratic citizenship.

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Democracy, democratic citizenship, and democratic citizenship education

Notably, in terms of education democracy and citizenship co-exist, because the "former frames education as a process of active consent and participation, whereas the latter designates the sense of belonging people demonstrate when socialized into educative practices" (Benhabib, 2002, p. 169). Conceptually speaking, belonging and active participation are thus connected to different forms of relationships. In Benhabib's (2002) view of democratic citizenship, the assumption of belonging is dominant, which means almost everyone would wish for citizenship with a shared collective identity, member privileges, and social rights and benefits. For instance, in the South African constitution, there is a common notion of citizenship which states that "all citizens are – (i) equally entitled to the rights, privileges, and benefits of citizenship; and (ii) equally subject to the duties and responsibilities of citizenship" (Republic of South Africa, 1996, s3). In other words, in South Africa's constitutional democracy, "citizenship" entails two unique understandings: citizenship as a lawful status (being a citizen) and as a practice (acting as a citizen). A fully democratic citizen enjoys all the civil liberties, constitutional rights, and benefits of citizenship.

Yuval-Davis (2011) notes that democratic citizenship hinges on several notions, which include political, civil, socioeconomic and cultural rights, along with the spatial right to security, in addition to citizenship duties and responsibilities. In defining democratic citizenship, Schuppert and Wallimann-Helmer (2014) refer to democracy as a system that promotes among its citizens equal participation in the process of decision making (i.e., citizen status). The status of being a participant in collective decision making implies a level of democratic equality or democratic citizenship (Schuppert & Wallimann-Helmer, 2014). Hence, democratic citizenship not only requires citizens to enjoy the right to participate in collective decision making or the right to vote, but also that they enjoy shared control, as well as equal power and influence (Arneson, 2004; Schuppert & Wallimann-Helmer, 2014).

In individuals' development as ideal democratic citizens, each person's education must take into account the nation's linguistic, cultural, ethnic, and religious commonalities (Benhabib, 2002, p. 162). Benhabib (p. 127) also argues for the creation of a civic space for "intercultural dialogue", in which "democratic citizens can enact what they have in common and at the same time state competing narratives and significations, so that all have a real opportunity to co-exist". The notion of establishing such a civil space is based on the assumption that people need to acquire knowledge of how to live with others who are different from them (Benhabib, 2002). In this way, citizens will not only create a community in which discourse and interdependence thrive, but will also develop one in which they can disagree without disrespecting the views of others (Benhabib, 2002).

When citizens use the opportunity to engage in conversations underpinned by disagreement and impartiality, they are engaging in an educative process with a shared identity (Waghid, 2010). Therefore, the main aim of citizenship education should be to cultivate public pedagogical spaces (in associational and non-associational networks such as schools, universities, religious sites and clubs) that promote platforms for diverse people to share their commonalities, while respecting individual and cultural differences (with culture representing people's shared values, meanings, linguistic signs and symbols) (Waghid, 2010). According to Waghid, an education which takes into account all of the abovementioned issues is underpinned by democracy and citizenship. In clear terms, what this means for mathematics education is that a mathematics classroom/education which provides students with access to debate and social understanding in a pluralistic society, by deliberating and making decisions amongst themselves in coming to understand multiple perspectives, will assist in producing vibrant, democratic citizens.

Teacher education programmes and teachers' role in promoting democratic values

According to researchers such as Biesta (2011), Bergmark and Westman (2018) and Olawale, Mncube and Harber (2022), teachers are essential in advancing democratic values. This is because for students to develop new skills and competencies and be able to apply these in their daily lives at home, at school, and in the community, teachers are responsible for introducing and explaining new concepts and values to them (Subba, 2014). As such, Howe and Covell (2011) argue that in addition to being explicitly taught in formal curricula, democratic values must also be reflected in mission statements, classroom interactions, and codes of conduct, which serve as models for democracy and respect for everyone's rights. By incorporating democratic values into the curriculum, education can promote democratic citizenship, and in this way students will be assisted in

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fostering an understanding of fundamental democratic values, as well as a sense of commitment and attachment to them (Subba, 2014).

