

A DAY AT THE MUSEUM: A CASE STUDY OF HOW MUSEUMS COULD PARTNER WITH UNIVERSITIES IN TEACHER EDUCATION

Phemelo Paige Jautse North-West University & Mphebotho Museum Phemelo.jautse@mphebathomuseum.co.za	Nicholas Thambe North-West University & Mphebotho Museum mncethambe@gmail.com	Josef de Beer North-West University South Africa Josef.debeer@nwu.ac.za
--	---	---

ABSTRACT– Higher Education Institutions in the 21st Century face many challenges, one being the call for the ‘decolonization of the curriculum’. This is also a challenge in pre- and in-service teacher education. The national school curriculum asks for the inclusion of indigenous knowledge in the sciences, yet teachers are not trained in indigenous knowledge. In this paper we explore the partnership between the Mphebotho Museum in the Pilanesberg, and the Faculty of Education Sciences at NWU, Potchefstroom, in training student teachers and practicing teachers in the incorporation of indigenous knowledge in the science and mathematics curriculum. We argue that teacher educators often do not have the knowledge and skills to pay justice to indigenous knowledge systems while preparing future teachers for this curriculum requirement. Museums, on the other hand, often employ holders of indigenous knowledge that could enhance this component in teacher education. This qualitative research elicits the role of the Mphebotho museum in the professional development of teachers who participated in an indigenous knowledge short course offered by the NWU. Teachers’ experiences of engaging with the holders of indigenous knowledge were captured through research instruments such as questionnaires, teacher reflections and individual interviews. We argue that the partnership between universities and museums hold promise for enhanced and more effective teacher education.

Keywords: Teacher Education; Role of Museums; Indigenous Knowledge; Teacher Pedagogical Content Knowledge

1. INTRODUCTION

There are many issues that plague science education in South Africa: a lack of inquiry approaches, chalk-and-talk approaches that do not portray the tenets of the nature of science, a lack of equipment, not all teachers having sufficient pedagogical content knowledge to teach more challenging topics in the curriculum, to mention but a few (De Beer & Ramnarain, 2012). In this paper we reflect on another problem, which is becoming increasingly important in an era of the ‘decolonisation of the curriculum’: how to infuse indigenous knowledge systems in the science and mathematics curriculum. Although there are a few vague statements to this effect in the Curriculum and Assessment Policy Statement, very few teachers in the country actually know how to incorporate indigenous knowledge in their teaching of science and mathematics.

Science education in South Africa is at the crossroads. Since the *#RhodesMustFall* student protests in 2015, the problems around transformation that bedevil education have been centre-staged. Mbembe (2015) writes that “there is something profoundly wrong when syllabi designed to meet the needs of colonialism and Apartheid continue well into the post-Apartheid era”. Ngugi wa Tjiong’o (1981:100), the Kenyan writer, wrote in a broader African context that “Africa as a continent has been a victim of forces of colonial exploitation, oppression and human degradation. In the field of culture she was taught to look on Europe as her teacher and the centre of man’s civilisation, and herself as the pupil. In this event Western culture became the centre of Africa’s process of learning, and Africa was relegated to the background. Africa uncritically imbibed values that were alien and no immediate relevance to her people. Thus was the richness of Africa’s cultural heritage degraded, and her people labelled as primitive and savage. The colonizer’s values were placed in the limelight, and in the process, evolved a new African who denied his original image, and exhibited a considerable lack of confidence in his creative potential”.

Albeit true, we would like to argue for the inclusion of indigenous knowledge not from a political perspective, but from a learning psychology perspective, grounding our argument in embodied, situated and distributed cognition (ESDC). The viewpoint of ESDC is that cognitive processes are deeply rooted in the body's interactions with the world (Wilson, 2002). Learners develop their worldviews based on their (situated) engagement with people and the environment. Such cultural knowledge is co-constructed (and therefore distributed in the community). This provides a very good entry into the abstract world of science and mathematics. The fact remain that few teachers are equipped for infusing indigenous knowledge in their teaching. Teacher educators at universities do not necessarily have the knowledge of indigenous knowledge to provide this professional development in either a pre-service or in-service teacher education setting. In this paper we explore the potential role that museums can play in empowering teachers to develop the necessary pedagogical content knowledge to teach indigenous knowledge. Teaching requires a special mixture of both content knowledge and pedagogical knowledge, a blend which Shulman (2004) refers to as pedagogical content knowledge. This special synergy between content- and pedagogical knowledge is made very explicit at the Museum. Museums often employ holders of indigenous knowledge, who have a lot to offer in teacher education. In this paper we explore the partnership between the Mphebotho Museum in Moruleng in the Pilanesberg, North-West Province, and the Faculty of Education Sciences, North-West University, Potchefstroom, in providing teachers with suitable education on indigenous knowledge systems.

