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Incorporating indigenous knowledge in the teaching of weather and climate in primary school classrooms in KwaZulu-Natal, South Africa

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Abstract

One of the challenges related to the teaching and learning of weather and climate in the social sciences is the somewhat abstract nature of these concepts. Incorporating indigenous knowledge (IK), a form of prior knowledge that learners acquire from communities and passed down through generations, can assist in making learning meaningful and relevant. Using a qualitative research design, we firstly explore the type of IK related to weather and climate practiced in a local rural community to identify the overlapping knowledges of community elders and Grade 5 social sciences teachers. Secondly, we set out to determine how these teachers view the incorporation of IK in the teaching of weather and climate. Finally, we show how teachers perceive the relationship between IK and scientific knowledge. The data confirms that there is a shared awareness, among the community members and teachers, of the rituals and practices associated with weather and climate in this area. Teachers do see the value of integrating IK into

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the lessons pertaining to weather and climate in their primary school classroom as it allows them to activate learners' prior knowledge and connects the classrooms to the communities from which the learners come. The data shows that teachers largely support the blending of IK with scientific knowledge in their classrooms in order both to activate prior knowledge and to address misconceptions. It is therefore important to create constructivist learning environments in classrooms that encourage debate and dialogue and which do not pitch IK and scientific knowledge against one another.

Keywords: indigenous knowledge; social sciences; prior knowledge; teaching and learning; weather; climate; primary school; rural; misconceptions; lightning

Introduction and background

There are numerous initiatives that have been introduced internationally to integrate indigenous knowledge (IK) systems into school curriculums (Barnhardt, 2005; MacNaughton & Davis, 2001). While IK has been given some attention in South African classrooms, its inclusion remains inconsistent across different subjects and schools. One of the broader aims of the South African curriculum policy, according to the Department of Basic Education, is to value 'indigenous knowledge systems', which means 'acknowledging the rich history and heritage of this country as important contributors to nurturing the values contained in the Constitution' (DBE 2011). While there are different interpretations of what constitutes IK for the classroom, there is broadly a recognition that IK comprises the knowledge, skills, and wisdom that is unique to a specific culture and passed down through generations (McKnight, 2015; Mwangi, 2015; Semeli & Kincheloe, 1999). Boven and Morohashi capture this broad framing of IK when they write:

> *Indigenous or local knowledge refers to a complete body of knowledge, know-how and practices maintained and developed by peoples, generally in rural areas, who have extended histories of interaction with the natural environment. These sets of understandings, interpretations and meanings are part of a cultural complex that encompasses language, naming and classification systems, practices for using resources, ritual, spirituality*

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> *and worldview. It provides the basis for local-level decision-making about many fundamental aspects of day-to-day life: for example hunting, fishing, gathering, agriculture and husbandry; food production; water; health; and adaptation to environmental or social change. Non-formal knowledge – in contrast to formal knowledge – is handed over orally, from generation to generation, and is therefore seldom documented (Boven & Morohashi, 2002: 6)*

Much of the informal learning that takes place within the often-rural areas where IK predominates 'is characterized by oral transmission and learning through experience and repetitive practice' (Sillitoe, 2000: 4). However, it is this very characteristic of IK that also contributes to its marginalisation in society. That is, because it is knowledge that is local and belonging to specific groups of individuals, it lacks the universality that is so often considered the hallmark of 'legitimate' knowledge. It is important that these local knowledges and experiences are recognised as valid within communities, schools and higher educational institutions (Balfour, 2019). Taking a prospective stance, Balfour (2019) argues for the importance of reclaiming IK in the social sciences, natural sciences and physical sciences. However, it is becoming increasingly acknowledged that IK is being lost in communities and among local people, thereby negatively impacting localized approaches to the environment and biodiversity (Batiste, 2005). It is therefore important to interrogate how IK can be transferred on an intergenerational level, especially through the more formalised school curriculum.

