Measuring dimensions of teacher resilience in Africa: Self-efficacy and teacher efficacy

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With this article we aimed to contribute evidence on reliable and valid measurement of teacher resilience in an under-researched African context and population. Scales from an existing instrument, ENTREE[i], were used to measure the resilience of pre-service teachers at a South African university. The sample constituted 1,193 final-year pre-service teachers (20–32 years), who completed the FIRE teacher resilience measure (2015 to 2017). Teacher resilience data were purposively selected from the FIRE dataset and items analysed related to self-efficacy and teacher efficacy beliefs. A quantitative approach was used, which consisted of reliability (internal consistency using Cronbach's alpha) and validity (construct validity using Spearman correlations) analyses of the teacher resilience scale and the teacher efficacy scale. The statistical analyses indicate that the FIRE teacher resilience measure is a reliable and valid measure for intrapersonal resilience-enabling pathways in a challenged context. The underlying variable structure of the teacher resilience scale and teacher efficacy scale held in a Global South setting when used with pre-service teachers. The article contributes to teacher resilience measurement discourse by providing insights into the utility of teacher resilience scales in South Africa. The results act as a precursor for comparative teacher resilience results worldwide for future studies.

Keywords: challenged context; ENTREE; Global South; pre-service teacher; quantitative; reliability; teacher resilience measure; validity

Introduction and Background
This article is based on the results of the FIRE study, Centre for the Study of Resilience (CSR), University of Pretoria (UP), South Africa. The CSR generates knowledge on resilience in a Global South space, with South Africa as exemplar. The FIRE project was implemented at a South African university between 2015 and 2017 with three cohorts of final-year pre-service teacher students between 20 and 32 years old. An adapted ENTREE measure (the FIRE teacher resilience measure) was used to measure the teacher students' resilience.

To quantify factors (including traits such as self-efficacy and teacher efficacy beliefs) influencing teachers' ability to resile despite the challenging profession is needed (Ainsworth & Oldfield, 2019). The paucity of teacher resilience measures (Beltman, Mansfield & Price, 2011; Peixoto, Silva, Pipa, Wosnitza & Mansfield, 2020) highlights the demand for robust teacher resilience scales for comparable results worldwide. Therefore, teacher resilience measurements require investigation (Beltman, Mansfield, Wosnitza, Weatherby-Fell & Broadley, 2018). This need for quantitative methodology in teacher resilience research is especially needed in Global South spaces, given the limited studies on resilience and pre-service teacher resilience (Mansfield, Beltman, Weatherby-Fell & Broadley, 2016; Peixoto et al., 2020) also in Africa (Bosch, 2020; Ebersöhn, Ferreira, Graham, Versfeld, Bosch, Seaworyeh & Tomlinson, 2020). In this study, therefore, we report on the piloting of ENTREE scales for pre-service teachers during the FIRE project. Reporting on the piloting of the scales was aimed to contribute to recommendations of the scales for the South African context.

Literature Review
Research on resilience, in particular psychological resilience, has a rich, replete, complex, and prolific history (Cassidy, 2015). Nonetheless, teacher resilience as a scholarly domain is an emergent research field. Literature highlights the limited empirical research on resilience in teachers (Beltman et al., 2011, 2018), markedly from a quantitative measurement perspective (Ainsworth & Oldfield, 2019). The lack of teacher resilience research is also evident in low- and middle-income countries[ii] with severely challenged contexts (Coetzee, Ebersöhn, Ferreira & Moen, 2017; Ebersöhn, 2014, 2016, 2017; Ebersöhn et al., 2020; Ngidi & Ngidi, 2019; Versfeld, Graham & Ebersöhn, 2023). Presently, South Africa is categorised by the World Bank as an upper-middle-income country (World Bank, 2023) with lower-income settings (Adam & Moodley, 2021). Therefore, within this research, South Africa was operationalised as a challenged context within a Global South setting denoting an emerging economy in transition, high adversity, and inequality as well as inherited structural disparity due to a post-colonial history (Ebersöhn, 2014, 2017).

The FIRE teacher resilience measure scales sampled for investigation in this study are the teacher resilience scale and the teacher efficacy scale. These scales were developed by Morgan (2011) and are grounded in the self-efficacy theory of Bandura (1997). Framed within Bandura's (1986) social cognitive theory (SCT),

the theoretical framework was used to gain insight into pre-service teachers' construction of reality regarding self-efficacy and teacher efficacy as protective resources enabling teacher resilience. The SCT underlines the notion that adaptation occurs in a reciprocal manner between the individual, ecology, and behaviour. The scales have been validated in other countries within the teaching landscape (Peixoto et al., 2020). As in this study, the teacher resilience and teacher efficacy scales were also used in studies in countries such as Australia (Beltman et al., 2018; Mansfield & Wosnitza, 2015), the Czech Republic (Wosnitza, Delzepich, Schwarze, O'Donnell, Faust & Camilleri, 2018), Germany (Peixoto et al., 2018; Wosnitza et al., 2018), Ireland (Morgan, 2011; Peixoto et al., 2018; Wosnitza et al., 2018), Malta (Peixoto et al., 2018; Wosnitza et al., 2018) and Portugal (Peixoto et al., 2018, 2020; Wosnitza et al., 2018). Results from studies applying similar ENTREE (Beltman et al., 2018; Peixoto et al., 2018; Wosnitza et al., 2018) and factors influencing teaching (FIT)-choice[iii] (Watt & Richardson, 2007, 2008, 2012; Watt et al., 2012) scales show the importance of pre-service teachers' confidence in both recovery from setbacks, and teaching and behaviour management.

