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TEACHER EDUCATION & DEVELOPMENT | RESEARCH ARTICLE

Self-efficacy: A South African case study on teachers' commitment to integrate climate change resilience into their teaching practices

Schalk Raath¹ and Anette Hay^{1*}

Abstract: A strong sense of self-efficacy in teachers has in many studies been consistently related to positive teaching behaviours and learner outcomes. This research reports on the differences among teachers regarding their self-efficacy and how this relates to their confidence and commitment to integrate climate change in their teaching practice. A questionnaire with the standardised scale of the Woolfolk “Teachers’ Sense of Efficacy Scale” was used to measure self-efficacy beliefs of participating teachers ($n = 25$). The quantitative data generated with the questionnaire were analysed using the SPSS statistical package and the Atlas-ti program was used to analyse the qualitative data. The findings showed that teachers with beliefs of greater self-efficacy were more willing and resilient to engage in a climate change project. It is recommended that besides the knowledge and skills component of teaching, teachers must be supported to reinforce their belief that they can contribute meaningfully to teaching and developing climate change resilience.

Subjects: Education & Training; Behavioral Sciences; Educational Psychology

Keywords: climate change resilience; self-efficacy beliefs; teaching practice; teacher efficacy scale

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PUBLIC INTEREST STATEMENT

Self-efficacy is a personal belief that one can perform in an appropriate and effective manner. It refers to the confidence that you have in your ability to teach effectively. This article shed light on teachers’ self-efficacy beliefs and how self-efficacy affects the efforts that they invest in their teaching, the goals that they set, as well as their level of ambition (drive). It has been said that teachers with greater self-efficacy beliefs are more open to new ideas and are more willing to experiment with new methods that could meet the needs of their students more efficiently. This article analyses this concept of “teachers’ self-efficacy belief” and how it relates to teachers’ confidence to teach about climate change within a South African context.

1. Introduction

A growing body of research on teachers' competencies has been focusing on educational and subject matter knowledge and skills (Jan Bent, Bakx, & den Brok, 2014). Gavora (2010, p. 18) mentions other teacher characteristics and/or competencies that could also be important in teaching. In this regard, Bandura (1997, p. 191) describes self-efficacy as a construct in his social constructive theory. Bandura (cited in Tschannen-Moran & Hoy, 2001, p. 743) defines self-efficacy as "a belief or judgment of his or her capabilities to bring about desired outcomes of learners engagement and learning". Self-efficacy is the personal belief that one can perform in an appropriate and effective manner. Teachers' self-efficacy beliefs therefore affect the efforts that they invest in their teaching, the goals that they set, as well as their level of ambition (drive). It has been said that teachers with greater self-efficacy beliefs are more open to new ideas and are more willing to experiment with new methods that could meet the needs of their students more efficiently (Gavora, 2010, p. 18). This article analyses this concept of "teachers' self-efficacy belief" and how it relates to teachers' confidence to teach about climate change within a South African context.

2. Problem statement

The South African Department of Education promotes environmental value education as a cross-curriculum approach that needs to be accommodated in all subjects offered at school and also in the training of student teachers. The aim is to transform learning and training by researching the integration of sustainability principles into all education and training environments (UNESCO, 2014, p. 12). An example of such a transformation in the learning and training environment was addressed by a project funded by the National Research Foundation (NRF) in South Africa, of which the aim was to develop Education for Sustainable Development (ESD) to empower selected in-service primary school teachers to implement climate change teaching. ESD is holistic and a transformational educational idea which addresses learning content and outcomes, pedagogy and the learning environment.

Three research areas have been identified for this proposed research project:

- Environmental management for sustainable development focuses on the incorporation of sound environmental management systems into the overall management of the school.
- Environmental issues and ESD in which the focus is on researching critical environmental issues such as climate change.
- The socio-environmental factors in sustainable development.

ESD is a holistic and transformational approach which integrates all three the research areas. This paper focuses mainly on the latter of the three. Climate change is a global phenomenon that has an effect on the economic, social and biophysical dimensions of the environment and is frequently mentioned in the media. Pruneau, Gravel, Bourque, and Langis (2003, p. 430) indicate that cause and effect (to name but one example) of climate change are misunderstood and for many it is a situation that will only manifest in the distant future.