While there is an abundance of research on the role of IK in the physical science curriculum at schools (Hewson & Ogunniyi, 2011; Shizha, 2007; Van Wyk, 2002), there is a paucity of research on the integration of IK in social sciences in South Africa. In this study, we firstly explore the type of IK related to weather and climate practiced in a local rural community to identify the overlapping knowledges of community elders and Grade 5 social sciences teachers. Secondly, we set out to determine how these teachers view the incorporation of IK in the teaching of weather and climate. Finally, we

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show how teachers perceive the relationship between IK and scientific knowledge.

In this article, we refer to the theoretical framework of social constructivism, as postulated by Vygotsky (1978). With an emphasis on the construction of knowledge through social interaction, learning cannot be viewed separately from the environment in which it takes place. From a social constructivist lens, knowledge creation occurs within the context of problems to be solved (Adams, 2006). A key aspect here is the belief that learners enter classrooms with prior knowledge and experiences derived from their social, historical, and cultural environment. IK forms part of learners' prior knowledge and experiences. While social constructivism acknowledges that formal knowledge is created within an expert community, this framework recognizes individual contributions that can be negotiated through dialogue to create a shared set of understandings. It is about inviting learners to tell their stories about their beliefs and practices to elicit knowledge that is contextually situated. Using a constructivist pedagogy in the classroom signals to learners that their background knowledge and beliefs are respected while simultaneously providing opportunities to challenge existing beliefs and understandings through active engagement (Richardson, 2003).

Drawing on local indigenous knowledge to teach weather and climate

It is essential that school learners have a thorough understanding of weather and climate, not only because it will influence the decisions they make (Dupigny-Giroux, 2010) and how to keep themselves safe in unpredictable weather conditions (Ratinen & Uusiautti, 2020), but also because of the growing urgency of understanding and mitigating the causes and consequences of climate change (Anyanwu, Le Grange & Beets, 2015; UNESCO, 2013).

However, there are various challenges related to the teaching and learning of weather and climate. One of the challenges is the somewhat abstract nature of these concepts. For example, Dupigny-Giroux (2010) argues that like other science disciplines, the climate sciences use particular terms, methods and vocabulary that may seem abstract and far removed from reality, especially for

younger children. Therefore, learners are not able to understand abstract climate science terminologies (Dupigny-Giroux, 2010) which sometimes results in reinforcing misconceptions (Gul & Yesilyurt, 2011). Misconceptions are also reinforced by teachers' lack of content knowledge and pedagogical experience in teaching geography (Tolppanen & Askela, 2018) which ultimately impacts negatively on the learners (Gul & Yesilyurt, 2011). One of the key reasons for teachers' weak pedagogical content knowledge (PCK) in the field of geography is a lack of expertise. This may arise because of poor control over the hiring of qualified teachers for specific subjects, resulting in principals allocating subjects to teachers that they are not qualified for (Mizzi, 2013). In other instances, it is a result of the insufficient preparation that pre-service teachers receive in teacher education degree programmes (Hidson, 2018). When comparing novice to veteran teachers, novice teachers often have poor content knowledge and require more training over time (Hidson, 2018). As a result, teachers are often not confident in teaching abstract concepts in ways that learners understand (Mizzi, 2013). Mizzi (2013) further explains that teachers are often expected to know the content knowledge of subjects that they have not specialised in and are expected to create activities to link to the context that they are teaching, often resulting in teaching practices that are tied very narrowly to the textbook. In addition, teachers' attitudes, which include a lack of motivation to teach topics linked to climate and weather, may impact how they address this topic in class (Tolppanen & Askela, 2018). Moreover, textbooks and teaching materials can quickly go out of date and, therefore, if professional development is not provided, teachers will not have the necessary knowledge to address learners' misconceptions (Haslett, France & Gedye, 2011).