It was found that confidence in recovery from setbacks (Beltman et al., 2018; Morgan, 2011; Peixoto et al., 2018, 2020; Wosnitza et al., 2018) and confidence in teaching and behaviour management (Beltman et al., 2018; Morgan, 2011; Peixoto et al., 2018, 2020; Wosnitza et al., 2018) were strong contributors to teacher resilience. In Ireland and Germany, teacher efficacy was the strongest significant predictor for teacher recovery from setbacks in comparison with social, emotional, professional, and motivational capacities (Peixoto et al., 2018). A recent South African study (Ebersöhn et al., 2020), applying similar FIRE scales, also highlights recovery from setbacks (high reliability) and teaching and behaviour management abilities (high reliability) as

important resilience traits for teachers in a challenged context. Furthermore, the reliability analysis of the relevant ENTREE scales in previous international studies (Beltman et al., 2018; Peixoto et al., 2018; Wosnitza et al., 2018) was higher (ranging from high reliability to excellent reliability) than the social, emotional, professional, and motivational measurement scales. However, to date, reliability, and validity studies for these scales with pre-service teachers in a Global South, African context is limited. The questionnaire has not been used with pre-service teachers on a large scale in South Africa but has been employed in a recent South African study with teachers in a challenged context (Bosch, 2020; Ebersöhn et al., 2020). Measuring dimensions of teacher resilience (e.g., self-efficacy and teacher efficacy), especially regarding pre-service teachers in Africa seems pertinent. Quantifying factors influencing teachers' ability to resile in a Global South context is needed given the emergent teacher resilience field, the lack of robust resilience measures and limited research on resilience in pre-service teachers (Beltman et al., 2011; Mansfield et al., 2016; Morgan, 2011).

The teacher resilience measure was employed at multiple cross-sectional (2015, 2016 and 2017) points with final-year pre-service teachers at a South African university to determine whether similar, different, or complementary results would be obtained. Therefore, we aimed at establishing the reliability and validity of the teacher resilience scale and the teacher efficacy scale (i.e., self-efficacy and teacher efficacy), within a challenged context.

Method
Participants
In this study we used previously collected data generated in the FIRE project, which, besides the FIRE teacher resilience measure, the FIRE dataset also included demographic information (i.e., age, gender, teaching phase and language), which is summarised in Table 1.

Table 1 Overview (statistics) of demographic information of extant data

Year		2015	2016	2017	Total
Descriptors					
Total questionnaires completed by final-year pre-service teachers [n, (%)]		313 (26.2%)	169 (14.2%)	711 (59.6%)	1,193 (100%)
Age between (years)		21–30	20–29	20–32	20–32
Gender	Gender male (indicated)	61 (19.5%)	21 (12.4%)	141 (19.8%)	223 (18.7%)
	Gender female (indicated)	250 (79.9%)	140 (82.8%)	539 (75.8%)	929 (77.9%)
Languages fluent in[iv] [n, (%)]	Afrikaans	200 (63.9%)	98 (58.0%)	327 (46.0%)	625 (52.4%)
	English	297 (94.9%)	153 (90.5%)	653 (97.8%)	1,103 (92.5%)
	isiNdebele	18 (5.8%)	5 (3.0%)	32 (4.5%)	55 (4.6%)
	isiXhosa	8 (2.6%)	1 (0.6%)	30 (4.2%)	39 (3.3%)
	isiZulu	75 (24.0%)	21 (12.4%)	197 (27.7%)	293 (24.6%)
	Sepedi	34 (10.9%)	14 (8.3%)	113 (15.9%)	161 (13.5%)
	Sesotho	20 (6.4%)	4 (2.4%)	58 (8.2%)	82 (6.9%)
	Setswana	29 (9.3%)	8 (4.7%)	80 (11.3%)	117 (9.8%)
	siSwati	20 (6.4%)	3 (1.8%)	56 (7.9%)	79 (6.6%)
	Tshivenda	3 (1.0%)	0 (0.0%)	7 (1.0%)	10 (0.8%)
	Xitsonga	5 (1.6%)	2 (1.2%)	18 (2.5%)	25 (2.1%)
	Other	7 (2.2%)	8 (4.7%)	19 (2.7%)	34 (2.8%)
Enrolled pre-service teaching programmes [n, (%)]	Foundation Phase (FP)/Early Childhood Development (ECD)	105 (33.5%)	45 (26.6%)	161 (22.6%)	311 (26.1%)
	Intermediate Phase (IP)	32 (10.2%)	17 (10.1%)	108 (15.2%)	157 (13.2%)
	Senior Phase (SP)	30 (9.6%)	14 (8.3%)	57 (8.0%)	101 (8.5%)
	Further Education and Training (FET) Phase	110 (35.1%)	60 (35.5%)	266 (37.4%)	436 (36.5%)
	Not specified/Other	25 (8.0%)	20 (11.8%)	91 (12.8%)	136 (11.4%)

The sample of pre-service teachers in this study was $N = 1,193$ between the ages of 20 and 32 years old, with 77.9% and 18.7% indicating their gender as female and male, with 3.4% not answering the question on gender identity. Respondents could indicate numerous languages in the demographic question pertaining to language fluency since it was an open-ended question. Since July 2023, South Africa has 12 official languages, with South African sign language being officially acknowledged as the 12th official language (Statistics South Africa [Stats SA], 2023), with most of the South African population speaking at least two of the official languages (Department of Basic Education [DBE], Republic of South Africa [RSA], 2021). However, since the data were collected before July 2023, South African sign language was not included as a response option in the questionnaire and, accordingly, is not reported on in Table 1. Based on the data collected, English (92.5%) was indicated as the language that most final-year pre-service teachers felt proficient in, with Tshivenda (0.8%) being the smallest group regarding language fluency. With regard to the enrolled pre-service teaching training programmes[v], the largest group of respondents was enrolled for the FET teacher training programme (36.5%).