Subba continues to argue that without effective democratic leadership, democratic education and citizenship understanding will not advance. In this vein, Gutmann (2004) asserts that in order to effectively teach citizenship and democratic skills and virtues, teachers must be effective. This is because students will comprehend democracy and its values better if teachers incorporate them into their lessons and allow students to learn about such issues themselves (Gutmann, 2004; Subba, 2014; Olawale et al., 2022). For this reason, Kesici (2008) argues that building a democratic classroom depends heavily on the teacher. As such, Selvi (2006) and Kesici (2008) suggest that teachers employ effective teaching strategies to enable students to express themselves and their ideas without difficulty. A democratic teacher must also be fair, apply the law consistently, and consider the answers to questions given by students before taking action (Subba, 2014; Olawale et al., 2021). With respect to rights, Kesici (2008) adds that teachers should assist students in comprehending and exercising their right to make their own decisions. Kesici further argues that in a democratic classroom a teacher's responsibilities include fostering a positive educational process that includes creating a collaborative learning environment; showing students respect; and inspiring them to sufficiently develop their social skills. Students must therefore be at sufficient ease to speak openly in class discussions and be free to think and act creatively (Kesici, 2008; Biesta, 2011; Subba, 2014). In other words, the classroom setting must be sufficiently risk-free for students to take chances, given that a democratic classroom should offer a risk-free, active learning environment in which each student's rights are upheld.

In terms of pre-service mathematics teacher education, Olawale et al. (2021) argue that teacher educators must help prospective mathematics teachers not only formulate good reasons for their educational plans, but also identify any social beliefs and schooling conditions that are impediments to democratic education. Since teachers develop the majority of formal educational programmes, they must not only understand democratic society, values, behaviour and attitudes, but also put this knowledge into practice in the classroom; otherwise, merely learning about democracy and its principles will not be beneficial in the long run (Ravitch, 2008; Olawale et al., 2022). In line with this, mathematics teacher educators should democratise their pedagogy so that their students gain knowledge of and expertise in democratic practice throughout their education (Subba, 2014; Olawale et al., 2022). This entails establishing the 'rules' of democratic discourse in classes and lectures, as well as engaging in critical questioning (Olawale et al., 2021). In light of this, teachers' responsibilities include creating a secure environment in which students can express themselves, while also fostering specific types of interactions. A culture of trust will create a safe environment in which students can share their experiences; disagreements can be acknowledged and constructively questioned; and resolutions, however tentative, can be mutually worked out (Subba, 2014). To achieve this, however, mathematics teacher educators must give up their position as the "moral authority" and develop the ability to listen to students with empathy and without passing judgment (Giroux, 2001; Gutmann, 2004; Subba, 2014; Olawale et al., 2022).

Deweyian democratic theory: An instinctive summary

The study is underpinned by Deweyian democratic theory: Dewey's (1946, 1951) theory focuses not only on ethical or radical issues, but also religious and logical ones (Višnovsky & Zolcer, 2016). His ideas are contained in a sequence of works entitled *The Ethics of Democracy,* which were published in the 1940s; an unpublished 1946 essay *What is democracy?*; and a 1951 piece *Contributions to democracy in a world of tensions*. Democracy, whether in principle or practice, was Dewey's main topic and concern throughout his life. He never denied that the term "democracy" encompasses a multitude of meanings, and considered this plurality to be a fully acceptable expression of the complex nature of the phenomenon. For Dewey (1946, p. 230), democracy begins from a shared moral and spiritual human condition, whose tenacity is "freeing intelligence for independent effectiveness – the emancipation of [the] mind as an individual organ to do its own work". When applied to an educational setting, Dewey makes rational assumptions by investigating whether schools and democracy have an interconnecting relationship. From this viewpoint, schools are "successful in building up the machinery of a democracy of mind", but they fail to be "conscious of the ethical principle upon which it rests" (Višnovsky & Zolcer, 2016, p. 52).

Dewey's sustained optimism, as well as his critical notions of democracy in education and society, brought him closer to a more convincing theory, when considering "education in an industrial democracy" (Dewey, 1916a,

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p. 232). He describes political democracy as "a form of government which does not respect the well-being of one individual or class above that of another", but which serves "the happiness and interests of all as upon the same plane" (Dewey, 1916b, p. 232). He defines moral or social democracy as "a state of social life where there is a wide and varied distribution of opportunities" along with "social mobility […], free circulation of experiences and ideas […], recognition of common interests […] and mutual support between social organizations and their members" (p. 232).