The way that learners learn is the other challenge that has been identified in teaching climate and weather. According to Alexandru et al. (2013), there are various learning styles by which learners process information. These could include some learners understanding abstract concepts through active experimentation, visualisation, collaboration, or through independent learning (Alexandru et al., 2013). Some of the teaching strategies that

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are normally used in classrooms are chalk and talk, textbook teaching, and group discussion, which might disadvantage some learners. In a study conducted by Laronde and MacLeod on modelling different teaching strategies, the chalk and talk method did not accommodate all students as they easily lost interest due to a lack of engagement in the teaching and learning process (Laronde & Macleod, 2012). On the other hand, Nilsson argues that the use of textbooks as the only resource may lead to learners getting bored if the material in textbooks lacks relevance (Nilsson, 2006). Textbooks may limit learners' ability to explore other materials and connect the content to their lived experiences (Nilsson, 2006). Group work as a teaching strategy also has its limitations as it can lead to learners disrupting the learning process if they are not meaningfully involved (Baines, Blatchford & Webster, 2015). Climate and weather are concepts that cannot only be learned through a transmission mode of teaching but requires teachers to make learning relevant to learners. If new knowledge is to be grasped by learners, it is also important for the teacher to leverage learners' prior knowledge (Choi et al., 2010) – an issue that has important implications for our study.

The existence of relevant prior knowledge significantly affects how learners grasp new knowledge, 'how judgments are made about this information, and what students are able to understand and remember' (Haslett, France, & Gedye, 2011: 7). Learners enter school with 'a range of prior knowledge, skills, beliefs, and concepts that significantly influence what they notice about the environment and how they organize and interpret it. This, in turn, affects their ability to remember, reason, solve problems, and acquire new knowledge' (Bransford, Brown & Cocking, 2004: 10). As such, existing knowledge plays an important role in laying the foundations for the incorporation of new concepts. Similarly, Diaz (2017) contends that learners who come to class with relevant prior knowledge may view the world differently and draw on the combined knowledge to solve problems. However, the availability of relevant prior knowledge does not guarantee that new knowledge will be remembered unless it is appropriately activated at the time when new information is received (Shing & Brod, 2016). Hailikari, Katajavuori and Lindblom-Ylanne (2008) also show

that meaningfully linking learners' prior knowledge to new knowledge is more likely to produce higher-order skills when it comes to solving problems. With this in mind, we argue that the form of knowledge that learners receive from their parents, and the communities from where they come, plays a significant role in learners' understanding of new knowledge. One form of prior knowledge is IK. Learners may enter classrooms with knowledge passed down from parents and grandparents and this can be used by the teacher as prior knowledge to make learning relevant to learners (De Jong & Harper, 2005). Therefore, teachers need to accommodate these experiences and knowledge without being biased about their sources. In so doing, teaching begins from concrete experiences, which then moves to the more abstract. As per the national Curriculum and Assessment Policy Statement (CAPS), the 'curriculum aims to ensure that children acquire and apply knowledge and skills in ways that are meaningful to their own lives. In this regard, the curriculum promotes knowledge in local contexts, while being sensitive to global imperatives' (DBE, 2011: 4). We argue that learners may enter classrooms with IK about weather and climate, and, if the teacher can use this as a foundation to start teaching, learning can be made more relevant and meaningful to learners.

Methodology

A qualitative research design was most suitable to address the aim of this study, namely, to determine social sciences teacher's perceptions of incorporating indigenous knowledge (IK) in the teaching of weather and climate to Grade 5 learners in a rural context. A second aim was to explore the type of IK related to weather and climate practised in the local rural community, as the children living in this rural community attend two of the schools where data was collected, and therefore it was likely that these community members were sources of the IK that constituted much of the learners' prior knowledge. As a result, an interpretive paradigm was most suitable for our study as we set out to describe and understand how people make meaning of their lived realities (Bertram & Christiansen, 2019). This paradigm aligns with a social constructivism framework as it involves how knowledge is constructed and interpreted by

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different individuals. Data was collected in South Africa's KwaZulu-Natal (KZN) province, in a rural town called Nqutu, situated in the Umzinyathi district. The town of Nqutu serves a large surrounding rural population.

Participants were selected from the rural community in which the first author resides due to ease of access to participants. Criteria used to select participants were age and number of years living in the area because they would most likely be able to discuss IK beliefs practiced in the area. Community members selected (n=6) ranged in age from 40-80 years. We believe that the number of years of experience of living in the same community provided in-depth information of the IK practices that they have observed or that have been passed on over time. The four schools were purposefully selected based on their location close to rural communities.