Sampling
Respondents in the initial FIRE project were purposely sampled with elements of convenience (UP, 2015) based on the research design of the FIRE project. For this study, we purposively selected (Cohen, Manion & Morrison, 2018) teacher resilience data from the FIRE dataset and analysed items related to self-efficacy and teacher efficacy beliefs.

Measurement and Scales

The FIRE teacher resilience measure was piloted as one of the baseline data generation questionnaires in the FIRE project. This questionnaire (structured, self-report pen-and-paper questionnaire) includes items from the measures used in the FIT-choice scale (Watt & Richardson, 2007, 2008, 2012; Watt et al., 2012), the ENTREE project (Mansfield & Wosnitza, 2015; Peixoto et al., 2018; Wosnitza et al., 2014) and contextual resilience questions (Coetzee, 2013). The contextual resilience questions were included for adaptation of the ENTREE scales given the South African context.[vi] Respondents rated their responses to questions on a seven-point Likert scale ranging from 1 (i.e., do not agree at all or absolutely not confident) to 7 (i.e., strongly agree or strongly confident).

Based on the literature review, we opted for a focus on self-efficacy (i.e., recovery from setbacks) and teacher efficacy (i.e., teaching and behaviour management) as intrapersonal resilience-enabling pathways to teacher resilience. Self-efficacy was operationalised as the confidence that final-year pre-service teachers demonstrate in recovery from setbacks in a school setting (Morgan, 2011), as depicted by the item indicators displayed in Table 2. Options on the Likert scale were ordinal: 1 = absolutely not confident to 7 = strongly confident.

Table 2 FIRE teacher resilience measure: self-efficacy (resilience) of pre-service teachers (adapted from Mansfield & Wosnitza, 2015; Peixoto et al., 2018; Wosnitza et al., 2014)

Self-efficacy (Resilience)	
Measure	Item
"How confident are pre-service teachers to deal with setbacks in school?"	Getting over setbacks in school
	Bouncing back, when things upset me
	Carrying on with my school work when things go wrong
	Carrying on in school when events upset me
	Feeling certain that things will come right even if there are serious problems in school
	Managing negative events in school when I try
	Coping with most problems on any school day
	Some negative things that have happened in school have made me better able to deal with problems
	Not getting disheartened even when children's circumstances make it difficult

Table 2 presents the self-efficacy (i.e., confidence in recovery from setbacks) variables measured by the teacher resilience scale from the FIRE teacher resilience measure. These variables may have a likely relationship with teacher resilience and are included here for analysis purposes.

As with self-efficacy (i.e., confidence in recovery from setbacks), teacher efficacy is an intrapersonal resilience-enabling pathway to teacher resilience. Therefore, the presence or absence of teacher efficacy may enable or constrain resilience. Teacher efficacy is not an objective measure of actual competence. Rather, it is the self-perceived belief that teachers demonstrate in their skills to accomplish a particular teaching task (Raath & Hay, 2016). Therefore, teacher efficacy is a teachers' context-specific judgement or belief on how they will adapt, given the acquired skills or situation, to effectively accomplish a particular teaching task (Bandura, 1997). For this study, teacher efficacy denotes final-year pre-service teachers' confidence in teaching and behaviour management in a challenged context. Item indicators are displayed in Table 3.

Table 3 FIRE teacher resilience measure: teacher efficacy of pre-service teachers (adapted from Mansfield & Wosnitza, 2015; Peixoto et al., 2018; Wosnitza et al., 2014)

Teacher efficacy (TeachEff)	
Measure	Item
"Teacher efficacy for teaching"	Teaching all the subjects on the curriculum effectively
	Explaining difficult material in ways that the children will understand
	Suggesting suitable examples when the children are having difficulty understanding
	Teaching in a way that my students[vii] will remember important information
	Applying the new developments in the curriculum into my teaching
	Helping children focus on learning tasks and avoid distractions
"Teacher efficacy for behaviour management"	Managing inappropriate behaviour
	Encouraging students to take responsibility for their behaviour
	Dealing with the diverse learning needs of the students in my class
	Teaching students positive behaviour
	Providing students with clear specific behaviour expectations
	Communicating effectively with parents

Table 3 presents the teacher efficacy variables (measured by the teacher efficacy scale) from the FIRE teacher resilience measure. These variables, which may have a likely relationship with teacher efficacy, are included here for analysis purposes (i.e., Likert scale: 1 = absolutely not confident to 7 = strongly confident).

Selection of FIRE Teacher Resilience Measure Variables for Analysis

For this study, we purposively included two variables, self-efficacy, and teacher efficacy. We excluded additional FIRE teacher resilience measure variables (i.e., teacher professional, teacher emotions, teacher motivation and teacher social capacities included in 2015–2017). Given the literature review, we wanted to foreground variables denoting pre-service teachers' confidence to both recover from setbacks, as well as in their teaching and behaviour management, given a challenged context. Table 4 provides an overview of the selected variables from the FIRE teacher resilience measure for this study. Instead of using all constructs[viii] available on the FIRE teacher resilience measure, only a selection of variables (i.e., self-efficacy and teacher efficacy beliefs) related to the purpose of the study were selected for analysis given the set parameters.