It seems that for many teachers in South Africa education about climate change constitutes "new" knowledge, mainly because they did not receive much training in this regard. The above-mentioned NRF project aims to build capacity in teachers regarding this "new" knowledge and skills as well as with respect to their professional competence to teach this topic. Pre-service teacher training programmes have therefore been developed and the aim is to address the following issues: how to integrate new knowledge into the teaching environment, improving the management of their schools and curriculum, as well as the social environment of the school. Knowledge on climate change alone will, however, not guarantee that teachers will be able to teach this topic effectively.

Palmer (2006, p. 656) points out that teachers' behaviour in the classroom will be highly influenced by their "own perceptions of their ability to teach (efficacy expectations), as well as a belief that their teaching strategies would be effective (response-outcome)".

Self-efficacy belief is characterised in the literature as the major mediator for behaviour and behavioural change, given the description of teachers' self-efficacy as "... judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391). In the light of the above-mentioned views on self-efficacy belief, this research paper wants to investigate how the concept of "teachers' self-efficacy belief" is related to in-service teachers' confidence to teach about climate change.

The research question was:

What are the differences among in-service teachers regarding their self-efficacy and how do these differences relate to their confidence and commitment to participate in a project that is aimed at integrating climate change in their teaching practice?

The purpose of the research reported in this paper was to measure the differences in the efficacy beliefs of those in-service teachers who participated in a climate change resilience project and secondly, how this relates to their confidence to integrate climate change in their teaching practices.

The paper is structured as follows: firstly, a conceptual theoretical framework to outline the concepts to be researched is provided. Next, the empirical investigation is described to focus on the concepts to be used in the research design and methods, followed by the findings and discussions. The paper concludes with suggestions regarding teachers' self-efficacy beliefs and teachers' confidence to teach about climate change in a South African context.

3. Conceptual–theoretical framework

The approach of this case study is based on a constructivist paradigm. According to Gravett (2005, p. 151), constructivism is not a single theory but rather a collection of related views that evolve from the basic concept that learning is a process of constructing meaning from interaction with the world. Constructivist theory sees learning not only as an addition of information to existing knowledge but also as a reconstruction of what is already known; it is built upon the premise of a social construction of reality (Baxter & Jack, 2008, p. 545). Constructivist conception of learning assumes that knowledge is individually and socially constructed.

Many education managers believe that teachers are motivated when they express interest, feel excited and regard their teaching task as important and worthwhile. Almost all motivational research includes constructs related to "people's own beliefs about their capabilities to do a task" (Linnenbrink & Pintrich, 2003, p. 120). Bandura, who originally described the construct of self-efficacy, defines self-efficacy as the personal belief that one is capable of performing in an appropriate and effective manner to attain certain goals (Gavora, 2010, p. 18).

An understanding of the capabilities of teachers to perform in an appropriate and effective manner requires a distinction between teacher self-efficacy and teacher "competence", where the latter is usually understood as the teacher's professional knowledge and skills. Self-efficacy is a future-oriented belief about the level of competence a person expects he or she will display in a given situation (Bandura, 1997, p. 191). On the whole, self-efficacy relates to perseverance, which means the stronger the self-efficacy the greater the perseverance, and the greater the perseverance the greater the chances that teachers' behaviour will continue to improve. To put it differently: teacher self-efficacy is the belief that teachers have in their own abilities and skills as educators.

Palmer (2006, p. 655) refers to self-efficacy as a person's judgements about how well they can organise and execute courses of action—especially, when this embodies unpredictable and

ambiguous elements. Self-efficacy beliefs influence thought patterns and emotions which, in turn, enable or inhibit actions and is, according to Gavora (2010, p. 19), accurate predictors of performance. People with low self-efficacy about an activity will therefore tend to avoid that activity, whereas people with high self-efficacy will make vigorous and persistent efforts in their teaching and will consequently be more likely to complete the task successfully (Palmer, 2006, p. 656). Bandura (1997, p. 191) emphasises that self-efficacy is highly context-dependent, meaning that a person might, for example, have a high self-efficacy with respect to teaching languages and a low self-efficacy with respect to teaching science.