Our argument is that the natural sciences and indigenous knowledge systems share similar tenets (despite some differences): both are empirical (although indigenous knowledge also has a metaphysical component), both have an element of subjectivity, both are tentative, and both have social and cultural roots. The epistemological border-crossing between western science and indigenous knowledge can therefore be done smoothly, provided that teachers have sufficient pedagogical content knowledge to do so. This partnership between a museum and a HEI provides promise for developing teacher PCK in terms of indigenous knowledge.

2. THE INTERVENTION: THE MPHEBATHO MUSEUM AS THE “THIRD PARTNER”

The Mphebotho Cultural Museum preserves the Bakgatla-ba-Kgafela culture and traditions. Unlike any other Cultural Precinct in the country, this museum explores Bakgatla-ba-Kgafela culture and traditions in unconventional ways. It is both a highly conceptual and an immersive space that stimulates the creative and critical thinking of the visitors. The North-West University conceptualised three day short courses in indigenous knowledge in Physical Sciences, Life Sciences, Natural Sciences, Mathematics and Technology. Day one of this three-day course is spent at the Mphebotho Museum where teachers engage with the holders of indigenous knowledge. On days two and three, back at the university, teachers further engage with the concepts introduced at the Museum. The Museum forms an integral “third partner” (Mathews & McArthur, 2004) in this value chain between the university and schools. The museum serves as an authentic setting for transferring indigenous knowledge from the academy to schools.

Teachers enter the museum as *Homo ludens* (the playing human) (Huizinga, 1955), and through cooperative learning and problem-based learning they are shown how indigenous knowledge could be brought to life in the classroom. The following activities form part of the course at the museum.

2.1. Welcoming: establishing a conducive learning space

The traditional dance welcome at the entrance of the Mphebotho Museum provides a true reflection of African reception and also arouses teachers' interest and curiosity. The idea is to also give teachers insight into Bakgatla tradition including traditional clothing.

2.2. Exhibition tours giving insight into Bakgatla Ba Kgafela culture

The teachers are then given a tour in the exhibition rooms to foster an understanding of the background and moral values of the Bakgatla Ba Kgafela people. Exhibitions are primarily on indigenous/traditional knowledge systems and history of Bakgatla Ba Kgafela people within the Batswana ethnic group.

2.3. Activities: *Homo ludens* learning through a pedagogy of play

The tour programme is not just a talk-and-walk affair but rather an interactive and engaging experience into the Bakgatla traditional ways of living. The Museum has developed activities based on Bakgatla traditions for teachers which also stimulate participation, team-work/interaction and strategic thinking. The activities' design encompasses problem-based learning and cooperative learning. Teachers are divided in groups so that everyone gets to be involved in these activities.

The activities are:

Puppet shows: Part of the programme for teachers is a short puppet show in which the puppets discuss the nature of respectively science and indigenous knowledge. This epistemological border-crossing between science/indigenous knowledge and the performing arts will hopefully provide teachers with a more nuanced understanding of the tenets of indigenous knowledge, and also emphasize STEAM (science, technology, engineering, arts and mathematics).

Interactive drumming: Drumming, as used traditionally to communicate with both ancestors and amongst community members, especially during the initiation ceremony or during the general community meetings, gives teachers insight into how the drums looked like, different types of sounds it produces, how they were used, and

what it was made of and why. This also links well with the ethno-mathematics activities that are dealt with at the university the next day, where teachers explore the links between mathematics and music.