Table 4 Key outcome measures assessing levels of self-efficacy and teacher efficacy beliefs of pre-service teachers within the current study

Variable name	Question index on the measure[ix]	Number of items	Response type and options	Example item	Origin of scale	Developed by
Self-efficacy[x]	Questions 114–122	9	Likert scale 1 = "absolutely not confident" to 7 = "strongly confident"	Getting over setbacks in school; bouncing back when things upset met	Teacher resilience scale	Morgan (2011)
Teacher efficacy	Questions 123–134	12		Teaching all the subjects on the curriculum effectively	Teacher efficacy scale	Morgan (2011); Peixoto et al. (2018)

The teacher resilience scale (Questions 114–122) appraises, as operationalised in this study, self-efficacy factors (ordinal data) (see Table 2) while the teacher efficacy scale (Questions 123–134) measures general teacher efficacy factors (ordinal data) (see Table 3).

Internal Consistency and Reliability Analysis

The reliability of a measurement instrument (such as questionnaires) relates to the ability of the instrument to measure a construct in a consistent (Creswell & Creswell, 2018; Gravetter & Forzano, 2018) and repeatable manner (Creswell & Creswell, 2018) with the required precision (Widaman, Little, Preacher & Sawalani, 2011).

The generally agreed-upon lower limit for Cronbach's alpha is .70, although some researchers advocate that a value as low as .60 is acceptable in general (Daud, Khidzir, Ismail & Abdullah, 2018; Zhan, Wei & Hong, 2021), and in social sciences (Ghazali, 2008). However, a limitation when employing Cronbach's alpha is the possibility of overestimating internal consistency due to the number of items (López, Valenzuela, Nussbaum & Tsai, 2015; Widaman et al., 2011). Adding items increases Cronbach's alpha (López et al., 2015), meaning that Cronbach's alpha can be artificially enhanced by simply adding more redundant items to the scale. The latter has caused researchers to caution that Cronbach's alpha values above .90 are not recommended, as a value that is too high may suggest redundant items (Tavakol & Dennick, 2011).

The reliability of the FIRE teacher resilience measure (including the teacher resilience scale and the teacher efficacy scale) has been confirmed in previous studies (e.g., Morgan, 2011; Peixoto et al., 2018, 2020; Wosnitza et al., 2018) with a Cronbach's alpha ranging from .67 to .91. Table 5 provides an overview of the reliability analyses of previous studies for the scales used in our study.

Table 5 Reliability of scales

		Cronbach's alpha				
Variable	Origin of scale	Beltman et al. (2018)	Morgan (2011)	Peixoto et al. (2018)	Peixoto et al. (2020)	Wosnitza et al. (2018)
Self-efficacy	Teacher resilience scale (Morgan, 2011)	.93	.91	.89	.93	.87 .92 .86 .94 .90
Teacher efficacy	Teacher efficacy scale (Teaching) (Morgan, 2011)	.94	.88	.82	N.A.	.86 .93 .85
	Teacher efficacy scale (Behaviour management) (Peixoto et al., 2018)		N.A.	.81	N.A.	.93 .88

As indicated previously, we foregrounded sections of the FIRE teacher resilience measure on self-efficacy[xi] and teacher efficacy, which indicates high satisfactory reliability on the original scales (i.e., Cronbach's alpha = .91 and Cronbach's alpha = .88, respectively) developed by Morgan (2011). Further studies (Beltman et al., 2018; Peixoto et al., 2018, 2020; Wosnitza et al., 2018) in numerous countries (Australia, the Czech Republic, Germany, Ireland, Malta, and Portugal) have demonstrated excellent reliability (Cronbach's alpha > = .90) to high reliability (.80 < = Cronbach's alpha < .90) for the scales as displayed in Table 5. Although, as mentioned earlier, researchers caution that Cronbach's alpha values above .90 is not recommended, as a value that is too high may suggest redundant items (Tavakol & Dennick, 2011). Thus, the studies with Cronbach's alpha coefficients above .90 indicate that some items might be redundant, and we intended to explore this concept of redundant items on the scale(s) in this study. When a Cronbach's alpha value is above .90, correlations are explored to assist with identifying redundant items. If the Cronbach's alpha value is above .90, and two items correlate strongly, then one of them may be redundant. In this study, the latter is also considered regarding the internal consistency of the scales.

Validity Analysis
Validity may imply that a sound instrument assesses what it claims or intends to measure (Cohen et al., 2018; Creswell & Creswell, 2018),

which is essential. In our study, the validity of the FIRE teacher resilience measure was derived from its intent to assess what the instrument was supposed to measure, in other words, the self-efficacy and teacher efficacy beliefs of final-year pre-service teachers. The validity of an instrument is especially important in cases where a hypothetical construct is measured using an operational definition (Gravetter & Forzano, 2018). Validity is determined by establishing whether data had been collected and reported on with care and meticulousness, warranting interpretations (Struwig & Stead, 2013).

Convergent and discriminant validity are subcategories of construct validity, and if one has evidence of both, construct validity has been established (Garson, 2013). For convergent validity, items loading on the same construct should correlate strongly and, for discriminant validity, items loading on different constructs should correlate less strongly than items loading on the same constructs.

Results
In this section we discuss the quality criteria measures of the FIRE teacher resilience measure for this study.

Quality Criteria: Reliability
The reliability of the FIRE teacher resilience measure has been confirmed by previous studies (see Table 5). Cronbach's alpha values for the study were calculated and are presented in Table 6.