In the context of this study of primary school teachers in townships and rural communities, self-efficacy was a particularly important issue because it concerns a teacher's belief that he/she can, and probably will, teach in his/her unique context about climate change. Aspects such as overcrowded classrooms, extreme poverty in the community and single parent households create a unique context in which teachers have to operate which challenge their self-efficacy to teach. Zimmerman, Bandura, and Martinez-Pons (1992, p. 664) pointed out that perceived self-efficacy influences the level of goal challenge people set for themselves, the amount of effort they mobilise and their persistence in the face of these difficulties.

As previously mentioned, this case study is based on a constructivist paradigm. Constructivism is built upon the premise of a social construction of reality (Baxter & Jack, 2008, p. 545), whereby Johnson and Johnson's theory of social interdependence informs, as well as built upon the development of self-efficacy. Social interdependence is a result of people's persistence when the outcomes of individuals are affected by their own and others' actions (Johnson & Johnson, 2005, p. 286). Positive interdependence promotes interaction and confidence among members, while negative interdependence is seen as detracting from interaction among group members (Johnson & Johnson, 2005, p. 287). It has to be said that a willingness to take on difficult tasks and to persevere, despite difficulties, may be the outcome when goals are accomplished.

In addition, "cooperation tends to stimulate greater intrinsic motivation, higher expectations for success, higher incentive to achieve because of mutual benefit, higher epistemic curiosity and continuing interest in learning, and higher commitment to achieve" (Johnson & Johnson, 2005, p. 287). A lack of interest or social helplessness furthermore exists when neither the person nor others can influence goal achievement. A goal structure specifies the type of interdependence among individuals' goals (Johnson & Johnson, 2005, p. 287). The type of interdependence determines how teachers should be interacting in order to achieve their goals.

Johnson and Johnson (2005, p. 288) furthermore state that "it is within the interaction that the opportunity exists to (a) promote and facilitate the goal attainment of others or (b) obstruct and block others' goal attainment". Interaction is defined as individuals' simultaneous or sequential actions that affect the immediate and future outcomes of the other individuals involved in the situation. Interaction may be direct or indirect. Direct interaction takes place through such means as oral, written or electronic communication. Indirect interaction occurs when a person acts in a way that increases or decreases the other persons' chances for successful goal accomplishment without actual interaction taking place. In this regard, Card (2011, p. 188) refers to the dependence that individuals' outcomes have on the joint behavioural choices of all involved individuals. In other words, the primary school teachers in our case study are dependent not only on the behaviours they enact, but also on the responses of other teachers in their school and in workshops. Working in collaborative groups not only develops teachers' personal self-efficacy but also a resilience to integrate "new" knowledge in the curriculum.

Teacher resilience provides a way of understanding what enables teachers to persevere in the face of challenges (Beltman, Mansfield, & Price, 2011, p. 3), in this case study the teaching of climate change. Gu and Day (2007, p. 1304) describe the multidimensional approach of resilience as a psychological construct, which incorporates the study of personal factors, such as self-esteem,