Children from the community where data was collected attended two of the four schools. The other two schools were selected as we needed to be able to compare and look for similarities from teachers' perspectives to enable an in-depth inquiry into participants' understandings and experiences. One teacher per school (n=4) who teaches social sciences was selected as they would most likely have gathered contextual knowledge about the community in which they teach. Data was collected using interviews and open-ended questionnaires. When presenting participants' views, we used codes to identify each participant. For example, in C2I/2L 52-57, C refers to community member, I refer to interviews and L refers to the line numbers in which the data can be located on the transcripts. Teachers were referred to by the letter 'T'.

Presentation of themes and discussion

Three themes emerged following thematic data analysis. The first theme to emerge from the data is a shared understanding, among both the community members and teachers, of the rituals and practices associated with weather and climate. The second theme is teachers' perceptions of how IK can be integrated when teaching weather and climate. Finally, the third theme addresses teachers' views of IK as scientific knowledge.

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A shared understanding of IK in relation to weather and climate

The data confirms that there were a number of environmental factors that community members used to predict and understand weather and climate patterns in the area, and it is this knowledge that is presumably available on an intergenerational level in the community. These factors included the behaviour of animals, birds, and insects as well as the growth patterns of plants. Firstly, all community members reported that the changing behaviour of birds was viewed as a sign of upcoming rain. They drew specific attention to the cries of the blue crane as a definite indicator of the beginning of the period of increased rainfall. There were a number of examples from the data, best exemplified by the following excerpt:

> *There was these huge birds which we called Izindwa (blue cranes). They were the sign that the rain was coming, they liked to stay near the river that has a lot of water. … These birds will cry every time when it was rainy season. We paid attention to that sound of those birds. Because they alerted us that the rain season has arrived (C2I/2L 52-57).*

There were also examples of the changing behaviour patterns of other birds that community members mentioned that were used as a signal of changing weather patterns, changing seasons and the start of the rainy season. These are captured in the excerpts below:

> *There were birds that will come and fly up and down in summer during the rainy seasons, it was an indicator that the rain was coming. These birds were called izinkonjane (swallows) (C1I/1L 13-15).*
>
> *There was another bird that we called Amahlolamvula (rock swifts). These birds will come in groups, flying on or near the household for a half day and they will go back from where they came from. These were the indicators that the rain was coming in the next few days and definitely the week won't end without a rain (C2I/2L 52-60).*

Teachers too were also aware of the relationship between the changing behaviour of birds and predicting the weather in terms of the onset of rain or changing seasons. This was confirmed

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by all teachers, as evidenced by the following excerpts from teachers' interviews:

> *People use to see birds from other places which are not local birds then they will predict that the season is changing. For example there were these colourful birds which were yellow and orange which comes in summer (T2I/7L 182-184).*
>
> *We would see the immigration of birds like swallows, they will appear during summer time, around November or December. It was an indicator that we have arrived into the rainy season. (T3I/7L 189-192).*
>
> *There were also izinkonjane (swallows) we knew that when many swallows were flying nonstop in the sky the rain was coming (T4I/7-8L 200-203).*

These observations from both the teachers and the community members align with earlier studies that confirm how IK related to birds signalled the onset of rains. Van Doren and Horton (2018) shared that the unfamiliar chirping of birds and birds bathing with sand were also traditional predictors of upcoming rain. Others have similarly argued that the particular behaviour of birds was considered a signal not only of the arrival of rain but also its intensity (Chang'a, Yanda & Ngana, 2010; Zuma-Netshiukhwi, Stigter & Walker, 2013).

A second environmental factor used to determine weather and climate was the growth pattern of plants. Our data confirms that both teachers and community members seemed to share a common understanding of how specific plants in the area were used to predict changing weather and seasons. As explained by one community member: *'There were flowers that would appear on Good Friday called Ujikanelanga. They were also an indicator of season change'* (C1I/1L 42-44). A teacher echoed very similar sentiments, noting that *'the flowers which comes in March or April we use to call them Good Fridays flowers, they were all indicators of season change'* (T2I/7L 184-186). This means that the appearance of certain flowers would mean that the season is changing. The community would then use these signs to prepare for the next season. This community's use of plant growth to predict changes in weather and climate is consistent with earlier studies (Nedelcheva, & Dogan, 2011;

Risiro et al., 2012). Such knowledge is acquired through experience, and a context-specific understanding of events that were happening in one's environment that transfers from one generation to the next (Muguti & Maposa, 2012).