Dewey (1937) emphasises the importance of formal education for preserving society, yet warns about the flaws that exist in both formal and informal methods of education: the former "easily becomes remote and dead – abstract and bookish, [indicative of] depreciation" (Dewey, 1888, p. 98). It might even become artificial, with more attention being paid to teaching learners abstract ideas, without actually transforming these into practice. When this happens, more vital social interests disappear from view. As formal education tends to overemphasise academic aspects (Dewey, 1888), it does little more than fill learners' minds with information to be memorised (Višnovsky & Zolcer, 2016).

By contrast, those educational experiences designated by Dewey as "informal" cannot be avoided. This is because Dewey (1988, p. 98) views informal education as a primary experience enabled by the social environment; that is, "the unconscious influence of the environment that is so subtle and pervasive that it affects every fiber of character and mind". In this respect, Dewey (1988) includes language learning, manners and aesthetic appreciation as experiences in an informal education which is mostly not intentional, but incidental. He therefore advocates that the experience of education in complex societies should be intensified and formalised – the reason being that as the complexity of a social group increases, so the informal type of education becomes insufficient, and as a result a more formal type of education is needed, which requires a school system (Višnovsky & Zolcer, 2016).

For Dewey, democracy hinges on the notion of participation. Participatory democracy requires a strong relationship between schools and society (Višnovsky & Zolcer, 2016). Dewey (1937) proposes that schools, as communities of learning, should be governed with respect for democractic principles, and function as entities which are not isolated from the wider community (which is also governed by democratic principles). This conception of participatory democracy encompasses cooperation, participation, communication and deliberation, not solely within schools, but also between the school community and the community at large. A major factor in both communities is that democratic citizens are vital social agents who shoulder the weight of a democratic social life (Višnovsky & Zolcer, 2016); therefore, Dewey's idea of participatory democracy revolves round communication, creativity and cooperation.

Dewey's theory of democracy, when effectively combined with his notion of education, has numerous inferences for this study. At the school level, teaching participation and involvement allows learners to initiate those practices which will help to form the mental and moral characteristics which any democratic citizen needs. When learners share their experiences, they cultivate social abilities such as honesty in dealing with others, a helping disposition, self-sacrifice, sympathy, unity, harmony, and a sense of social justice and accountability. This underscores the importance of Dewey's conceptualisation and theorisation that education connects the school curriculum to life in the local community.

Problem statement

Education policy in many developing countries (such as African ones) now explicitly views democracy as a key educational goal (Harber & Mncube, 2012). For example, current South African education policy (including teacher education policy) has made a decisive break with the past. Post-apartheid education policy is based on an explicit commitment to education for democracy. In particular, The Manifesto on Value, Education and Democracy provides a detailed explanation of how democracy can be put to practical use in every educational context and subject, including mathematics (DoE, 2001). Despite legislation to guide related efforts, a potentially significant hindrance to schooling in education for democratic citizenship seems to be teacher education.

Bartholomew (1976) put forward the "myth of the liberal college", arguing that there are contradictions between democratic and liberal colleges on the one hand, and authoritarian and traditional schools on the other. The myth suggests that, during their training, student teachers are introduced to a more democratic form of teaching and learning, with greater attention being paid to learners' involvement. However, this is soon readjusted into a more authoritarian approach during their teaching practice and subsequent employment as

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teachers. Bartholomew suggests that this might not be the case, and that teacher education itself might be more authoritarian and less liberal than it would initially appear to be.

This study explores two contradictory theoretical roles of mathematics teacher education in relation to power and control in both educational scenarios and in society. The first is that, in reality, teacher education is essentially re-productive, in that its authoritarian relationships and curricular control do not encourage independent and diverse discussion or criticism, or challenge existing and dominant conventions, practices and ways of knowing (Bartholomew, 1976; Beyer & Zeichner, 1987; Liston & Zeichner, 1987; Harber & Serf, 2006; Harber, 2009; Giroux, 2010). The second role is that in a world in which democracy is increasingly becoming a global phenomenon and being recognised as a key aim of developmental efforts, education is (ideally) essentially democratic in nature (Sen, 1999; Holden, 2000; Roh, 2004; Starkey, 2005; Stemhagen & Smith, 2008). There is, however, a contradiction between these two roles in terms of the power over what is taught and learned, and how and when this takes place, and the discrepancy between "do as I say and do as I do". This has prompted the need to examine the practices and processes involved in teacher education programmes at South African universities, as employed in the preparation of mathematics teachers, to investigate whether or not they are being prepared for democratic citizenship.

