

PHOTOVOICE METHODOLOGY TO PROMOTE EDUCATION FOR SUSTAINABLE DEVELOPMENT

I. Muller

Faculty of Education

North West University

Potchefstroom, South Africa

<https://orcid.org/0000-0001-9018-5771>

ABSTRACT

Education for Sustainable Development is best addressed in a spontaneous, place-based context where participants have the freedom of choice. Such an opportunity occurred with the Ripple Effect, a global initiative that allows participants to indicate the role of water in their living experience. Preservice teachers embraced the chance to display their interpretation of the role of water in their lives by participating in a Photovoice project. Photovoice is a chameleon in action research as it not only provides a research methodology but can serve as a reflection tool to enhance learning. The preservice teachers concluded, after reflecting on the role of water in their daily lives, that they are citizen scientists who can utilize place-based learning opportunities. The Photovoice project allowed for affective learning as well as an opportunity to face communal problematic scenarios regarding water.

Keywords: participatory action research, Photovoice, Education for Sustainable development

INTRODUCTION

Serious environmental problems, such as global warming, ozone depletion, and the extinction of species, are threatening sustainable life on earth. Environmental education (EE) is regarded as the most valuable defence against these threats (Saribas, Teksoz, and Ertepinar 2014). The goal of EE was defined in 1976 as the raising of awareness and concern about the environment and associated problems, as well as the ability to work individually and collectively towards solutions to existing problems and the prevention of new ones (United Nations Education, Scientific and Cultural Organization – International Environmental Education 1976). Research has indicated that EE is better suited than legal provisions decided by governments to permanently change positive behaviour towards the environment (Lieflander and Bogner 2018). According to Yilmaz and Gultekin (2012), EE is a necessity at every stage of education to enable the solving of environmental problems and the raising of environmental awareness. EE is a polysemous term and a new concept dawned in 2002 namely Education for Sustainable Development (ESD). ESD was used in 2002 at the World Summit on Sustainable Development,

held in Johannesburg, South Africa. ESD accentuates the key role that education must play in environmental protection and social development (Imara and Altinay 2021; Irwin and Lotz-Sisitka 2014). The implementation of the United Nations Decade of Education for Sustainable Development for the years 2005–2014 initiates a global movement with focus of improving and redirecting education systems towards sustainable development (UNESCO 2014). This movement was followed by the Global Action Programme (GAP) of 2014 which redirect education and learning to contribute to sustainable development in communities (UNESCO 2018). In 2019, ESD building on the lessons from GAP on ESD and launched ESD for 2030 and once again stressed the contribution of education in attaining Sustainable Development Goals (SDGs) (UNESCO 2022).

The education and training of the youth with essential knowledge and skills to address and solve current and future problem scenarios in their world and communities require creative action by educators and facilitators. In ESD, participants are encouraged not only to relate to ecological matters but also to indicate concerns about social, political, and economic matters (Haiping 2016). ESD focuses on teaching and learning approaches that allow participants to develop values, competencies, skills, and knowledge to contribute towards a sustainable future via critical and holistic thinking (Leal Filho 2015). In 2011 Reddy claimed that limited evidence is available of the inclusion of EE in teacher training programs. Waghid (2002) declares that the pressure on educational institutions to bridge the gap between them and societal requirements is rising. The best response to this pressure will be when educational institutions excel in community engagement by integrating teaching and research opportunities with knowledge production grounded in the context of real-world application. Such an opportunity occurred via the Ripple Effects global citizen science initiative in education (SciStarter 2021) and a South African National Research Foundation project that focused on education for sustainable development (ESD) with specific attention to citizen science and place-based education. As the lecturer of pre-service teachers at a South African university in the B Ed program in a Natural Science module, these combined initiatives provided me with an opportunity to promote ESD among my 4th year pre-service teachers and therefore address the lack in training opportunities in teacher education programs, as indicated by Reddy (2011).