A third related environmental factor identified by the participants were changes in atmospheric conditions. Participants cited atmospheric events such as dew, clouds, wind, moisture, and the appearance of rainbows as signs that community members interpreted when predicting the weather or changing seasons. For example:

> *The other we use to look at amazolo (dew) on the grass, we knew that when haze start to appear the season was changing and sometimes when dew appear in summer mornings it was an indicator that rain was coming in the afternoon (C3I/3L 88-91).*

Both the teachers and community members referred to the appearance of specific types of clouds to predict changing weather patterns. There are various examples from teachers' interviews and questionnaires that support this view, including the following observation: *'Farmers knew when the rain was coming by looking at the clouds'* (T1I/6L 170-171) and *'People were able to sense the air moisture to dictate the change of the weather indicating the change of the season to plough. I think it links to what social sciences its teaching and climatologist are still doing to predict the weather focus'* (T1Q/4 102-106). Similarly, a teacher noted that *'past people use to look at the clouds to detect that if it will rain or not'* (T2I/7L 174-175). This participant further explained that 'by looking at the formation of the clouds they could see if it is coming with a storm or not' (T2I/7L 177-178). Similar views were held by a community member who commented that *'we also looked at the formation of the clouds, when they were too dark they were indicating that they were holding rain'* (C6I/7L 195-200). From these examples it shows that participants believe clouds carry a message about the changing weather and, by paying attention to the characteristics of the clouds, they were able to predict weather conditions linked to whether it will be cold, warm or the intensity of rain expected

Participants also shared other signs that exist in the atmosphere that were used to predict temperature such as wind direction and its influence on

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plant growth. For instance, one of the teachers explained *'that they use to look into things like wind direction: when it was time for planting the direction of the wind will change'* (T3I/7L 187-188). Temperatures experienced in one season were also used to predict temperatures in an upcoming season. As one teacher explained: *'There were things like when it gets too hot it meant it will be too cold during the winter'* (T4I/7L 199-200). We found the following utterances from a community member important as it points to an intuitive relationship with the environment, gained from their wisdom of experiences over the years:

> *Even the hotness of the sun, we could tell that at the afternoon of that day it will rain and sometimes it will indeed rain. We could even tell how long that rain would last, by listening at the thunder rumbling. We could detect if it was a type of rain called Umvimbi (long showers) (C6I/7L 195-200).*

The data therefore reveals that teachers and community members are equally aware of how atmospheric elements (such as wind, dew, rainbow, clouds, and moisture content in the air) can be used to predict weather patterns. For example, extremely hot days in this area often lead to thunderstorm activity in the afternoon. While the use of atmospheric conditions as an indicator of changing weather conditions has been documented before (Chang'a et al., 2010; Jiri et al., 2016), what we are pointing to here is how teachers and community members from this area appear to have a shared understanding of the relevant IK. This means that this is the type of prior knowledge that learners from that community are likely to bring to the classroom, and which teachers need to be able to leverage effectively.

A fourth indicator of weather and climate, as reported by participants, was the behaviour of insects and animals. The following excerpt from interviews with community members captured observations about frogs that signalled approaching rain: *'even frogs in the rivers they used to cry when the rain was approaching'* (C1I/1L 17-18). The example provided by teachers linked to the behaviour of insects to show the change of seasons, that *'we will see insects called izinhlwabuzi (termite) mating which was the indicator that the summer has started'*

(T4I/8L 204-205). These views are supported by the scholarly literature which has shown how insects and animals can be used to predict rain: the croaking of native frogs and the migration of crabs (Van Doren & Horton 2018), in one case, and the manner in which termites collected and stored food, in others (Risiro et al., 2012; Tume, Kimengsi & Fogwe, 2019). The overlaps between both community members' and teachers' IK in our study in KwaZulu-Natal show that birds, plants, and atmospheric events played a significant role in weather and climate prediction and it is therefore vital that such knowledge is passed on to learners, or at least recognised as the basis of their prior knowledge.