2. MATERIALS AND METHODS

PARTICIPANTS

The study population comprised all student teachers and teacher educators in traditional South African universities. However, it was impossible to approach everyone for the purposes of data collection. For that reason, it was important to select and approach a typical group of participants from the population in order to gather information which would apply to the group as a whole (Creswell & Cresswell, 2018). Therefore, out of the 12 traditional universities, the study focused on three which provide theoretically-oriented university degree programmes across the nine provinces in South Africa. These universities were selected purposively, with the expectation that they would report unique and interesting data with regard to democratic citizenship and the preparation of mathematics teachers. The purposive sampling technique was also employed to identify two mathematics teacher educators and 25 preservice mathematics student teachers in their second to fourth year of study in each of the three universities. Consequently, the sample comprised a total of six mathematics teacher educators and 75 preservice mathematics student teachers. The selection was based on the fact that the selected participants would be ideally suited to provide information about their lived experiences during their programme.

RESEARCH INSTRUMENTS

To "get inside" the teacher education processes and relationships, and to understand the views and practices of mathematics teacher educators and student teachers, a number of research methods were used for triangulation purposes at each institution:

i. Semi-structured interviews were conducted with the mathematics teacher educators and mathematics student teachers on how teacher education programmes prepare democratic citizens;
ii. Observation was made of teaching and learning, and follow-up interviews held with the participants; and
iii. A document review was undertaken.

DATA ANALYSIS

The study employed Marshall and Rossman's (1999) thematic analysis procedure, which comprises six steps: data gathering; the identification of categories, themes and patterns; the coding of data; the testing of emergent understanding; the search for alternative explanations; and report writing. Vulliamy et al. (in Oats, 2014) posit that any analysis of data involves two fundamental steps, namely making decisions, judgements and choices about what is or is not deemed important; and generating insights which will assist the researcher in constructing reasonable arguments, whether recorded on paper, in the mind of the researcher, or on tape.

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Therefore, data analysis requires researchers to make sense of the information gleaned from participants' understanding of a situation, by noting patterns, themes, categories and regularities.

3. RESULTS

The data analysed were grouped according to emergent themes. The three participating higher education institutions (HEIs) were differentiated through the use of fictitious names (University X, University Y and University Z). Table 1 shows the codes representing the respective participants.

Table 1: Codes representing participants

Participants	Codes representing participants
Mathematics teacher educators in University X	ME 1; ME 2 – University X
Mathematics teacher educators in University Y	ME 1; ME 2 – University Y
Mathematics teacher educators in University Z	ME 1; ME 2 – University Z
Mathematics student teachers in University X	ST 1, ST 2…ST 25 – University X
Mathematics student teachers in University Y	ST 1, ST 2…ST 25 – University Y
Mathematics student teachers in University Z	ST 1, ST 2…ST 25 – University Z

Mathematics teacher education programmes and the preparation of democratic citizens

Democratic Practices

The participants were asked "How do teacher training programmes prepare [you] to be democratic mathematics teachers (citizens)?" Despite the differences among the participants at the various institutions, there was evidence that the mathematics education classrooms upheld democratic practices in terms of preparing students to be democratic citizens. The participants emphasised the significant contribution made by mathematics teacher educators to the training programmes, by promoting a free and safe space for learning. For example, they stated that this empowered the students to "improve critical thinking abilities and problem-solving skills", which encouraged them to participate actively in the classroom, and assisted them in developing their problem-solving skills. As one participant stated:

> *… generally, it is said that mathematics opens minds and improves the skill of problem solving. So, by having this mathematics module through our teacher training programme enhances our skills of teaching, listening and reasoning, which can help when we are teaching our learners. So, this teacher programme helps me to improve [my] critical thinking abilities and problem-solving skills which I can [also] use in society. For example, there are projects that need [ ] us to go out of university and investigate as preservice mathematics teachers, meaning that this extracurricular activity also enhances our investigative skills, which [are] the same skills that we need when we become teachers, to help develop the learners. (ST2; University X)*