Traditional beer-brewing: An elderly knowledge holder will demonstrate and explain to teachers how to make traditional beer and the fermentation processes. The group will then be engaged in brewing the tradition beer and get a small quantity to take home. Back at the university teachers will further explore the curriculum links with the Curriculum and Assessment Policy Statement for Life Sciences, e.g. anaerobic respiration.

Traditional medicine and healing: The Museum has pre-prepared medicine in place for experimentation such as the resurrection plant, *Myrothamnus flabellifolius* ('uvukwabafile' or 'opstandingsplant'). This plant is used to treat people suffering from the trauma of the death of a beloved, or depression. The traditional healer/ African psychologist would give a twig of this plant to the patient, with the instruction to put it in a glass filled with water on a window sill. This plant has the unique characteristic that its leaves become brown and curl up in winter, which gives it a dead-like character. When put in water, it almost miraculously becomes green (overnight). This serves to show the patient that there is always hope, and that there is life after death. There is also a traditional healer to explain the process of the healing process and the preparation process. Some of these muthi plants are tested for anti-microbial activity back at the university the next day.

Leather tanning (go suga le go do dira dikgole): The process of leather tanning is demonstrated to the group, and the teachers get the opportunity to practically engage in the whole process and they take home the final product so that they monitor the drying of the leather.

Indigenous games/ board games: Games such as Diketo, Morabaraba, Mmelo and Dibeke are introduced to the teachers. These African games vary in difficulty. The games incorporate various mathematical elements, and back at the university the next day these concepts are further explored in

terms of the Curriculum and Assessment Policy Statement. (The following link provides a 10 minute overview of the project: https://youtu.be/hrA3_MpsA2Q)

Mat making: With the mat making the museum shows the group that both mathematics and technology existed long before the introduction of some of the modern machines that we see in this age and time.

Food preparation: Preparing food was a process on its own with stamping, grinding and sifting which actually needed time. Teachers are provided the opportunity to engage in these processes.

3. METHODOLOGY

This generic qualitative research captured the affordances of a museum visit for the professional- and pedagogical content knowledge development of teachers in terms of indigenous knowledge. The research question that guided this research was: What are the affordances of establishing a partnership with a museum in teacher education? Life Sciences, Natural Sciences, Technology and Mathematics teachers who visited the museum as part of a short course were asked to reflect on the museum visit in the questionnaire that they completed after the course, and individual interviews were also conducted with the teachers. A convenience sampling method was used, implying that only teachers who attended the interventions participated in the study. Semi-structured interviews were conducted with eight randomly selected teachers who were willing to participate. We used Saldana's (2009) coding technique, and the in-vivo codes (codes taken from the exact words spoken by the participants) were organised into categories, that resulted in a number of emerging themes (Saldana, 2009:8).

Validity

Construct validity refers to whether a questionnaire or interview protocol measure what it is intended to measure, and this was ensured by asking a panel of experts to peruse the instruments. Member checking was also used, and the generated data was taken back to the participants in order for them to judge whether what was written accurately reflects reality (Creswell, 2007).

4. FINDINGS: THE AFFORDANCES OF A MUSEUM VISIT IN TEACHER EDUCATION

Saldana (2009) suggests that between three and seven themes are identified in qualitative studies. In this study we highlight three dominant themes that emerged from the data. We'll then discuss the affordances of museum visits in teacher education.

4.1. Theme 1: Teachers realise the affective outcomes of such museum visits

Many of the teachers commented on the fact that excursions and such museum visits hold opportunities to develop affective outcomes in learners. The nature of the programme reminded teachers of the importance of emphasizing the science-in-society dimension in the classrooms, and that learners might better understand the relevance of science in their daily lives, resulting in better motivation and an interest in science. Some of the teachers' comments include: "The trip to the museum reminded me of a trip I myself did many moons ago as a pupil, and I suddenly remembered how excited I was. I actually feel bad that I am not arranging trips for my learners. I think a museum visit would spark their interest"; "The Museum guide spoke of us as 'playing humans' today, and it made me wonder if I should not use such approaches more in my own teaching. Perhaps it could spark new energy in my classroom".