Table 6 Reliability analysis for the teacher resilience and teacher efficacy scales

FIRE teacher resilience measure scales	Cronbach's alpha	Items
Teacher resilience scale	.874	9
Teacher efficacy scale	.914	12

Table 6 indicates that the teacher resilience scale (Cronbach's alpha = .874) and the teacher efficacy scale (Cronbach's alpha = .914) had satisfactory reliability for our study. This reliability analysis concurs with results from previous studies (Beltman et al., 2018; Morgan, 2011; Peixoto et al., 2018, 2020; Wosnitza et al., 2018). Therefore,

based on the results displayed in Table 6, it may be concluded that the scales were appropriate and reliable for measuring pre-service teachers' confidence in recovery from setbacks (i.e., self-efficacy) and confidence in teaching and behaviour management (i.e., teacher efficacy). However, a high alpha value (> .90), indicated for the teacher

efficacy scale (i.e., Cronbach's alpha = .914) may imply redundancies and indicate that the length of a measure should be revised (Tavakol & Dennick, 2011). Therefore, Cronbach's alpha values were calculated for each question of the teacher efficacy scale to investigate possible unnecessary questions (see Table 7).

Table 7 Reliability analysis for the teacher efficacy scale questions

Cronbach's alpha		Number of questions		
.914		12		
		Item-total statistics		
Questions	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted[xii]
TE1: Teaching all the subjects on the curriculum effectively	65.21	66.341	.566	.9114
TE2: Explaining difficult material in ways that the children will understand	64.86	66.925	.679	.9053
TE3: Suggesting suitable examples when the children are having difficulty understanding	64.82	67.356	.668	.9058
TE4: Teaching in a way that my students will remember important information	64.73	66.995	.722	.9037
TE5: Applying the new developments in the curriculum into my teaching	65.08	67.222	.685	.9051
TE6: Helping children focus on learning tasks and avoid distractions	65.07	67.359	.681	.9053
TE7: Managing inappropriate behaviour	65.15	66.745	.614	.9083
TE8: Encouraging students to take responsibility for their behaviour	64.85	66.771	.714	.9039
TE9: Dealing with the diverse learning needs of the students in my class	64.96	67.055	.686	.9050
TE10: Teaching students positive behaviour	64.67	67.003	.719	.9038
TE11: Providing students with clear specific behaviour expectations	64.83	67.002	.703	.9044
TE12: Communicating effectively with parents	65.36	65.702	.523	.9156

The content of Table 7 shows that when item TE4, "Teaching in a way that my students will remember important information", was removed from the teacher efficacy scale, the Cronbach's alpha value dropped the lowest (.9037), but it was still above .90 (> .90). Accordingly, item TE4 was removed, and the results are shown in Table 8.

Table 8 Reliability analysis for the teacher efficacy scale with TE4 (Question 126) removed

Cronbach's alpha		Number of questions		
.904		11		
		Item-total statistics		
Questions	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
TE1: Teaching all the subjects on the curriculum effectively	59.07	55.305	.565	.9003
TE2: Explaining difficult material in ways that the children will understand	58.72	56.132	.659	.8940
TE3: Suggesting suitable examples when the children are having difficulty understanding	58.68	56.619	.641	.8950
TE5: Applying the new developments in the curriculum into my teaching	58.93	56.258	.675	.8933
TE6: Helping children focus on learning tasks and avoid distractions	58.93	56.310	.677	.8932
TE7: Managing inappropriate behaviour	59.00	55.630	.617	.8964
TE8: Encouraging students to take responsibility for their behaviour	58.71	55.738	.713	.8913
TE9: Dealing with the diverse learning needs of the students in my class	58.81	55.937	.689	.8925
TE10: Teaching students positive behaviour	58.52	55.958	.718	.8912
TE11: Providing students with clear specific behaviour expectations	58.68	55.926	.703	.8919
TE12: Communicating effectively with parents	59.21	54.615	.527	.9049

From the data in Table 8, it appears that removing items TE4 ("Teaching in a way that my students will remember important information") and TE7 ("Managing inappropriate behaviour") from the teacher efficacy scale, the Cronbach's alpha value was reduced from .914 to .896. Spearman correlation coefficients (Field, 2018) were employed to investigate the possible correlation between TE4, TE7, and the rest of the items on the scale (see Table 9).

Table 9 Correlation between TE4 ("Teaching in a way that my students will remember important information") and other items on the teacher efficacy scale

		TE4: Teaching in a way that my students will remember important information	TE7: Managing inappropriate behaviour
TE1: Teaching all the subjects on the curriculum effectively	r_s	.406*	.327*
	n	1,174	1,166
TE2: Explaining difficult material in ways that the children will understand	r_s	.589*	.353*
	n	1,166	1,158
TE3: Suggesting suitable examples when the children are having difficulty understanding	r_s	.622*	.310*
	n	1,180	1,172
TE4: Teaching in a way that my students will remember important information	r_s	1.000	.363*
	n	N/A	1,173
TE5: Applying the new developments in the curriculum into my teaching	r_s	.531*	.358*
	n	1,179	1,172
TE6: Helping children focus on learning tasks and avoid distractions	r_s	.477*	.462*
	n	1,179	1,172
TE7: Managing inappropriate behaviour	r_s	.363*	1.000
	n	1,173	N/A
TE8: Encouraging students to take responsibility for their behaviour	r_s	.431*	.540*
	n	1,176	1,169
TE9: Dealing with the diverse learning needs of the students in my class	r_s	.433*	.409*
	n	1,177	1,170
TE10: Teaching students positive behaviour	r_s	.457*	.442*
	n	1,171	1,166
TE11: Providing students with clear specific behaviour expectations	r_s	.441*	.454*
	n	1,181	1,174
TE12: Communicating effectively with parents	r_s	.326*	.362*
	n	1,164	1,157

Note. *$p < .001$.