Citizen science is defined as a process where community members, as novices, but with a keen interest in science, become actively involved in the collection of scientific data (Buytaert et al. 2014). Citizen scientists include concerned citizens, industries, academics, and community groups at local institutions who collaborate to monitor, track, and respond to environmental issues (Buytaert et al. 2014; Whitelaw et al. 2003).

Place-based education is a multidimensional concept that integrates the community in all

facets of learning, whereby learning becomes open and inviting (Powers 2004). Place-based education allows for cultural constructs, which may alter in time, and is displayed in three dimensions. These dimensions are as follows: (a) the personal or actor dimension, which is linked to specific memories or the symbolic meaning of experiences, such as a significant meeting or the accomplishment of a personal milestone; (b) the psychological process, which considers how individuals and groups interact with a place via emotional affiliation, cognition, or sense belonging and behaviour; and (c) the place dimension, which fosters social relations and collective identity or sense of community (Adams, Savahl, and Fattore 2017). Attachment to a place is expressed through action in the psychological and the place dimensions.

In this study, environmental awareness and ESD are regarded as the response of participants to environmental issues linked to their values, beliefs, and social system (Ham, Mrcela, and Horvat 2016). Environmental awareness can be linked to two approaches of people – ecocentric and anthropocentric. Ecocentric individuals support the intrinsic value of the natural environment, that is, they protect and value it for its own sake. Anthropocentric individuals support the protection and maintenance of the natural environment to improve the quality of human life (Gagnon Thompson and Barton 1994). Environmental behaviour follows environmental awareness. Pro-environmental behaviour can be predicted in attitudes towards the natural environment and indicates pro-environmental behaviour by action. It can, therefore, be concluded that environmental awareness constitutes a positive attitude towards the environment, also known as environmental responsibility and appropriate pro-environment behaviour (Ham et al. 2016).

In this research project, a reflective practice, following the photovoice methodology, was used to determine the ability of pre-service fourth-year Bachelor of Education (BEd) students, majoring in Natural Science, to act as citizen scientists linking place-based education to ESD. Photovoice was developed in the early 90s in China when women who lived in rural areas reported healthcare issues via photographs (Wang and Burris 1994). The diverse application of photovoice, which is regarded as both a research method and research technique, as well as a teaching and learning tool and even an assessment method (Haffejee 2021; Mulder and Dull 2014), made it suitable for the research project. Photovoice, as a data collection tool, demonstrate individual interpretation of a concept in a user-friendly and relatively cheap way to perform research (Jordaan and Pieterse 2020). As a participatory action research method, photovoice allows for a cooperative process in research and, therefore, the co-creation of knowledge (Haffejee 2021). The integration of more visual stimuli and processing, by using photovoice as a teaching and learning tool, allows for the fostering of creativity and the evaluation of personal expression. Reflection, as part of the research process, allows

participants to remember what they enjoyed, what they can change for the better, and what they learnt through the experience (Cook and Buck 2010; Fletcher and Cambre 2009). The reflective praxis of photovoice allows for insight into morals and viewpoints, which supports the exploration of the affective or emotional domain (Jordaan and Pieterse 2020) and, therefore, serves the purpose of promoting awareness of the environment and natural resources.

AIM OF THE STUDY

The aim of the study was to determine whether photovoice, as a participatory action research methodology, could enhance citizen science and place-based education in ESD with pre-service, fourth-year BEd teachers.

RESEARCH METHODOLOGY

Study design and theoretical framework

The project was conducted from an advocacy and participatory worldview (Creswell 2009). The multiple identities of the pre-service teachers were displayed by their choice of photographs and the meaning they related to these photographs in their experiences. Both the advocacy and the participatory worldviews support the focus of the participants on a real-world issue, namely the role of water in everyday life. This attention to ESD aids to empower them to engage in experiences about the role of water to promote a sustainable future.