4.2. Theme 2: Teachers reported on having more nuanced understanding of the nature of indigenous knowledge after the museum visit

A major theme that emerged, is that teachers felt that they gained knowledge and insight on indigenous knowledge systems. Some of the teacher comments include: "I must admit that I was skeptical about indigenous knowledge, and I always considered it as unscientific. However, I was amazed at the innovation and creativity of the Bakgatla people. I especially enjoyed learning about the medicinal plants". Another teacher commented: "I realised that one needs to delve deeper, and try to understand what sometimes is unclear. It was interesting to hear that plants that are sprinkled outside the house to keep 'evil spirits' away, actually has antiseptic and anti-microbial substances that kill bacteria".

4.3. Theme 3: Teachers would like to learn more about other cultural groups

In our diverse society it is important for teachers to have a good understanding of as many cultures as possible. This is a strong theme that emerged. One teacher commented: "I am Xhosa, and it was interesting for me to learn more about the Bakgatla, and to see what similarities and differences there are between our cultures. It made me realise that I will need to learn more about other cultures". One of the White teachers commented: "I realised today that I should put in more effort to learn about the cultural ways of Black people. This might help me to better connect with my Black learners in my classroom".

4.4. The affordances of a museum visit in teacher education

The visit to the museum holds affordances for the professional development of teachers. (With 'affordance', a term that was coined by Gibson (1979), we refer to the possibilities of an action or object).

A pedagogy of play is utilised at the museum, and elements of drama is incorporated in the programme. Teachers are shown how a pedagogy of play could be used in the science classroom, with the learners exploring their world as *Homo ludens* in more context-sensitive learning opportunities. Drama as a pedagogy is a powerful method available to teachers in the constructivist paradigm (Braund, 2015), yet it is alarming to note how little attention it receives in schools. Fels and Meyer (1997: 75) states that "...drama in theatre and science share some common ground... both seek explanations of the world through real, imagined or vicarious experience".

At the Museum teachers can experience African teachings in a pure form. Unlike the school curriculum with a predominant Eurocentric approach, an Afrocentric approach is used at the Museum. We should not just be talking about the 'decolonisation of the curriculum' but rather about the 'decolonizing of the mind', and during the programme at the Museum teachers can first-hand experience how indigenous knowledge is often underpinned by rigorous science. One of the medicinal plants of the Bakgatla is *Myrothamnus flabellifolius* (the resurrection plant or moswa-a - rula in Setswana). Traditionally this plant is used for blood diseases, kidney problems and as an immune booster. Western science has shown that *Myrothamnus* contains volatile oils containing trans-pinocarveol, limonene, and trans-p-mentha-1(7),8-dien-2-ol. Van Wyk, Van Oudtshoorn & Gericke (2009) state that the oil of this plant has powerful bacteriocidal activity. Research shows that the active ingredients in this plant can serve as a urinary antiseptic and diuretic. It is therefore interesting to note how western research is providing evidence for these indigenous knowledge claims.

The Museum pays attention to the morals and values of the Bakgatla people. In a modern society that in many instances has moved away from traditional values, it is important to draw both teachers and learners attention to some of these values, e.g. respect for the elders. Many teachers can attest to how this often lack in our schools. An interesting example is also life passage. Virginity is highly regarded by the Bakgatla-ba-Kgafela. Traditionally emphasis is placed on the diet of young people. Dairy products and eggs are restricted in the diet of especially girls. The belief of the Bakgatla is that this will delay the

sexual maturity of young people. Certain gum/ resins, mainly from *Acacia* species (borekhu) is eaten to delay the menstruation cycle. This highlights the value that the Bakgatla-ba-Kgafela place on only engaging in sexual activities as adults. Boys also need to eat this, and it might also have had an effect on boys.

Problem-based learning is foregrounded. Indigenous games (e.g. marabaraba, mmelo and diketo) are highly strategic games that stimulate the mind. Back at the university the teachers engage with these games again, and are shown how these games can be used to teach many of the concepts in the CAPS Mathematics curriculum. If one studies these games, and people's involvement with these games, it becomes clear that it meets Schmidt's (1983) definition of problem-based learning, namely that small groups of learners learn collaboratively in the context of meaningful problems that describe observable phenomena or events.