This mathematics student teacher acknowledged the essence of teaching mathematics as a tool which helps and enables students to draw their own conclusions. The idea of values and skills development through teacher education programmes was also echoed in the following comment:

> *Preparing my students is based on certain values that the faculty upholds, which emphasise promoting justice, encouraging innovation and encouraging maximum participation, and other democratic values. The basis of these values emanates as a way of trying to detach from the past practices where students would expect to be told precisely […] how they should do their task. Now, with the students I work with, I basically give them the framework, ask them "How would you do this?" and then I listen to their views and opinions. [In] so doing, I stopped being prescriptive. So, giving the learners the opportunity to engage with content and with their peers during teaching and learning encourages them to be as innovative as possible in executing the task. (ME2; University Y)*

It is evident that the teacher education programmes are geared towards developing students' abilities and skills to think critically and engage positively with their peers in order to solve problems. Based on the research findings, it can be argued that developing mathematics student teachers' ability to reason critically, their sense of value, humanitarian concerns, and aspiration to enthusiastically make contributions to teaching and learning activities by engaging in the process of decision making will foster the essential skills and abilities needed to sustain democratic practices. Therefore, democracy and the manifestation of democratic

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characteristics (e.g., freedom of choice, respect for others' views and opinions, and tolerance) have a positive shaping influence on mathematics student teachers. Olawale et al. (2022) concur that the aims of teacher education should be to sustain the democratic practices that students need if they are to participate actively in all aspects of democratic life. Subba (2014) and Olawale et al. (2022) further highlight that it is crucial to be able to identify democratic values, such as creating a communal life; taking care of how we treat people and value one another; seeing the equal worth of all people regardless of their background and gender; and recognising the rights and responsibilities of individuals within the school. These characteristics, amongst many others, help learners to value democracy and equip them to become world-class citizens (Subba, 2014; Olawale et al., 2022).

The observation revealed that mathematics educators and student teachers showed respect for each other's rights and dignity. In the classrooms, the participants exhibited democratic characteristics, such as freedom to question their peers and educators, freedom to deliberate on answers to reach a reasonable and acceptable solution, and the liberty to actively participate during the teaching and learning process. Moreover, from the researchers' observations, it was obvious that the interactions that took place amongst the participants during the teaching and learning process were characterised by mutual respect and deliberate participation, something which both the DoE (2001) and Morrison (2008) emphasise. Morrison (2008) argues that schools should place more emphasis on democratic organisation, in which the freedom and dignity of all citizens are respected in an open, fair, respectful and pluralist environment which encourages a critical intellectual approach, and seeks the truth and meaning in people's lives. The researchers believe that such respect facilitates deliberate collaboration and effective communication.

A few participants made reference to how locating mathematical methods within a specially developed social justice context can assist students in realising the related meaning and power that mathematics possesses. As one teacher educator explained:

> *Mathematical beliefs recognise that, over the years, mathematics has been used as a dehumanising tool. That is, mathematics has been used as a tool of oppression. For instance, concepts like the bell curve, which is always referred to as normal distribution, can be used to further some kind of oppressive ideology like the idea that blacks are less human because they're less intelligent. But, in the real sense, the problem is not with the concept of normal distribution, but the way the concept is deceitfully used to promote oppressive social beliefs. Hence, integrating social justice issues into [the] mathematics classroom through critical pedagogy will give students ample opportunity to question [the] ways in which certain forms of knowledge in mathematics have been used to sustain domin[ant] beliefs. (ME1; University Y)*

Other examples of mathematical concepts that can be used to oppose an oppressive ideology and help to develop active citizens, include the following:

> *For example, we teach our students mathematics that would be useful to them and to their learners [in] the FET phase and, as such, learners make statistical comparisons of data for [the] distribution of wealth in society, the distribution of wealth according to provinces, distribution with regards to the wealth we have, and the ones [wealth/resources] they think we should have and the ones we actually have. Similarly, students interpret graphical lines relating to various measures of national progress to wellbeing, and consider how various policy changes within the country affect their wellbeing. (ME1; University Y)*

Let us consider this example in relation to the above comment. It costs R1.50 to make a journey each way on a city bus. A transit city "fast pass" costs R65 per month. Which method of transport is cost-effective in order to get to work – the daily fare or the fast pass? A possible solution to this example would be:

> 5 working days in a week x 4 weeks a month = 20 working days in a month
> 20 days x R3 round-trip = R60.