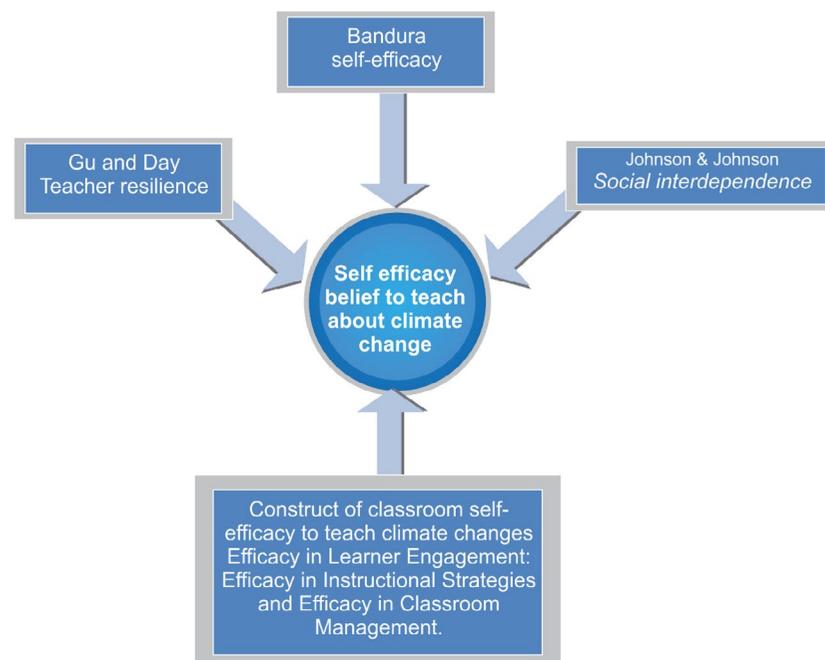
self-efficacy, motivation, resourcefulness and health. Stanford (2001, p. 75) summarises the multi-dimensional approach as if resilient teachers derived deep personal satisfaction from their work and relied on an extensive network of support involving their colleagues, family and friends. Gu and Day (2007, p. 1304) also highlight the notion that good teaching is charged with positive emotions. It is not just a matter of knowing one's subject, being efficient, having the correct competences, or learning all the right techniques. Good teachers are emotional, passionate beings who connect with their students and fill their work and their classes with pleasure, creativity, challenge and joy.

The nature of resilience is determined by the interaction between the internal assets of the teacher and the external environments in which the teacher lives and works (Gu & Day, 2007, p. 1314). Internal assets refer to teachers' confidence that they are able to implement efficient classroom management strategies, employ instructional strategies and can engage learners effectively. External aspects pertain to a school environment which includes support from colleagues and school management. Self-efficacy is an interactive process and a key component of resilience. While high self-efficacy is important for teacher resilience, self-efficacy could be enhanced as teachers encounter and overcome challenges of the learning environment in their unique context to teach (Beltman et al., 2011, p. 185).

The value of considering self-efficacy beliefs, interdependence and teacher resilience as theoretical perspectives can enhance and structure the study to focus on confidence among teachers to integrate new knowledge of climate change in their teaching.

The following empirical investigation was based on the insights flowing from this conceptual-theoretical framework. The constructs of Efficacy in Learner Engagement: Efficacy in Instructional Strategies and Efficacy in Classroom Management were identified as aspects that will influence teachers' self-efficacy belief (Figure 1).

Figure 1. Conceptual framework.



4. Empirical investigation

4.1. Research design and methods

An explanatory case study design (Yin, 1994) was chosen for this study to focus on teachers' self-efficacy beliefs to teach climate change in the context of schools in townships and rural communities in the Rustenburg area. For analysis a mixed methods approach was used with a structured questionnaire with closed- and open-ended questions (Tschannen-Moran & Hoy, 2001, p. 743).

The population of this case study were in-service teachers. Five schools were selected in the Rustenburg area of South Africa using a non-probability convenience sampling method (McMillan & Schumacher, 2006, p. 125). Non-probability sampling refers to a situation where the probability of including every element of the population in a sample is unknown. The participants in this study comprised out of 25 in-service Social Sciences teachers and school principals of the five schools. The in-service teachers were aged between 25 and 60 with varied levels of teaching experience.

In-service teachers did not receive training in climate change during their pre-service training. To support them to integrate this topic in the curriculum, several workshops were held to provide them with knowledge on climate change and an understanding of teaching methods that could be used, as well as to urge them to develop their self-efficacy beliefs so that they would be able to teach effectively on the topic. Group work activities implementing the interdependence theories that underpin the cooperative work of Johnson and Johnson (2005) were utilised in every workshop to strengthen teachers' self-efficacy beliefs, to stimulate greater intrinsic motivation and to build resilience to adapt to the unique circumstance of their schools. During the last workshop session, the teachers were asked to complete the adapted standardised questionnaire about self-efficacy belief (Tschannen-Moran & Hoy, 2001, p. 743).