The data also confirms that there were some cultural practices and rituals that were performed to invoke rain. All community members and teachers reflected on stories from the past linked to these rituals, best exemplified by the following excerpt:

> *When we get to mountain we will pray to ask rain from God and the old man from the community will share with us the verse from the bible then we will pick up the leaves of the tree called Umsenge (cussonia spicata/ cabbage tree) which was the specific tree that grows on the mountain. Each one of us … when we done we suppose to take these leaves and throw them in the dam that was near the mountain. The reason for the Umsenge (cabbage tree) was used because it was always green (C1I/1L 6-13).*

Common to the stories shared by community members was that the rainmaking rituals took place in the mountains, near the source of a river, and involved speaking to ancestors. From these stories, we gathered that water and plants used in the ceremony had to have specific characteristics – namely plants that are green, signifying growth, and water directly from a spring, signifying purity, as this is the source of the river and has not been contaminated with any type of pollution. Crucially, IK is, therefore, also about inculcating in community members a respect for the environment, even on a symbolic level. Teachers too were aware of rituals that were performed on the mountain, with some believing that there were significant symbolic reasons for these rituals that emphasised respect and

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care for the environment:

> *There could be a symbolic reason, at the end of the day people see the importance of water. They realize that there is no life without water especially here in rural areas. They have livestock and they still plough they need rain to survive (T2Q/2L 35-38).*

However, some of the teachers were sceptical about these practices and reported that it could contribute to some misconceptions about the occurrence of rain. For example, one of the teachers reported that over time, people were under the belief that if you pray even in winter, the rains will come.

> *Yes such as praying for rain in the mountain. I believe there is misconception about this ritual because for instance if you can go there in winter and pray for rain in winter I don't think it will rain because it is not a rainy season and I believe even though people believed in this it was not always the case that whenever they went to the mountain to pray it will definitely rain. Yes I think they were doing this out of desperation of water which made them realized the importance of water that is why they ended up believing that indeed praying in the mountain will bring rain (T1Q/1-2L 26-32).*

The misconception that it will only rain after these rituals are performed is similarly expressed by another teacher: *'Yes, I heard that people use to go with drums and pray for the rain when they get to the mountain, they will sing and pray for the rain. Misconception is that the only reason it rains it's because of these rituals'* (T4Q/2L 46-48). The teachers' responses highlight not only the importance of the rituals linked to instilling values of care for the environment but also misconceptions which must be addressed and corrected in the classroom. To do this, teachers need to be aware of the belief systems that might inform learners' prior knowledge.

Another cultural practice linked to weather was the way in which the community protected themselves during unpleasant weather conditions, such as lightning strikes. Certain indigenous practices that were carried out to protect community members from thunderstorms and lightning are described by a community member:

'When we saw that lightning or thunder rumbling is coming badly, we would take mealies and throw on our yards or lighting the candles to prevent lightning strikes' (C6I/6L 181-183). Another community member added that *'the manganese and the sea water were also used to prevent lightning'.* Another community member added that:

> *There were somethings we did to prevent being strike by lightning, we used sticks called Abafana which were made of Izintungo from any tree that cannot be strike by lightning. The head of the house would take these sticks that had ointment called Insizi put them on the yard corners every time when the rain was coming (C3I/4L 91-94).*

However, with the high incidents of deaths related to lightning in rural areas (Trengove & Jandrell, 2010), it is important to assess whether such beliefs compromise the safety of the community, and, if so, to engage critically with such IK within the classroom. It is important to correct misconceptions linked to lightning as it may give individuals a false sense of safety (Trengove & Jandrell, 2010), and thereby seriously endanger them. It is essential to integrate IK into the social science classroom as IK forms the prior knowledge of many of the learners, even if this prior knowledge is also the basis for several misconceptions that need to be corrected.