Teachers are reminded of engaging pedagogies when working with children, as the museum invests effort in communicating indigenous knowledge in ways that appeal to Generation Z. Whereas many museums have display boards that require a lot of reading, Mphebatho has visual displays where they "tweet" small chunks of information. This is supplemented by hands-on activities where learners will engage for instance in indigenous games such as morabaraba and food preparation activities. This is in sharp contrast to the chalk-and-talk approaches evident in many classrooms. The Mphebatho Museum believes that the take-home message should be clear. Lortie (1975) speaks of the "apprenticeship of observation" referring to teachers who often mimic the behaviour of the teachers that they themselves had as pupils. The Museum demonstrates a pedagogy that provides such teachers with other options.

As a diverse society, teachers might not understand the cultural practices of cultural groups other than their own. At the museum they interact with a particular culture- the Bakgatla – and they can then identify similarities and differences between cultures. Museum guides facilitate discussions where teachers engage in border-crossing between cultural practices, and finding unity within diversity. Circumcision and initiation schools provides an interesting example. In the case of the Bakgatla, boys are expected to attend initiation school for a month in winter time. Boys are sensitised towards their roles as adults in society, and they are made aware of cultural rules that should be respected. Part of the curriculum also entails circumcision. After the operation, the Bakgatla elders (traditional surgeon) would use the bulb scales of *Boophone disticha* (poison bulb or leshwama in Setswana, or Ishwati in Xhosa) as a wound dressing. It is interesting to note that in other cultures other plants are used for the same reason, such as *Eucomis autumnalis* (umathunga), or *Helichrysum odoratissimum* (imphepho).

Young men coming back from the initiation schools (bogwera) (or girls after attending the bojale) form a brotherhood called mophato, and this group then has a collective responsibility in society. During bogwera the boys would learn the responsibilities of a respectful and responsible adult. On their return they then are assigned with collective responsibility, which very much reminds of Johnson & Johnson's (2009) criteria of positive social interdependence in cooperative learning. Johnson & Johnson (2009) state that social interdependence exists when the outcomes of learning are affected by own and others' actions. Their research shows that knowing that one's performance affects the success of peers seems to create responsibility forces that increase one's efforts to achieve. This has traditionally been true of Bakgatla culture, where the mophato cooperatively learn from each other, mentored by the kgosi and other traditional elders.

Learners often look at teachers in a sexual way- Bakgatla's has a strong ethical and moral code- and this might be insightful to teachers. In today's permissive society the indigenous knowledge of the Bakgatla emphasizes respect of a person's body.

In difficult economic times teachers learn how they can address issues of food security. At the Mphebotho Museum one of the activities focuses on the storage of foods. With this knowledge teachers can actually show learners how people can actually save money by growing foods and preserving it. This IK could be useful. Attention is given during the programme to the structure of the huge clay pots that act as silo's (*sefalana* in Setswana): the way it is built and plastered keep maize/sorghum/ beans fresh and free from pests. Teachers should emphasize the science behind these silos. Such an approach will show the learners how science is relevant to our daily lives (contextualised science). Gibbons (2000) calls this mode 2 knowledge construction. In mode 2 knowledge production "...society can (and will with increasing frequency) 'speak back' to science. The idea of science communicating with society is familiar enough. Now, society is speaking back to science. Reverse communication is generating a new kind of science, let us call it context-sensitive. In epistemological terms, context sensitive science is new in the sense that it produces robust knowledge- that is, knowledge reliable not only inside but also outside the laboratory"(Gibbons, 2000, page 161).

The Mphebotho Museum plays an important role in documenting of our history. African history has historically been written up by Europeans. This has lead to what Ngugi Wa Thiongo refers to as the colonization of the African mind, and has resulted in Africans forgetting their African ways. The visual displays at the Mphebotho Museum are based on oral research amongst Bakgatla elders. An example that is showcased at the Museum is the Bakgatla contribution in the Anglo-Boer War. This 'white man's war' actually was also fought by the Bakgatla people, who joined ranks with the British. The British were dependent on the local knowledge of the Bakgatla people, in providing them with a strategic advantage over the Boers. The Bakgata people fought in the battles of Kaeye, Derdepoort and Moretele, in which the Boers were defeated. In those wars they were promised land by the British, that they never received.