This participatory action research study used the photovoice methodology in the project. Photovoice originated from three theoretical frameworks, namely empowerment education, the feminist theory, and documentary photography (Sutton-Brown 2014). This research study was attempted from two of these frameworks, namely empowerment education, in support of Freire's concept to promote experiential learning as part of a problem-based inquiry, and documentary photography. The choice of photographs and the reflection on the photographs that the pre-service teachers linked to it formed, in Freirean terms, the curriculum of the project. Empowerment education allows participants to unveil their own reality and to emerge with consciousness and critical intervention in their reality (Freire 1993, 62). The preservice teachers therefore had freedom of choice of which photographs to include and in reflection could indicate why they chose to include it. The process of reflection encouraged the pre-service teachers to critically analyse and collectively evaluate the role of water in their everyday lives (see Wang and Burris 1994). The documentary photographs displayed the social and mental wellness of both the pre-service teachers and the society of which they are part (see Wang and Burris 1994).

Photovoice methodology and data generation

Traditionally, photovoice participants meet face to face in a small group to receive training. Later, after taking photographs, the group members meet again and share their photographs and stories. Due to the global coronavirus disease (Covid-19) pandemic, an online photovoice methodology, developed by Tanhan (2020), and adjusted steps of documentary photography (Sutton-Brown 2014) were followed. The pre-service teachers were informed of their voluntary participation in the project during an online training meeting presented by an independent informant – a colleague of mine. The minutes of the training and guidelines were made available in written form to the students on the teaching and learning electronic platform of the higher education institution. The invitation to the project read as follows:

“Capture or include *at least five images of what water means to you* by taking pictures with your cell phone or accessing your photo albums.

Save the images on a small scale via JPG on your phone or computer.

Indicate where and when the images were taken, e.g., Vanderbijlpark, Sebokeng, Mswati Street 47, 27 April 2021.

Write a paragraph of 100 words on how taking and observing water-related images raise awareness of water as a valuable, natural resource.

Upload your photographs and narrative to Dropbox.”

At a time, suitable to the pre-service teachers, they took their photographs. They were allowed to use archived photographs as well. These archived photographs could be available in a personal photo album or in a gallery on a cell phone or made available to them by their parents or other family members.

The identity of each of the pre-service teachers, as linked to their photographs and interpretation, was only available to me and not shared with the other participants. This collection technique that was followed in the project had the following advantages for the pre-service teachers (see Tanhan 2020): they had enough time to share their photographs and experiences; the choice of photographs and experiences shared was anonymous, which allowed for a safe space to share their emotional experiences; they were allowed to use archived photographs in the time of the Covid-19 pandemic, as their health was regarded as important; the project was economically viable, as the pre-service teachers were allowed to use archived photographs as well as photographs taken with their cell phones or from the galleries of their phones.

Research context

The natural resource under consideration in the project was water. The higher institution of education at which the pre-service teachers received training is situated next to the second largest river in South Africa, the Vaal River. In the industrial hub of the Emfuleni Municipality, water is the most important communal commodity but also the weakest link when under threat (Janse van Rensburg 2021b). The inability of local authorities to manage water as a resource has been a daily battle for the past two decades. At this stage, the management of the Vaal River is regarded as a matter of national safety. The Vaal River catchment provides water to 19 million people (Janse van Rensburg 2021b). In June 2021, the minister of water and sanitation took control of water management in the Emfuleni Municipality. Reasons for the degradation of the river can be laid at the door of various role players in the immediate community. Wastewater spills in the river due to mining and industrial activities have been reported. A lack of wastewater treatment management and the poor attendance of the local municipality to systems in water management add to this Pandora's box (Janse van Rensburg 2021a). The participating pre-service teachers are, therefore, not only immediate observers but also a group that can potentially be most influential in future to respond with the powerful weapon of ESD to aid in education on clean water, which is a basic human right.

RECRUITMENT OF PARTICIPANTS

Purposeful and convenient recruitment techniques were used in the project. Pre-service teachers were informed during a non-compulsory Zoom meeting about the photovoice methodology. The inclusion requirements for the participants in this research were as follows: (a) BEd fourth-year Intermediate Phase pre-service teachers majoring in Natural Science at a specific higher education institution in South Africa; (b) who can take photographs with a cell phone or camera or have access to archived photographs in albums or cell phone galleries; (c) and who are able to communicate in written form in English about an experience. Twenty pre-service teachers voluntarily participated and took the lead in the research process. These participants were acknowledged as experts who could make decisions regarding the photographs and stories they wanted to share (see Sutton-Brown 2014).