Weather stations were established at all the schools in the form of a Stevenson screen. Each school received a wet and dry bulb and a maximum and minimum thermometer to be kept in the Stevenson screen as well as a rain gauge on a pole. The weather stations were erected taking into consideration the standardised conditions as prescribed by the South African Weather Bureau. The teachers divided learners into groups to record the readings on a daily basis during solar noon time. The schools also received a poster on which the readings could be displayed so that the wider school community could observe the documented weather data. The purpose of supplying these instruments to the schools was to involve the teachers and learners in the collection and interpretation of real weather data and then to compare that with averages over a 30-year period for the Rustenburg area, which information was also portrayed on the poster.

Ethical clearance for this study was provided by the Ethics Committee of the faculty of education at the university under whose auspices the study was undertaken.

To measure teacher efficacy beliefs the researchers used the long forms of the Teachers' Sense of Efficacy Scale (TES) (Tschannen-Moran & Hoy, 2001). To gather information regarding the research question a biographical section was added to the TES questionnaire. The questionnaire addressed the differences of teacher efficacy levels with respect to gender, experience and qualifications. Two open-ended questions were added to the questionnaire to collect data regarding the factors that decrease or increase teachers' confidence levels to teach on the topic of climate change. These questions were: "Please indicate two factors that decrease your confidence level to teach on the topic of climate change" and "Please indicate two factors that increase your confidence level to teach on the topic of climate change".

The TES includes two dimensions, namely the personal teaching efficacy and general teaching efficacy. Each item in the survey was linked to nine choices on a Likert scale. The items were scored 9–1 in which 9 was the most positive response and 1 was the most negative.

Generally, the questionnaire addressed three moderately correlated groupings or constructs: Efficacy in Learner Engagement: Efficacy in Instructional Strategies and Efficacy in Classroom Management.

The collected data were captured by the university’s statistical consultation service (South Africa) and analysed using the Statistical Package for Social Sciences (SPSS). Qualitative data gathered by means of the open-ended questions were analysed using the Atlas ti™ seven program.

Effect size measures the sizes of associations. Cohen provides rules of thumb for interpreting these effect sizes, suggesting that an r of $|0.1|$ represents a “small” effect size, $|0.3|$ represents a “medium” effect size and $|0.5|$ represents a “large” effect size.

The linear correlation coefficient measures the strength and the direction of a linear relationship between two variables. A correlation greater than 0.8 is generally described as strong, whereas a correlation less than 0.5 is generally described as weak.

Teachers’ Sense of Efficacy Scale is a standardised questionnaire (TES) (Tschannen-Moran & Hoy, 2001). This scale was adapted to accommodate the construct efficacy in climate change teaching.

To determine validity and reliability, Cronbach’s Alpha (α) quotient was used. An alpha quotient of >0.70 is acceptable as a sign of high internal consistency (Fraenkel & Wallen, 2010: G-2). As indicated in Table 1, Cronbach’s alpha value for all the aspects that were tested was above 0.70.

Data collection by means of the open-ended questions was organised by means of Atlas ti™ 7 and analysed by means of coding, categorising, and the identification of themes.

The descriptions in the open-ended questions were incorporated as primary documents into one heuristic unit in Atlas ti™ 7. The NCT (noticing, collecting and thinking) model was used for data analysis (Friese, 2012). Significant statements were noticed, codes were collected and thinking took place when codes were conceptualised into categories and themes, and links were made and described. During the analysis, the researchers continually returned to the data to derive their inner structure and meaning (Merriam, 2009). The “dependability” of the data was ensured by having multiple researchers independently code a set of data and then meet to come to consensus on the emerging codes and categories (Baxter & Jack, 2008, p. 556).

Table 1. The Cronbach alpha value

Aspects	Items	Cronbach’s alpha value
1. Efficacy in learner engagement	1, 2, 4, 6, 9, 12, 14, 22	0.816
2. Efficacy in instructional strategies	7, 10, 11, 17, 18, 20, 23, 24	0.865
3. Efficacy in classroom management	3, 5, 8, 13, 15, 16, 19, 21	0.752

5. Findings

Positive linear correlations shown in this case study is between age and self-efficacy and self-efficacy and the use of the Stevenson screen equipment as teaching media. Where age and the usage of the Stevenson screen are higher there is an increase in the teachers' self-efficacy level.

Negative correlations are indicated between level of education and self-efficacy levels. Where the education levels are lower the teachers' self-efficacy decreases.