In an era where there is increased concern about the state of the environment, the cultural ways of the Bakgatla provides an interesting angle on environmental and sustainable development. The way food was stored traditionally, compared to a western way of food packaging, has a much lighter environmental and carbon footprint. Baskets that were used for storage was made with reeds (not plastic), and had a very long lifespan.

5. CONCLUSION

Kinsella and Pitman (2012) state that teacher education suffers from a theory-practice gap- implying that education is too theoretical, and not sufficiently practice focused. Kessels and Korthagen (1996:2) refer again to the "gap between our words and the students' experiences that we cannot bridge", referring to the fact that teacher education is often experienced as too theoretical, leaving students confused about its practical value. Partnerships such as this one between a HEI and a museum might help to overcome this theory-practice divide, and help universities to get rid of the "ivory tower" label it often carry. Our findings show that museums can play a valuable role in initial teacher education. This is also the finding of Yuan, Stephenson & Hickman (2015). Teacher educators do not necessarily have the knowledge to address indigenous knowledge sufficiently, and a partnership with a museum could address this shortcoming. Such a partnership would empower teachers to effectively incorporate indigenous knowledge in their teaching, and make science and/or mathematics more meaningful and relevant to the learners. Such a museum visit could also assist teachers in making this epistemological border crossing between the natural science and indigenous knowledge easier in their classrooms. Teachers will also become more aware of the role of arts in the natural sciences classroom. The Department of Science and Technology nowadays promotes STEAM rather than STEM, emphasizing the affordances of art in the science classroom.

ACKNOWLEDGEMENT

We would like to acknowledge financial support from both the National Research Foundation, and the Fuchs Foundation.

REFERENCES

- Braund, M. (2015). Drama and learning science: an empty space? *British Educational Research Journal* 41(1), pp. 102 – 121.
- Creswell, J.W. (2007). *Qualitative inquiry and research design. Choosing among five approaches*. Thousand Oaks, California: SAGE Publications.
- De Beer, J. & Ramnarain, U. (2012). The implementation of the FET Physical- and Life Sciences curricula: opportunities and challenges. Research report prepared for the Gauteng Department of Education.
- Fels, L. & Meyer, K. (1997). On the edge of chaos: Co-evolving worlds of drama and science. *Journal of Teacher Education*, 9(1), pp. 75 – 81.
- Gibson, J. (1979). *The ecological approach to visual perception*. Boston: Houghton Mifflin.
- Huizinga, J. (1955). *Homo ludens: a study of the play element in culture*. Boston: Beacon Press.
- Kessels, P. & Korthagen, F. (1996). The relationship between theory and practice. *Educational Researcher*, 25, pp. 17 – 22.
- Kinsella, E.A. & Pitman, A. (Eds). *Phronesis as professional knowledge. Practical wisdom in the professions*. Rotterdam: Sense.
- Mathews, B.A. & McArthur, M. (2004). The Museum in the middle: Strengthening the role of the “third partner” in educational partnerships. *Perspectives on History*, March 2004. Accessed on-line: <https://www.historians.org/publications-and-directories/perspectives>
- Ngugi wa Thiong’o (1981). *Decolonising the mind*. Oxford: James Currey Ltd.
- Shulman, L.S. (2004). *The wisdom of practice. Essays on teaching, learning and learning to teach*. San Francisco: Jossey-Bass.
- Van Wyk, B-E., Van Oudtshoorn, B., & Gericke, N. (2009). *Medicinal plants of South Africa*. Pretoria: Briza Publications.
- Wilson, M. (2002). Six views of embodied cognition. *Psychonomic Bulletin & Review* 9(4), 625 – 636.
- Yuan, Y., Stephenson, P. & Hickman, R. (2015). Museums as alternative settings for initial teacher education: Implications of and beyond the “Take one Picture” program for primary art education. *Visual Arts Research* 41(1), Summer 2015, pp. 27 – 42.