DATA ANALYSIS

Wang (1999) proposes the SHOWeD technique to allow for the interpretation of photographs. I used the questions in the technique to guide my analysis of the collected photographs. The questions of the SHOWeD technique are: What do you see? What is really happening? How does this relate to our lives? Why does this situation, concern, or strength, exist? What can we

do about it?

I took into consideration that the pre-service teachers contextualised the photographs in their reality and had already analysed these individually by telling their unique stories. My intent was to allow the pre-service teachers to attribute to and explore their own experiences regarding water as a natural resource (see Sutton-Brown 2014). The steps suggested by Tesch (cited in Creswell 2009) directed my analysis of the written narratives. I read and interpreted each narrative and made a list of the themes that emerged. Similar themes were clustered and coded. Reflection on the data and topics allowed for categorising the themes. The following types of codes provided in Bogdan and Biklen's list (cited in Creswell 2009) were considered: setting and context codes; perspectives held by subjects; activity codes; and relationship codes.

ETHICAL CONSIDERATIONS

Permission for the photovoice project, which formed part of a National Research Foundation research initiative of the Environmental Education for Sustainable Development in the COMBER (Community-Based Educational Research) research entity, was granted by the Education, Management and Economic Sciences, Law, Theology, Engineering, and Natural Science Research Ethics Committee of the North-West University (NWU-00483-A2). The project complied with ethical guidelines concerning voluntary participation, respect for the rights of participants, and fairness in the selection and treatment of participants. Participation by the pre-service teachers was voluntary. Furthermore, the goal of the project and the potential benefits and harm resulting from the project were disclosed to the participants during a Zoom meeting. The participants signed consent forms that allowed me to use their photographs and reflective narratives for publication in an academic journal. In addition, the participants retained control over their photographs and were allowed to censor these to prevent their individual identities from being revealed.

FINDINGS AND DISCUSSION

Table 1 provides a summary of the photographs submitted by the pre-service teachers, which were analysed according to the SHOWeD technique. Eleven themes emerged from the photographs. The sequence of the SHOWeD steps allowed me to relate the themes to observation and interpretation in terms of my reality and experience in real life. Determining the observed scenario as a concern or strength and indicating what we can do about it promoted my higher thinking and classification skills.

Table 1: Photographs in the photovoice project in terms of the SHOWeD technique

What do you SEE here? (Theme)	What is really HAPPENING here?	How does this relate to OUR life?	WHY does this situation, concern, or strength exist?	What can we DO about it?	Number of photographs containing the theme	Type of code (Bogdan and Biklen as cited in Creswell 2009)
1 Water containers such as buckets, glasses, bath, toilet, tap, and shower	Water is used to hydrate and clean people	Hygiene and health	Strength: to maintain life and living Concern: people carrying buckets of water from rivers and taps	Ensure access to water of good quality – basic human right	15	Context
2 Water in nature like the sea, a farm dam, a river, a dam with flamingos, and water hyacinth	Water has a recreational purpose	Water enables people to relax and enjoy life	Strength: to revive Concern: run-off of fertiliser	Preserve water in natural settings	17	Context and relationship
3 Washing with water like clothes, use in a kitchen, cars, and animals (dogs)	Water is used to keep things clean	Water enables people to clean objects, therefore, have a healthy environment	Strength: to ensure hygiene	Continuous water supply to domestic areas assists in promoting health and cleanliness	9	Context
4 Children drinking water from a tap at school	Water hydrates the youth; pre-service teachers were at schools	Water is needed to live; professional development	Strength: to have access to running water in pipes and taps Attendance to work-integrated learning	Continuous water supply to maintain living EE in action	5	Context
5 Watering gardens, vegetable gardens, and animals (chicken, goats, cows) drinking water	Water hydrates plants and animals	Living things need water to live	Strength: to maintain living and food sustainability	Droughts have a severe impact on all living things – maintain water supply for agriculture	11	Activity
6 Polluted water sources	The impact of humans on water sources	Water pollution is a serious problem	Concern: valuable water sources that are polluted cannot be used	Prevent water pollution by recycling, reusing, and renewing	5	Context
7 Recreational activities, e.g. swimming	Recreational purpose of water; enjoyment by people	Exercising and relaxing in water promote a healthy body	Strength: sport and recreational activities	Maintain water sources (natural and artificial) to	15	Activity