Table 9 demonstrates that TE4 correlates statistically significantly with all the other items (*p*-value < .001). The Spearman correlations ranged from .326 to .622. The strongest positive correlation was between TE4 ("Teaching in a way that my students will remember important information") and item TE3 ("Suggesting suitable examples when the children are having difficulty understanding"*)* with a Spearman correlation coefficient of .622.

Given the correlation between items TE4 and TE3, one may consider to remove one of the questions to reduce redundancy. Literature on teacher efficacy demonstrates the facilitation of the learning process as well as engagement to bring about preferred learning outcomes even among challenging learners (Bandura, 1997; Moulding, Stewart & Dunmeyer, 2014). Furthermore, according to research (Hewitt, Buxton & Thomas, 2017; Organisation for Economic Co-operation and Development [OECD], 2019), teacher efficacy comprises different but related capacities or factors, including engaging learners (e.g., teaching in a way that learners will remember information) and using different instructional strategies (e.g., suitable examples). Teachers with a high perception of self-efficacy appear to anticipate success in the classroom even if learners have difficulty understanding (Bandura, 1997). In addition, teachers with beliefs of high self-efficacy may be more open to using a variety of new ideas, resources, or pedagogical approaches, including suitable examples, to support and meet the needs of their learners (Woolfolk Hoy, Hoy & Davis, 2009). As a result, this leads to effective teaching, autonomy support, and a conducive classroom atmosphere (Fackler & Malmberg, 2016; Hewitt et al., 2017). Teachers prepared with essential content knowledge and instructional abilities feel confident enacting pedagogical practices resulting in positive educational outcomes (Duffin, French & Patrick, 2012).

Table 9 also indicates that TE7 correlates statistically significantly with all the other items with all *p*-values < .001. The Spearman correlations ranged from .310 to .540. The strongest positive correlation was between TE7 ("Managing inappropriate behaviour") and TE8 ("Encouraging students to take responsibility for their behaviour"), with a Spearman correlation coefficient of .540. Given that items TE7 ("Managing inappropriate behaviour") and TE8 ("Encouraging students to take responsibility for their behaviour") are behavioural items, it may be considered to remove one of them to limit redundancy. Literature indicates that efficacious teachers may adopt a more humanistic (e.g., learners taking responsibility for their own behaviour) but strict classroom management approach (e.g., managing inappropriate behaviour) by using positive and reductive strategies to achieve or maintain desirable behaviour (Woolfolk Hoy et al., 2009). Efficacy for classroom management is thus the teacher's belief in their ability to implement the necessary actions to maintain an orderly, organised, non-distractive classroom context (Delale-O'Connor, Alvarez, Murray & Milner, 2017). Classroom management has been associated with the need for teachers to regulate emotions, behaviour, and balance caring with discipline (Delale-O'Connor et al., 2017). Since reliability was established for the instrument, the validity analysis conducted is described in the next section.

Quality Criteria: Validity
In this study, the validity of the FIRE teacher resilience measure was derived from the ability to assess the self-efficacy (i.e., teacher resilience scale) and teacher efficacy beliefs (teacher efficacy scale) of final-year pre-service teachers.

Convergent validity shows that items that belong to the same construct are related (Sauro & Lewis, 2016). All the correlations were statistically significant (i.e., all *p*-values < .001) for the teacher resilience scale, with the weakest correlation being .316 and the strongest .661, as is depicted in Table 10.

Table 10 Convergent validity – Teacher resilience scale

	Bouncing back, when things upset me	Carrying on with my school work when things go wrong	Carrying on in school when events upset me	Feeling certain that things will come right even if there are serious problems in school	Managing negative events in school when I try	Coping with most problems on any school day	Some negative things that have happened in school have made me better able to deal with problems	Not getting disheartened even when children's circumstances make it difficult
Getting over setbacks in school	.577*	.462*	.398*	.348*	.430*	.421*	.316*	.356*
Bouncing back, when things upset me		.493*	.416*	.383*	.435*	.416*	.344*	.359*
Carrying on with my school work when things go wrong			.661*	.396*	.431*	.410*	.365*	.368*
Carrying on in school when events upset me				.444*	.492*	.460*	.371*	.371*
Feeling certain that things will come right even if there are serious problems in school					.528*	.428*	.321*	.329*
Managing negative events in school when I try						.592*	.441*	.417*
Coping with most problems on any school day							.469*	.415*
Some negative things that have happened in school have made me better able to deal with problems								.468*

Note. *p < .001.

For the teacher efficacy scale, all the correlations were statistically significant (all *p*-values < .001), with the weakest correlation being .269 and the strongest .628, as is portrayed in Table 11. These coefficients provide evidence for convergent validity.

Table 11 Convergent validity – Teacher efficacy scale

	Explaining difficult material in ways that the children will understand it	Suggesting suitable examples when the children are having difficulty understanding	Teaching in a way that my students will remember important information	Applying the new developments in the curriculum into my teaching	Helping children focus on learning tasks and avoid distractions	Managing inappropriate behaviour	Encouraging students to take responsibility for their behaviour	Dealing with the diverse learning needs of the students in my class	Teaching students positive behaviour	Providing students with clear specific behaviour expectations	Communicating effectively with parents
Teaching all the subjects on the curriculum effectively	.527*	.410*	.406*	.450*	.406*	.327*	.362*	.384*	.356*	.396*	.308*
Explaining difficult material in ways that the children will understand		.628*	.589*	.458*	.445*	.353*	.375*	.409*	.395*	.397*	.307*
Suggesting suitable examples when the children are having difficulty understanding			.622*	.480*	.421*	.310*	.391*	.431*	.432*	.416*	.269*
Teaching in a way that my students will remember important information				.531*	.477*	.363*	.431*	.433*	.457*	.441*	.326*
Applying the new developments in the curriculum into my teaching					.531*	.358*	.417*	.447*	.439*	.436*	.386*
Helping children focus on learning tasks and avoid distractions						.462*	.489*	.456*	.460*	.454*	.395*
Managing inappropriate behaviour							.540*	.409*	.442*	.454*	.362*
Encouraging students to take responsibility for their behaviour								.505*	.540*	.508*	.367*
Dealing with the diverse learning needs of the students in my class									.561*	.525*	.416*
Teaching students positive behaviour										.612*	.409*
Providing students with clear specific behaviour expectations											.430*

Note. *$p < .001$.