Teachers' views of integrating IK when teaching weather and climate

Teachers acknowledged the importance of integrating IK into the teaching of weather and climate. They were of the opinion that much of the teaching in social sciences draws on knowledge from the past. While one teacher observed that *'It will help them grow knowing that they must depend on the past'* (T1I/2L 44), another teacher added that *'social sciences consist of history and history cannot contain current knowledge'* (T4I/3L 57-58). Another teacher captured the importance of IK aptly by stating the following:

> *Social sciences came when nature was already existing […] trees were valuable things even though some did not bear fruits [....] now Western knowledge tells us that trees are breathing we get oxygen*

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> *from the tree. While old people used trees for shade and medicine (T2I/2L 46-51).*

Teachers were also of the view that it is important that IK is integrated in the curriculum as it will help the learners understand content better. The following examples provided by teachers support these views:

> *It is important for better understanding using their prior knowledge for them to understand, it makes it easier in the lesson to introduce Western concepts. It is important for them to understand their current and local context that they live in (T3I/2L 53-56).*
>
> *I think that it still applies because even now there are still obvious signs that we still use to predict weather […] Yes I think it's the simplest way to use to teach weather and climate (T2Q/4L 107-109).*

Teachers also agreed that including indigenous indicators of weather conditions in the curriculum could have a positive impact on learners. This was confirmed by three teachers as they explained that *'they will be able to relate to the lesson'* (T1I/8L 209); *'they will also find familiar things that they will be able to reach and understand weather and climate change'* (T3I/8L 315) and *'it will stimulate their interest to learn about particular topic most of them will be even eager to observe when these form of birds appear and disappear'* (T4I/8L 222-223). This means that teachers believe that IK could be a solution for learners who find it difficult to understand concepts related to weather and climate. Diaz (2017) argues that learners who come to school with relevant prior knowledge regarding a topic are less likely to struggle to solve problems, as they are able to use IK to make sense of Western knowledge. Prior knowledge plays a significant role in providing the building blocks which scaffolds learners' understanding of new concepts (Haslett et al., 2011). Drawing meaningfully on learners' prior knowledge, therefore, impacts positively on how children 'remember, reason, solve problems, and acquire new knowledge' (Bransford et al., 2004: 10). De Beer (2019: 4) argues that the principles and underlying theories that characterise specific subjects must remain as the foundations and that the integration of IK 'provides contextualization that will provide epistemological access to

learners'. IK should, in this way, serve as a bridge between the sciences and the lived experiences of people (De Beer, 2019). Moreover, the immediate environment that children learn and grow up in 'plays a vital role in their learning, which of course determines how new concepts are learned and stored in long-term memory' (Jegede, 1999).

Teachers' views of IK and scientific knowledge

Teachers presented different views on the place of IK in the curriculum. One of the teachers indicated that IK and scientific knowledge are equally important in the curriculum, noting that *'both knowledges are important because nothing has changed'* (T2I/10L 266). Another teacher explained that it was important to infuse both forms of knowledge so that learners could

> *Learn about their tradition and culture and also costumes. But in Western we follow other people's ideas we don't learn about ourselves …Because of our education today we use both you don't have alternative to say that I will do one (T1I/9-10L 258-260).*

However, the teachers explained that different types of knowledge were not equally valued, with IK receiving less prominence and prestige. For example, one participant argued that *'it is different because Western science comes with the idea that IK is incomplete'* (T21/10L 263-264). Other teachers expressed their preference for scientific knowledge, which they likened as coming from the West, which they thought about in terms of developed nations. In their explanations, they provided different reasons for this preference, which include the following:

> *I would prefer the Western knowledge because it is integrated it covers all cultures across the globe… no standards set as far as IK is concern. It does not gives direction or instruction on how to teach these forms of knowledge (T3I/10L 270).*
>
> *IK is not into details […] They don't come with instructions […] Both knowledge is important because you found even these Western medicines are being produced using traditional plants; it is just that it is now tested. This knowledge complements each other (T4I/10L 278 and 285).*