What do you SEE here? (Theme)	What is really HAPPENING here?	How does this relate to OUR life?	WHY does this situation, concern, or strength exist?	What can we DO about it?	Number of photographs containing the theme	Type of code (Bogdan and Biklen as cited in Creswell 2009)
and fishing				promote healthy living		
8 Storage of water in tanks	Water is a scarce natural resource	Water is needed for life	Strength: indicate planning in water management	Management of water in communities	5	Context
9 Cooking with water	Water is used to prepare food	Eating or feeding	Concern: use of water	Maintain water supply to support feeding	3	Context and activity
10 Water leaks and sewage spills	Not preserving water; poor maintenance	Threat to health and sustainable living	Concern: loss of valuable resource	Report leaks and sewage spills to local authorities	11	Context
11 Spiritual use of water	Water heals and restores	Link experience or people and events to water	Strength: role of water in communities	Respect and acknowledge	3	Context and relationship

The analysis of photographs according to the SHOWeD technique revealed that photovoice allowed the pre-service teachers to create knowledge in a unique, individual way (see Fletcher and Cambre 2009). No two pre-service teachers' choice of photographs or their narratives were constructed in the same way. They displayed their experience of their view of water in diverse living conditions in local communities via their choice of photographs. Some of them shared photographs of themselves (selfies) and their family members drinking water, swimming in water sources, or washing clothes in various objects. Others shared tranquil water settings or the pollution or waste of water without any people visible in the photographs. This finding that the participants created knowledge in a unique and individual way agrees with Freire's (1993, 15) empowerment education and supports self-efficacy, as the participants had the freedom to create and construct and were active in and responsible for their learning and choice of objects to display in their photographs.

The intent of the research to collect scientific data, using novice data collectors who were regarded as citizen scientists, proved to be successful, as motivated by the first theme.

Theme 1: Confirmation of the pre-service teachers as citizen scientists

The high number of photographs linked to water sources in nature (Theme 3), the use of water to sustain plant and animal life (Theme 5), and the recreational use of water sources (Theme 5) supports non-commodity base monitoring of water sources, meaning that no economic gain was involved for the participants (see Fernandez-Gimenez, Ballard, and Strutevant 2008). This type of advocacy monitoring or bottom-up monitoring occurs when a group concentrates its efforts

on an area of concern in the hope to generate action and affect decision making. This finding agrees with Freire's (1993, 15) empowerment theory and indicates that the pre-service teachers performed a method of consciousness and, therefore, co-intentional knowledge production. Co-intentional knowledge production is regarded as the gain of knowledge of reality through common reflection, the narrative, action, the taking of photographs, and the writing of reflective notes. The pre-service teachers acknowledged in their interpretation of the meaning of water in their lives and, therefore, can be regarded as permanent re-creators of knowledge (see Freire 1993, 87).

The narratives of the pre-service teachers confirmed the value of citizen science to co-create environmental awareness. Pre-service teacher 17 explained that they could observe how water was used by humans and that the world would come to a halt without a supply of water. Pre-service teacher 16 mentioned that the photographs aided them with the realisation of the importance of water and why it should be kept clean. This participant said that "a picture is worth a thousand words". Pre-service teacher 14 indicated that the photovoice project allowed communities to raise awareness with local newspapers, which could then allow local governance to attend to the problem scenario. Pre-service teacher 3 stated that "taking and observing water-related images made me realise the importance and the benefits of having access to clean water". According to Pre-service teacher 10, the project is a valuable source of data to confirm the necessity of preserving and re-using water. The responses of the pre-service teachers in this theme support an eco-centric attitude towards the environment (see Gagnon Thompson and Barton 1994).