In addition, discriminant validity shows that items that do not belong to the same construct are not statistically related. Table 12 demonstrates the discriminant validity analysis between the teacher resilience scale and the teacher efficacy scale.

Table 12 Discriminant validity – Teacher resilience scale vs Teacher efficacy scale

	Teaching all the subjects on the curriculum effectively	Explaining difficult material in ways that the children will understand it	Suggesting suitable examples when the children are having difficulty understanding	Teaching in a way that my students will remember important information	Applying the new developments in the curriculum into my teaching	Helping children focus on learning tasks and avoid distractions	Managing inappropriate behaviour	Encouraging students to take responsibility for their behaviour	Dealing with the diverse learning needs of the students in my class	Teaching students positive behaviour	Providing students with clear specific behaviour expectations	Communicating effectively with parents
Getting over setbacks in school	.288*	.305*	.309*	.275*	.343*	.292*	.276*	.295*	.341*	.314*	.318*	.228*
Bouncing back, when things upset me	.215*	.310*	.270*	.238*	.262*	.273*	.250*	.299*	.296*	.288*	.268*	.171*
Carrying on with my school work when things go wrong	.321*	.308*	.299*	.281*	.308*	.314*	.261*	.321*	.323*	.338*	.310*	.236*
Carrying on in school when events upset me	.297*	.288*	.265*	.262*	.235*	.301*	.258*	.283*	.275*	.283*	.276*	.223*
Feeling certain that things will come right even if there are serious problems in school	.248*	.289*	.258*	.262*	.266*	.307*	.242*	.295*	.286*	.294*	.295*	.227*
Managing negative events in school when I try	.334*	.355*	.316*	.286*	.329*	.374*	.339*	.330*	.320*	.340*	.340*	.296*
Coping with most problems on any school day	.359*	.365*	.321*	.299*	.332*	.365*	.347*	.342*	.360*	.348*	.346*	.260*
Some negative things that have happened in school have made me better able to deal with problems	.298*	.321*	.308*	.265*	.316*	.298*	.267*	.346*	.311*	.296*	.315*	.207*
Not getting disheartened even when children's circumstances make it difficult	.331*	.352*	.320*	.308*	.371*	.352*	.288*	.340*	.326*	.311*	.308*	.285*

Note. *p < .001.

When correlating the teacher resilience scale, all correlations were statistically significant (all *p*-values < .001). The weakest correlation was .171, and the strongest .374, as is shown in Table 12. This result indicates that the correlation of items that do not belong to the same constructs are lower than those belonging to the same constructs, because the correlations between items on the teacher resilience scale ranged from .316 to .661 and those for the teacher efficacy scale ranged from .269 to .628. Therefore, these coefficients provide evidence for discriminant validity. Thus, from the evidence depicted in Tables 10 to 12, the likeliness of construct validity is reasonably established.

Discussion and Recommendations
The measure used in our study (i.e., FIRE teacher resilience measure) has been employed in countries such as Australia (Beltman et al., 2018), the Czech Republic (Wosnitza et al., 2018), Germany (Peixoto et al., 2018; Wosnitza et al., 2018), Ireland (Morgan, 2011; Peixoto et al., 2018; Wosnitza et al., 2018), Malta (Peixoto et al., 2018; Wosnitza et al., 2018) and Portugal (Peixoto et al., 2018, 2020; Wosnitza et al., 2018). Ebersöhn et al. (2020) found that teachers in South Africa demonstrate confidence in recovery from setbacks (teacher resilience scale) and teaching and behaviour management (teacher efficacy scale) in a challenged context. As postulated in the SCT, the behaviour of pre-service teachers can thus result from a reciprocal causation between experience, skills and beliefs which develops through interaction with the environment (Bandura, 1986). However, to date, the FIRE teacher resilience measure has not been used with pre-service teachers in a Global South context such as South Africa on a large scale. The results provide an opportunity to improve or amend the questionnaire to render it better suited to a South African context. The results on the scales can also be used for transnational comparative studies.

The respondents in the sample (2015–2017) were 1,193 final-year pre-service teachers at a South African university. Most respondents were female, and almost all respondents were fluent in English, while approximately half were fluent in Afrikaans and the majority were not fluent in African languages. Most respondents were enrolled in the FET and FP/ECD pre-service teacher programmes. The extant collected data (2015–2017) may limit the results as contextual factors may have changed given the timeframe of the obtained data (Cohen et al., 2018). Further challenges limiting the generalisation of results can include the use of cross-sectional data, single-country and institutional study and pre-service teacher self-report questionnaire data.