Teachers thus believe that both forms

of knowledge are important, even though some prefer Western knowledge as they believe it is more integrated. They were also of the view that IK lacks depth, detail and sufficient pedagogical support resources - a concern that has been raised by others (Angaama et al., 2016). There are numerous challenges with integrating IK in the classroom that the teachers touched on, including concerns about how to ensure that integration does not amount to 'tokenism', not appearing disrespectful in their teaching, and the difficulties reconciling IK with scientific knowledge (Baynes, 2015). Significantly, in contrast to an earlier study of physical science teachers who felt that IK was regarded as "backward and primitive" (Ogunniyi, 2013), the social science teachers working in this community held a more balanced and inclusive view about the place of IK.

Teachers also highlighted misconceptions about IK that children who enter classrooms may have internalised. It is therefore important for such misconceptions to be corrected if new content is to be learnt. These misconceptions include:

> *That if you drink water while standing lightning will hit the house when it rains. I don't believe in such (T1Q/4L 89-90).*
>
> *I know that many superstitions were put in place in order for respect purposes (T3Q/4L 96-97).*
>
> *I have heard when people were using a plough, there was a time when these ploughs touches each other when they were working and they continue with what they were doing, they believe that it will cause hail. So they believed that if those ploughs touches each other they must stop immediately. I do not believe in such things (T2Q/4L 91-95).*

Although we argue that the school curriculum should integrate IK as it links to community contexts, it is also important to acknowledge that not all knowledge and beliefs that emanate from community activities are accurate. These misconceptions must be addressed as any new knowledge linked to these concepts will not be grasped by students (Goris & Dyrenfurth, 2010). Teachers were broadly of the view that there is a space for blending IK with scientific knowledge in this regard. For example, one teacher noted that she could use

'especially games not rituals' (T3Q/5L 128), while another argued that *'I can use it especially the ones that they are not myth but real and students can relate to them'* (T4Q/5L 137-138). The use of indigenous games and folktales, therefore, has a place in primary school classrooms to assist learners to access the formal knowledge systems set out in school curriculums (Ronoh, 2017; Seehawer, 2018). Using constructivist pedagogies that stimulate dialogue and debates is important as it provides opportunities to challenge existing beliefs and understandings but at the same time, respects and acknowledges learners' prior knowledge and experiences (Richardson, 2003).

Conclusion and recommendations

Teachers do see the value of integrating IK into the lessons pertaining to weather and climate in a social sciences classroom. What needs to be interrogated is how best this can be done. It would require classroom strategies that enable learners to 'travel from their everyday lifeworld to the world of science found in their science classroom' (Jegede, 1999). It is therefore important to create constructivist learning environments in classrooms that encourage debate and dialogue and which do not pitch IK and scientific knowledge against one another. This could be a valuable platform for students to share indigenous knowledge and practices with each other, and, in this way, learners and teachers could also learn from one another (Cronje, De Beer & Ankiewicz, 2014). A social constructivist pedagogy also signals to learners that their background knowledge and beliefs are respected while simultaneously providing opportunities to challenge existing beliefs and understandings through active engagement (Richardson, 2003). Communities and classrooms can therefore become more connected when IK is integrated with knowledge prescribed in the formal school curriculums.

An African proverb says that 'it takes a village to raise a child'. This means that children encounter knowledge shared by the community in which they are raised and through their interactions with their environment. In light of this, we argue that the prior knowledge that children acquire from their interaction with their environment at home should also be considered in schools. This could start by ensuring that parents and

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community members are not excluded from planning the curriculum, especially in terms of IK, as the study shows that community elders are among the key sources of IK for school learners in this rural community. It is important that the values that the community hold are taken into consideration. The study also highlights that even though the integration of IK is required by the CAPS curriculum, it often does not translate into usable knowledge in classrooms. Here the struggle was that IK is still regarded as informal knowledge and tangible examples of IK that can be referred to when teaching relevant concepts are difficult to locate. The curriculum should therefore be subjected to constant renewal, and teacher education programmes need to increasingly develop pedagogical skills that will allow teachers to incorporate IK into diverse classrooms.

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