The second theme that emerged confirmed that ESD was context-based and confirmed the project as place-based education.

Theme 2: Acknowledgement of place-based education

Due to the Covid-19 pandemic, the implementation of the project by the pre-service teachers was off campus, at their place of residence with their families. The term *place* refers to a location, space, site, or environment to which people attach significance. A place is, therefore, regarded as a directly experienced and meaningful phenomenon in the real world (Kruger and Shannon 2010).

The photovoice project provided valuable detail such as that not all schoolrooms have walls, and that knowledge can be collected and interpreted in the context of the real world. Place-based education allows for learning in a wider social context that is dynamic and ever changing (Powers 2004). The inclusion of photographs, according to Themes 3, 4, 6, 8, 9, and 10, confirmed the project as place-based education. Photographs of water storage in tanks, the

supply of water to schools by means of taps, and learners drinking water were included by the pre-service teachers and indicated the link to their profession and the school grounds. Photographs 1 and 2 support the theme, showing learners drinking water from pipelines and the storage of water at schools.



Photograph 1: Water supply and drinking water at a school (Pre-service teacher 5)



Photograph 2: Storage of water in tanks at a school (Pre-service teacher 3)

The occurrence of place-based education in the project was confirmed by the pre-service teachers indicating their social relations and sense of identity. Responses such as “communities like where I am from where water pollution and sewage disposal issues have taken over” and “after taking and observing these images I have realised as a community we must make wise water choices” (Pre-service teacher 3) support the finding that place-based education took place. Some of the pre-service teachers mentioned their setting; for example, Pre-service teacher 4 said: “in Parys we have a big problem with water, we go up to three days struggling to get water from taps which leaves us with no choice but to go to water wells to collect water.”

In addition, Pre-service teacher 15 mentioned that “in the township of Alexandra, Johannesburg, there is a serious water crisis”.

Place-based education supported the pre-service teachers’ anthropocentric attitude and disposition, as well as their understanding of environmental issues (see Brandl, Alvarado, and Peltomaa 2019). This led to the third theme, namely the advancement of affective learning and the sharing of emotions.

Theme 3: Advancement of individual affective learning: sharing of emotions

A noticeable contribution was the raised awareness of the attitude and emotions of the participants regarding water. This finding links well with the psychological process of place-based education. A high number of the pre-service teachers’ photographs accentuated the recreational purpose of water (Photograph themes 2 and 7). Seventeen pre-service teachers included photographs of water in a natural setting, such as the sea, a river, a farm dam, or water as a carrier of water life, which include plants and animals. The recreational use of water, in activities such as swimming or fishing, was displayed in 15 photographs. These photographs were linked to positive emotions when the photographs were interpreted. The pre-service teachers showed how, with smiling faces, they (in selfie photographs), as well as other community members, participated in such activities. The recreational purpose of water, linked to the emotion of happiness, was accentuated by remarks such as “children like water, they will play in any water pool” and “water is life” (Pre-service teacher 19). Water serves as “a source of enjoyment” (Pre-service teacher 8). According to Pre-service teacher 18, water can be linked to each special moment in life. Water assists in connecting this participant to friends and family to make valuable memories. This finding supports the personal or actor dimension of place-based education, as specific memories and personal milestones were linked to water (see Adams et al. 2017).

Pre-service teacher 18 commented on the emotional effect of water by saying: “[Water] cleans my mind and gives me an opportunity to forget about life’s problems.” Other positive emotions were displayed by Pre-service teacher 19 who remarked: “I view water as being powerful yet gentle to creatures living in it.” Furthermore, Pre-service teacher 16 indicated that people swimming and children playing in water made her happy. Pre-service teacher 14 declared: “Water has a majestic element that makes it mesmerising to look at and admire. Water can be seen as a calming and relaxing mode of music when sounds crushing over the beach or children running, laughing, and playing in it.” This participant mentioned that the scattering of her grandfather’s ashes over a dam where he used to go fishing was a treasured memory. This interaction with place and water to display emotional and cognition attachment agrees with the

findings of Adams et al. (2017).