The self-efficacy in classroom management of the case study was low, as shown by the effect size (0.43) relative to efficacy in instructional strategies (0.68) and efficacy in learner engagement (0.52) (Table 2).

The number of learners in the class also had a negative effect on the self-efficacy level regarding instruction of climate change (Table 3, (-0.112)).

The Sig. two-tailed level of 0.003 shows that there was a significant relationship between self-efficacy on teaching climate change and the use of the Stevenson screen's weather instruments as a teaching tool. The relationship is positive, which means that as one variable goes up or down, so will the other.

Analysis of the open-ended questions facilitated a more holistic understanding of the phenomenon of self-efficacy beliefs of teachers. In response to the open-ended question: "Please indicate two factors that decrease your confidence level to teach climate change", overcrowding of classrooms and a lack of resources were frequently mentioned. This led to a lack of interest in classroom-based activities and caused behavioural problems (i.e. learner discipline-related problems) in class (see Figure 2).

In response to the open-ended question: "Please indicate two factors that increase your confidence level to teach climate change" the teachers showed a strong appreciation for the workshop presentations that built on the interest that teachers and learners intuitively have for caring for the environment. This is associated and supported by the availability and use of instruments in the Stevenson screen. Some respondents remarked that this process of teaching and learning contributed to better engagement of learners, more positive school attendance as well as better parent involvement (see Figure 3).

Table 2. Self-efficacy according to gender

	Gender	N	Mean	Standard deviation	Standard error mean	Effect size
1. Efficacy in learner engagement	Male	12	7.0833	1.09276	0.31545	0.52
	Female	12	6.5167	0.93768	0.27068	
2. Efficacy in instructional strategies	Male	12	7.3185	0.85270	0.24615	0.68
	Female	12	6.3542	1.42804	0.41224	
3. Efficacy in classroom management	Male	12	7.4167	0.69563	0.20081	0.43
	Female	12	6.9097	1.17956	0.34051	
Efficacy total	Male	12	7.2728	0.77753	0.22445	0.64
	Female	12	6.5935	1.06955	0.30875	

Table 3. Variables of effective learner engagement, effective instruction strategies and effective class management

	1.1 Age	1.3 Education	1.4 Experience	1.5 Post	1.6 Stevenson	1.9 Integration	1.11 Number	Eff_learner_eng	Eff_instr_start	Eff_classman	Eff_total
Eff_learner_eng	0.262	-0.072	0.021	-0.023	0.356	0.071	0.105	1.000	0.618**	0.839**	0.877**
	Correlation coefficient										
	0.205	0.757	0.922	0.912	0.088	0.735	0.617		0.001	0.000	0.000
	Sig. (2-tailed)										
	25	21	25	25	24	25	25	25	25	25	25
Eff_instr_strat	0.052	0.082	-0.023	0.143	0.565**	0.110	-0.112	0.618**	1.000	0.743**	0.871**
	Correlation Coefficient										
	0.807	0.723	0.915	0.494	0.004	0.602	0.596	0.001		0.000	0.000
	Sig. (2-tailed)										
	25	21	25	25	24	25	25	25	25	25	25
Eff_class_man	0.276	-0.035	0.065	0.083	0.495*	0.135	0.050	0.839**	0.743**	1.000	0.910**
	Correlation Coefficient										
	0.182	0.879	0.757	0.694	0.014	0.521	0.814	0.000	0.000	0.000	0.000
	Sig. (2-tailed)										
	25	21	25	25	24	25	25	25	25	25	25
Eff_total	0.244	-0.037	0.089	0.107	0.572**	0.103	0.043	0.877**	0.871**	0.910**	1.000
	Correlation Coefficient										
	0.240	0.874	0.673	0.612	0.003	0.624	0.837	0.000	0.000	0.000	0.000
	Sig. (2-tailed)										
	25	21	25	25	24	25	25	25	25	25	25

Notes: *Italic values indicate linear correlation greater than 0.8 is generally described as strong. Correlation less than 0.5 is weak.*

****Correlation is significant at the 0.01 level (2-tailed).**

Figure 2. Factors that decreased confidence level to teach climate change.