Therefore, the daily fare is more economical. However, to arrive at the reportedly "correct" answer, one needs to assume a five-day working week.

From the above (adapted) illustration, as Tate (1997) argues, learners from lower-income families might ask the following questions: How many jobs does this person have? How many days a week does s/he travel to

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work? The problem also assumes that the "fast pass" will only be used for travelling to work. Consequently, teaching mathematics for social justice recognises the development of sociopolitical consciousness and praxis through mathematics study (Harper, 2019). As Gutstein (2006) states, helping learners through mathematical thinking to become conscious of the social injustices that occur in their society and in their lives on a daily basis is one way that social justice can be incorporated into the teaching of mathematics. Gutstein (2006) adds that such teaching increases learners' mathematical understanding, and cultivates critical realisation and reasoning for them to become active and creative agents capable of reconstructing and changing their society (Freire, 1970). The responses of the participants in this study corroborate the findings of Wonnacott (2011), who investigated the effect of incorporating social justice in mathematics amongst affluent middle-school learners. The study revealed that integrating social justice issues into mathematics affected learners' cognitive and affective domains, while empowering them and developing their social agency. Arguably, incorporating social justice issues in mathematics education classrooms is capable of broadening mathematics student teachers' understanding of equity, and helps to promote a more just society, which is a fundamental prerequisite if a democratic society is to survive.

Although it is easy to enthuse about incorporating social justice issues into mathematics education classrooms, there is also a need to consider which teaching and learning methods promote democratic values and practices. The educators who participated in this study referred to teaching and learning methods commonly used in the classroom, which they found suitable for developing democratic mathematics teachers. As one participant explained:

> *I think the teacher education programme prepares our students to be democratic citizens [ ] and democratic teachers, because […] although the programme is based on the content to be taught in class, […] it gives liberty for discussions, so I listen well to my students and I use discussion methods so that students can be free to come up with their own opinion[s], and their own understanding of the content that is being taught, so they're not limited to using only one way of teaching. (ME1; University X)*

One way in which a teacher education programme prepares mathematics student teachers to be democratic is by involving them in projects which require community engagement. The participants in this study argued that discussions, debates and community engagement have the potential to allow students to embark on investigations, conduct research and design reports on their own, based on their findings. During the discussions with the educators, the researchers found that cooperative work and active classroom participation were encouraged as teaching strategies in preparing democratic citizens. These findings concur with those of Ferguson-Patrick (2012), who states that a democratic classroom which employs a cooperative strategy is one that engages the learners cognitively, socially and emotionally. Such a classroom is capable of developing citizens who will build a democratic society that promotes social justice and respect. Corroborating this view, Kovalchuk (2015) contends that the development of leading citizenship (i.e., education for optimal citizenship, which builds a stronger identity for liberal democrats) necessitates the use of collaborative, dynamic and critical pedagogies to empower individuals to debate contested issues, take action through decision making and other activities, and think for themselves.

During the observation, the researchers found that the student teachers were planning to meet for a group discussion on their own initiative. This indicates that they were aware of the importance of working together or holding group discussions for joint decision making, which is indicative of concrete, real democracy in action, not the illusion of an illustrative democracy. Similarly, classroom observation revealed cooperation and a spirit of collaboration between the educators and mathematics student teachers. Hence, the research findings from the classroom observation corroborated the interview findings. This confirms Roy and Swaminathan's (2002) view that collaborative classrooms are crucial in supporting mathematics teachers to become intellectually empowered through engagement in discussions about teaching and curricula, as this enables them to take action aimed at bringing about change across numerous spheres of power. Ellis and Malloy (2007) state that in democratic mathematics classrooms, various teaching and learning methods should be employed to help learners "see themselves" in the curriculum. By doing so, they will be able to link mathematics to their everyday lives, as they will identify interconnecting relationships between mathematics and the societal needs of their community, thereby expanding and deepening their democratic possibilities (Tate, 1995; Ladson-Billings, 2001).

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Therefore, based on the research findings, it is argued that there is a democratic school culture, characterised by various forms of human interaction, which suggests high levels of communication, deliberation and participation, which cultivate a civic space for promoting democratic principles. For Apple (1988), Harber and Serf (2006) and Oats (2014), teacher education programmes are ideally placed to advance democratic practices.