Some of the pre-service teachers also acknowledged negative emotions in the photovoice project. Pre-service teacher 17 realised that not all communities had access to an abundant supply of water. Pre-service teachers 4 and 6 concurred, stating that a shortage of water was the norm in their villages. According to these participants, villagers share their water source with animals, and the local municipality fails to provide them with running water. Living in a student village near campus made Pre-service teacher 4 come to the following realisation: “Some people do not value water because they do not know the struggle of not having water. In my community carrying a 20-litre bucket and pushing a wheelbarrow with laundry and scoops of water is part of our daily life.”

The pre-service teachers indicated their concern about the management of water and the loss of this valuable natural resource due to leakage and sewage spills in 11 photographs (Photograph theme 10). Pre-service teacher 17 pointed out: “Sewage runs in rivers, and fish and other animals died. Humans cannot use the river water anymore, and you cannot eat fish from such a river.” Pre-service teacher 16 supported this view and listed four water-related problems in their community, namely sewage, water pollution when people throw litter in the water, community members who had no or poor access to running water, and water leaks because of broken pipes. Pre-service teacher 15 reported on a water crisis in a township where the community disposed of their wastewater in the river and then used the same water for household cleaning and washing. Photograph 3 provides evidence in support of this statement.



Photograph 3: A woman pouring wastewater into a river running through an informal settlement (Pre-service teacher 15)

The revelations of the pre-service teachers indicated their realisation of the unique relationship of communities with water. This finding agrees with that of Moseley, Reinke, and Bookout (2003), who indicate that pre-service teachers need to have opportunities to interact in contexts such as those in which they intend to teach. The photovoice project provided an opportunity for such interaction. The pre-service teachers who displayed negative emotions and concern about water management had a shared, collective identity towards water and showed persistence and resilience to live under difficult conditions. They also revealed the psychological process of place-based education to be both emotional and cognitive (see Adams et al. 2017).

The pre-service teachers proposed possible actions to preserve and manage water because of environmental awareness in the final theme to be discussed.

Theme 4: Display environmental awareness by facing the truth

Freire (1993, 86) suggests that if participants display the ability to react with changed behaviour, they can face an overwhelming challenge presented to them and regard it as a true aspect. The pre-service teachers displayed the ability to identify challenging scenarios regarding water quality and use and proposed mitigation to meet those challenges. The anthropocentric approach to water, as a natural resource, was accentuated by this theme (see Gagnon Thompson and Barton 1994).

The photographs linked to Theme 1 (water in containers), Theme 3 (washing with water), Theme 6 (water pollution), Theme 8 (storage of water), and Theme 10 (water leaks and sewage spills) indicated that the pre-service teachers realised that water quality and supply were essential elements to secure communal activities and health. Pre-service teacher 20 declared that water was a precious and scarce resource that ensured survival in their community. Participation in the photovoice project allowed this participant to commit to making wise choices regarding the use and saving of water.

The storage of water in tanks, as shown in five photographs (Photograph theme 8), can be regarded as an indication of initiatives to manage and save water. Some of the pre-service teachers made suggestions on water saving and management and, thereby, displayed environmental awareness. The following valuable suggestions were made by the participants: Pre-service teacher 20 asserted that “we must learn to preserve our limited supply of water to keep it clean and free of contamination – this will ensure that future generations have access to clean water”. Pre-service teacher 19 pointed out that although one could not see the end of the sea, when standing on the shore, water was not in abundance. The participant added that “in South Africa not every household has access to clean drinking water running from a tap”. A commitment to managing water well was made by Pre-service teacher 18 who avowed: “I will

do my part in protecting this natural resource.”