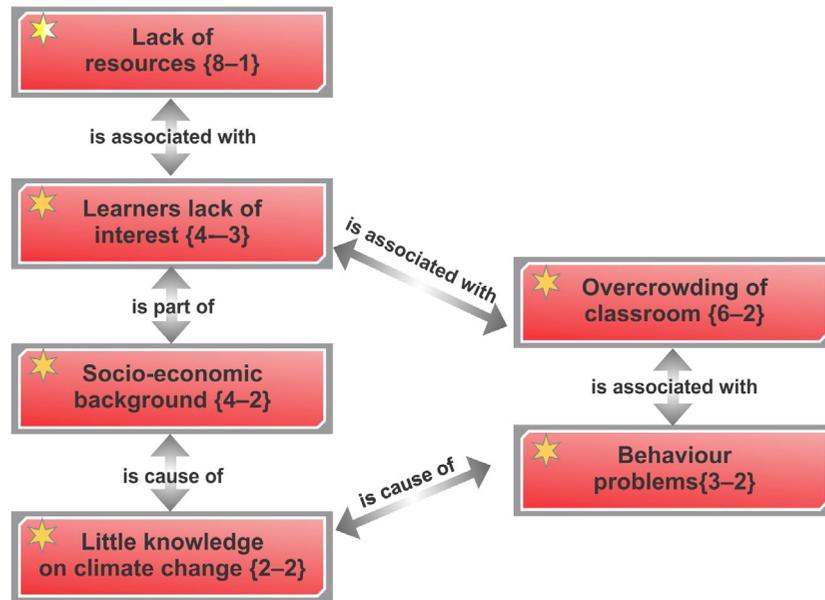
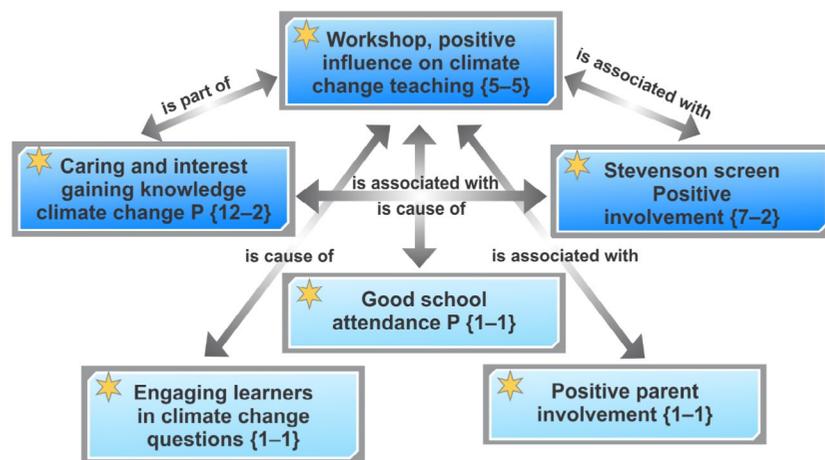


Figure 3. Factors that increase confidence level to teach climate change.



6. Discussion

Relationships between the proposed constructs that emerged as data were analysed. In-case study data from these multiple sources are then converged in the analysis process rather than handled individually. Each data source is one piece of the “puzzle”, with each piece contributing to the researcher’s understanding of the whole phenomenon. Although levels of efficacy are regarded as lying on a continuum, as opposed to representing a dichotomy, it is common to describe the characteristics of prototypical high- and low-effective teachers—that is, the characteristics of teachers who lie at the opposite ends of the continuum (Witcher et al., 2006).

The research question for the study was:

What are the differences among teachers regarding their self-efficacy and how do these differences relate to their confidence and commitment to participate in a project that is aimed at integrating climate change in their teaching practice?

In this regard, the study indicated that the participating teachers held a high self-efficacy belief that they could teach on climate change (0.68) (see Table 3). This indicates that the workshops, school visits and supporting newsletters did have a positive influence on the self-efficacy belief of teachers.

The self-efficacy belief regarding the management of the class showed a medium to low self-efficacy level among the teachers (0.43) (see Table 3). In the analysis of the open-ended questions, the overcrowding of classrooms was indicated as an aspect that negatively influenced the teachers' ability to teach effectively. Schools in the case study are located in the township areas of Rustenburg and the large number of learners in the classrooms is a phenomenon in all these schools. It is recommended that the education authorities should support schools in the provision of more classroom facilities to improve the quality of teaching.