Undemocratic Practices

Notably, not all the participants in the study believed that there was a connection between mathematics education and democratic citizenship. Some argued that teacher education programmes were merely training grounds for acquiring the necessary skills for the world of work. As one participant stated:

> *I do not see a connection between our teacher training programme and democracy. For instance, issues of racism, gender equality and other debates relating to societal unease are in no way accommodated in [the] mathematics method classroom, but we sometimes discuss them in other modules. Our mathematics method classroom focus[es] more on content to teach high school learners, nothing related to real-life situations and the things relating to democratic principles. (ST7; University X)*

It therefore did not seem that this student teacher believed that the teacher education programme was preparing students to become democratic citizens. Another participant confirmed this:

> *For me, I really do not believe that mathematics education prepares students to be democratic citizens, because I do not see its relevance. For instance, if you give learners activities that help them to investigate [a] societal problem in their immediate environment, with [the] assumption that th[ese] activities will empower them, while learners succeed in developing democratic skills through such empowering activities, it is not guaranteed that the skills they have acquired will be assessed in their tests and examination. So, how relevant is that? It could even lead them to having poor marks, which might eventually disempower learners. (ME1; University Z)*

This comment suggests that mathematical activities targeted towards promoting students' democratic competencies often involve conflict; for instance, when greater emphasis is placed on the practices of teaching and testing, and the focus is on equipping students with skills needed for the world of work, this hinders them from making connections between mathematics, community and societal issues. This finding corroborates the views of Aguilar and Zavaleta (2012), who posit that attempts to implement mathematics education in curricula which seek to advance democracy, by promoting democratic competence in mathematics students, are seldom devoid of crisis, difficulties and contradictions.

For Giroux (2010), most classes in schools can be described as "dead zones", devoid of any sign or indication of critical reasoning, self-discovery or creativity, and that they are further degraded by a corporate-driven media philosophy. Giroux argues that the main issue driving schools is how to teach learners for the purpose of testing and examinations (Giroux, 2010). Therefore, the system punishes learners who, because of their social status, class or race, dismiss the school district's ranking, and where a lack of ethics and insensitivity accompany winner-takes-all testing and verifiable scorecards (Giroux, 2010). As a result, this practice suppresses critical thinking and creativity amongst both learners and teachers.

Harber (2009) argues that in schooling there is conflict between the types of education that strive to produce people who are obedient and politically passive, and those which educate young people for critical awareness, freedom and participatory democracy. Harber affirms that, while the latter approach to education has been prevalent among some educational experts and policy makers, the original purpose of schooling for power and conformity is strongly embedded globally in a prevailing authoritarian model, which is very difficult to change. Over time, critics of the dominant authoritarian model of schooling have called for an extensive transformation that promotes learner-centered and democratic pedagogies (Harber, 2009), with reforms aimed at encouraging democratic practices and empowering learners through education. However, such reforms might not be possible without simultaneously changing the processes followed in teacher education programmes (Apple, 2001; DaMatta et al., 2013).

Worryingly, as noted during one of the observation sessions, the focus is largely on providing students with the necessary information needed to pass the module. Teaching and learning practices focus more on

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mathematics content for examinations, using the traditional method of teaching, whereby the educator "owns" the front of the classroom, and ready-made solutions to mathematical expressions are presented through the use of a projector. This classroom scenario leaves little room for dialogue and communication, because it silences students and means their voices are not heard. This finding concurs with that of Darling-Hammond (2010), who states that teacher education is often a one-way undertaking which puts the educator in control of the instruction process and makes the student a passive listener. This situation is exactly what Koliba (2000) terms a "closed classroom", in which students adapt to standards, learn how to follow instructions, and compete with their classmates to succeed.

According to Koliba (2000), the traditional way of teaching within this space is based on instruction which imposes learning methodologies on students, in which the educators are "experts" who impart information. A closed classroom setting fails to teach learners about democratic principles and practices; it also fails to teach them how to function in a democracy. Freire (1968) uses the term "banking education" to define this dictatorial form of education, which is based on a programmed view of consciousness. Freire argues that banking education detaches learners from the content and processes of education, because it assumes that the teacher is the master of knowledge, while learners know nothing. In such a classroom setting, the teacher recommends and offloads information which learners must then unquestionably accept and learn by heart, in order to repeat it in a test or examination. This transfer of knowledge is a sign and instrument of oppression that hampers investigation, creativity and healthy dialogue (Freire, 1968). Hemming (1980) brands it a flaw in the education system, whereby issues to do with individual development are completely overlooked. He argues that, instead of schools focusing on the needs of the government and other relevant stakeholders in education, they should offer a personalised education that seeks to meet the needs and aims of the learners.