Pre-service teachers 12 and 11 both revealed that water-related problems included inadequate maintenance of water pipes and the addition of chemicals that make water undrinkable. Cutting off the water supply over weekends results in communities not being able to perform house chores, according to Pre-service teacher 11. Moreover, this participant raised awareness that it was difficult to determine the person responsible for a specific problem with regard to water management; either an individual or the municipality can be responsible for poor maintenance such as using low-quality material to mend leaking pipes or using material that is corrosive. Water restrictions also have a negative impact on the ability of the community to plan. Some communities depend on river water for survival, which means that their human right of access to clean water is impeded (Pre-service teacher 11). Pre-service teacher 7 noted that local government did not timely respond to repair water leaks, while resilient efforts were made in their community to gain access to water. Pre-service teacher 4 revealed that people walked long distances to collect water and “some people even buy their own JoJo tanks and fill every container they have in their houses”.

The links between decent quality water and health and between poor-quality water and illness were accentuated by remarks such as “you can get illnesses from the polluted water” and “plants, animals and humans, all need water to survive” (Pre-service teacher 8). The availability of water for the survival of people was emphasised in responses such as “without water humans can simply not survive” (Pre-service teacher 16) and “the human body can’t go long without water” (Pre-service teacher 19).

The pre-service teachers indicated that the reflective narrative allowed them to go from word to work to action. Freire (1993, 68) explains that action, in this case the taking of photographs, and reflection on the action allow for the sacrifice of action, which is verbalism, or the narrative and the sacrifice of reflection is activism, the ability to act.

Pre-service teacher 2 displayed this sequence of action by pointing out that “a communal garden aids the community with homegrown and healthy vegetables” and “learners who [frequently] drink water function effectively in classrooms”. The ability to identify problem scenarios and take positive action was confirmed by Pre-service teacher 8, who said that people took water for granted and were selfish. These people “don’t think of how many people in the world need water; they only think about themselves” (Pre-service teacher 8). This participant expressed sorrow about the waste of water due to leaks, mismanagement, and belated attendance to repair jobs. Pre-service teacher 4 showed empathy with elder people who live on their own, as “going to water wells to collect water becomes difficult for them”. According to Pre-service teacher 15, the photographs indicate current water problems in communities and

can aid with reporting pipe leaks to the municipality.

CONCLUSION AND RECOMMENDATIONS

This project allowed pre-service teachers to identify vulnerabilities regarding water in their communities, as well as inequalities with respect to access to clean water. This facing of reality was not necessarily a comfortable experience but allowed for the application of learning in a real-world setting and an increase in critical thinking in a complex scenario (see Jordaan and Pieterse 2020). Acting as citizen scientists, the pre-service teachers made use of informed understanding to determine and interpret the way they regarded water in their communal context. They displayed the skills to choose, collect, interpret, and reflect on their view of water. Reflection allowed for the pre-service teachers to allocate personal meaning to and an increased gain in understanding the social-environmental importance of water (see Jordaan and Pieterse 2020). The project supported the idea that place-based education can be effective to engage pre-service teachers and promote focused learning in a real-life context (see Adams et al. 2017). Place-based education, such as this project, allows for the development of a positive attitude towards the environment, and the engagement thereof allows for agency awareness regarding water supply and management in communities (Brandl et al. 2019). The development of environmental awareness was displayed by the pre-service teachers in their sharing a variety of cognitive and affective expressions promoting a valid interpretation of photographs, a detailed report of experienced scenarios, and attempts to improve the use and management of water in communities. Despite the limitation of the short duration of the project (see Sutton-Brown 2014), the pre-service teachers utilised the opportunity by providing rich, descriptive data and progress in their development.

Photovoice proved to be suitable as a participatory action research method and a teaching, learning, and assessment tool to provide for creative, real-world learning. The photovoice skills and skills in reflexive practice gained by the pre-service teachers demonstrate that reflecting on visual images can be a powerful tool to negotiate learning and advance critical thinking in real-life learning contexts.

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