Regarding gender, male teachers had a higher self-efficacy belief level to teach climate change (see Table 2). The older teachers showed a higher self-efficacy level to handle the new knowledge of climate change teaching (see Table 2). There was a negative correlation between teachers' qualifications and self-efficacy levels. Where the education levels were lower the teachers' self-efficacy was also lower. Palmer (2006, p. 656) comments that people with low self-efficacy may regard emotions such as stress, anxiety and fear to be responses to their own inadequacies, which might feed these negative emotions until they become overwhelming.

Bandura (1997) reviewed a number of studies on teacher behaviour and found that teachers who had a high sense of self-efficacy as well as a strong commitment to teaching, tended to regard learning problems as surmountable. They made extensive efforts to motivate students, devoted more class time to academic work, provided students with guidance and offered praise for their accomplishments and in general were associated with higher levels of student achievement. However, teachers with low self-efficacy spent less time on instruction, did not persevere when students experienced difficulties, had an authoritarian approach, made little effort to motivate students and had a weak commitment to teaching the subject matter. Teachers' self-efficacy beliefs may vary from subject to subject, therefore a teacher who is highly efficacious in an English lesson might not be as confident in a Science lesson (Palmer, 2006, p. 656).

Gu and Day (2007, p. 1314) point out that teachers' resilience to adapt in order to handle difficult situations is determined by the interaction between the teacher's internal assets (self-efficacy) and the external environments in which the teacher lives and works (efficacy in classroom management). They also indicate that the characteristics of resilient teachers can be acquired through appropriate training. Teachers' behaviour in classrooms would be highly influenced by their own perceptions of their ability to teach (efficacy expectations to engage the learners), as well as a belief that their teaching/instructional strategies would be effective (response-outcome expectancies) (Palmer, 2006, p. 656). The development of teachers' self-efficacy consistently interacts with their growth as effective teachers. As they experience success in their work, it builds their self-efficacy, which then leads to greater perseverance. It is essentially a dynamic, developmental process, of which the key characteristic seems to be resilience (Castro, Kelly, & Shih, 2009, p. 622; Gu & Day, 2007, p. 1312).

In the climate change workshops, knowledge as well as skills to present the topic were emphasised. The workshop was followed up with a "Sharing of best practices" workshop where teachers had the opportunity to learn from one another regarding the implementation of climate change teaching. In this regard, Palmer (2006, p. 656) points out that when people see competent models perform successfully, it encourages the belief that they would be able to master similar situations.

The researchers implemented this case study because they have an intrinsic interest in the subject of self-efficacy belief of teachers to teach climate change and are well aware of the fact that the results have limited transferability. It is, however, recommended that training with respect to the

topic of climate change teaching should be continued; resilience-building activities should include the teaching of social skills, assertiveness training, self-regulation and empathy. Teachers should continually be supported by means of newsletters and collaborative training sessions to inform them on research and best practices regarding climate change teaching.

7. Conclusion

As the sample size of this case study was small, it was not possible to generalise findings beyond the population of this particular case study. The importance of the dynamic process of developing self-efficacy and resilience in teachers to handle difficult situations through collaborative training was nevertheless re-emphasised and undoubtedly has pedagogical significance and link directly to the development of generic competencies that teachers must have. The provision and use of equipment in an experiential learning experience where learners are involved in the learning process and the positive influence this had on teachers' self-efficacy belief were also highlighted by this study. It does seem to have relevance for curriculum development efforts that endeavour to accommodate "new" knowledge such as climate change and evoke the kind of transformative learning envisaged by the school curriculum.

Further research is needed to determine other factors contributing to the level of teachers' self-efficacy as well as factors impacted upon the development of teachers' self-efficacy. Bandura (1997) mentioned other sources of efficacy expectations: mastery experiences, physiological and emotional state of teachers, social persuasion and vicarious experiences. These sources should be examined to investigate how they impact teachers' self-efficacy. Furthermore, to design school curriculums so that it can successfully impact teachers' self-efficacy.

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