Even though the teaching and learning policy of the institution to which one of the researchers is affiliated (name withheld) states that educators should promote inquiry-based learning to assist in the development of problem-solving, reasoning and critical thinking skills capable of developing democratic citizens, this is not evident in practice. Presumably this is why Batchelor (2012) advocates teacher training programmes which adopt a democratic approach, one that is evident in the classroom, in order to eliminate traditional top-down modes of teaching, as this will open doors to opportunities for discussion and debate amongst mathematics educators and student teachers alike, permitting them to link mathematics to democratic practices in their own classrooms and in their immediate society.

Deweyian (1888, 1946, 1951) democratic theory stresses the importance of formal education for the preservation of society, but cautions against the unavoidable inconsistencies that exist between formal and informal types of education. Dewey (1888, p. 98) states that formal education "simply becomes remote and dead – abstract and bookish, to use the ordinary words of depreciation", which means it might become somewhat artificial, with greater attention and focus being placed on teaching students theoretical concepts, without translating these into practice. When this happens, the interests of society are ignored (Višnovsky & Zolcer, 2016). Dewey (1988) explains that problems in the formal education sector stem from an overemphasis on academic aspects. For Dewey (1988), education is not the practice of enriching learners' minds with pieces of information to be learned, but rather a living process which is meaningful to individuals and society. Sunal et al. (2015) suggest that education for democratic citizenship should include dialogue and discourse in the classroom, with these then linked to learning about common values, human rights and equity. Teachers in such classrooms must utilise a conversational instructional style that is capable of challenging existing power structures, while complementing and sustaining achievement, rather than diverting attention from it (Sunal et al., 2015).

This study's research findings suggest that connections do exist between mathematics education and the development of democratic citizens, because decisions that are generally significant are subject to virtual reality (i.e. every decision a citizen makes requires complicated calculations or the applications of mathematics) (Ellis & Malloy, 2007; Aguilar & Zavaleta, 2012). For example, questions that could be asked include: Which metropolis in South Africa is considered poor enough to benefit from the province through additional financial aid? At what level should an employee produce in order to maintain their position in a company? What size of population in a metropolis should lead to the recommendation that citizens should avoid or practise exercise in the open air? The argument here is that it would be challenging for citizens to assess whether their decisions are appropriate or inappropriate, unless they have been exposed to the basics of mathematics education (Aguilar & Zavaleta, 2012).

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A striking finding in this study is that the connections between mathematics education and the development of democratic citizens are not always positive. This is because mathematics education is capable of promoting democratic competencies and ideals, as explained above. In contrast, it can also inhibit and disempower students and later their learners, because mathematics teacher education programmes stress the importance of teaching and testing, as well as the acceptance and rejection of "right" answers.

4. CONCLUSION

This study examined the practices and processes involved in teacher education programmes at South African universities, as used in the preparation of mathematics teachers, to investigate whether or not mathematics student teachers are being prepared for democratic citizenship. The findings reveal contradictions in theory and practice within mathematics education programmes in South African universities. On the one hand, teacher education programmes which promote a free and safe space for learning; the development of democratic skills and values; the incorporation of social justice into mathematics classroom; and the use of different teaching methods, inculcate democratic values and knowledge in students, allowing them to thrive as democratic citizens in society. In contrast, the findings reveal that the programme serve as a training ground for acquiring the necessary skills for the world of work, in which mathematics teacher educators rely heavily on the traditional and authoritarian approach to teaching, one that focuses largely on providing students with the information needed to pass. Based on the above findings, it is recommended that mathematics teacher education programmes genuinely contribute to the development of active citizenry, by being devoted to preserving democratic principles. In addition, educators should endeavour to democratise their mathematics teacher education classrooms and adopt a humanising pedagogical approach which is based on care, trust and respect in the development of democratic citizens.

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