The reliability and validity results indicate that the factors of the FIRE teacher resilience measure are reliable and valid for the use of pre-service teachers in a challenged Global South

setting. Therefore, the underlying variable structure of the FIRE teacher resilience measure seems to hold well in the setting of a challenged Global South setting when used with pre-service teachers. However, to reduce possible redundancy and to reduce the length of the FIRE teacher resilience measure, it is recommended that certain items from the teacher efficacy scale be removed for pre-service teachers in a challenged context, as this reduces the Cronbach's alpha value from .914 (> .90 indicating redundant items) to .896 (.70 < = Cronbach's alpha < .90; acceptable). These items are questions TE4 ("Teaching in a way that my students will remember important information") and TE7 ("Managing inappropriate behaviour").

The FIRE teacher resilience measure was also administered in English with final-year pre-service teachers at the UP. Although English is the main language of teaching and learning at the UP, with most pre-service teachers indicating English fluency, the questionnaire was not translated into any of the respondents' other home languages. As such, potential language difficulties in understanding the questionnaire items should be contemplated, as almost one-tenth of the respondents indicated that they were not fluent in the language in which the questionnaire was presented to them. Furthermore, the language demographic question on the FIRE teacher resilience measure (i.e., "List of languages you are fluent in") was an open-ended question with no clear indication of the meaning of the term, "fluency." The possibility remains that respondents could misinterpret such questions and only indicate their dominant (home) language or indicate a conservative answer relating to language fluency (i.e., only indicate one language). However, even if the language demographic question on the teacher resilience measure was a yes or no question across languages, the measure is not robust enough to make further meaningful inferences about the possible role of multilingualism.

Terms such as *student* used in the original ENTREE questionnaire (Mansfield & Wosnitza, 2015), were also used in the FIRE teacher resilience measure despite the convention in South Africa to refer to *learners*, which could make questions inherently ambiguous (Cohen et al., 2018). Therefore, we interpreted the data with sensitivity by considering cross-cultural and socioeconomic factors influencing the data, as the measure was not standardised for the South African context. Nonetheless, the reliability analysis of the measure compares well with reliability results from other studies (Beltman et al., 2018; Morgan, 2011; Peixoto et al., 2018, 2020; Wosnitza et al., 2018).

Given the complex construct of resilience and suitable questions in a challenged South African context (e.g., language categories), teacher resilience measures should be further developed to conduct nationwide longitudinal research.

Appraising resilience presents challenges due to the multidimensional and dynamic nature of resilience (Beltman et al., 2018). The FIRE teacher resilience measure consists of items sourced from existing scales. The scales indicated acceptable reliability and validity in preceding studies (Mansfield & Wosnitza, 2015; Morgan, 2011; Peixoto et al., 2018, 2020; Watt & Richardson, 2007, 2008, 2012; Watt et al., 2012; Wosnitza et al., 2018).

The FIRE resilience measure has, however, not been standardised for the South African context. Further questionnaire development in this regard is necessary to consider the instrument used to determine pre-service teacher resilience in a challenged context, given cross-cultural and socioeconomic influences in culturally diverse settings. Furthermore, the FIRE teacher resilience measure could be translated into isiZulu (the most spoken language in South Africa) to be used in rural areas to investigate teacher resilience. Providing additional reliability and validity evidence may strengthen the appropriateness of worldwide use and allow for cross-cultural comparisons to expand the generalisability of the constructs. Future researchers could also seek to establish the reliability and validity of the FIRE teacher resilience measures with other than South African pre-service teachers. Contextual factors influencing teacher resilience should also be incorporated into questionnaire development to provide necessary information for a challenged context.

Conclusion
This article informs limited knowledge on quantitatively derived teacher resilience results from an often under represented Global South setting. Evidence from an African perspective is presented to inform global teacher resilience discourse. This study contributes to teacher resilience measurement knowledge with insights into the utility of teacher resilience scales used in other global contexts, in South Africa. The results act as a precursor for comparative teacher resilience results worldwide.

Research within a Global South challenged education space, such as South Africa, thus provided a much-needed lens outside developed countries by delivering evidence on the use of existing teacher resilience scales and yielding comparative results for future studies. This article contributes to knowledge on teacher resilience by establishing the reliability and validity of the teacher resilience scale and teacher efficacy scale of the FIRE teacher resilience measure, for pre-service teachers in a challenged context within an SCT (Bandura, 1986) framework.

Reliability and validity of the instrument, for this study, were established using internal consistency (Cronbach's alpha) and construct validity (correlations). To establish how the underlying variable structure of the teacher resilience measure holds with pre-service teachers in challenged contexts, Cronbach's alpha values were calculated seeking evidence for the teacher resilience measure scales (i.e., teacher resilience scale and teacher efficacy scale) as a consistent measure.

Results in this article indicate the utility of existing teacher resilience scales (from ENTREE) to measure intrapersonal pathways to teacher resilience in a challenged context (i.e., Africa) but also pave the way for the comparison of results with comparable results on the scale elsewhere. The results highlight the reliability and validity of existing resilience scales to measure pre-service teachers' recovery from setbacks, and teaching and behaviour management abilities as important resilience traits for teachers in an African context.

The results provide important insights to guide the development of teacher education training to respond adequately to the development of pre-service teachers in a challenged context. The identification and presence of intrapersonal resilience-enabling pathways (i.e., self-efficacy and teacher efficacy beliefs) can be further developed during initial teacher education programmes. Therefore, the results may guide international teacher training for developing countries. In addition, the description of final-year pre-service teachers' confidence in recovery from setbacks in schools and confidence in teaching and behaviour management provide insights into the current self-perceived professional status of pre-service teachers in a challenged context. Therefore, based on the results in this study it may be concluded that the scales (i.e., teacher resilience scale and teacher efficacy scale) were appropriate to measure pre-service teachers' confidence in recovery from setbacks (i.e., self-efficacy) and confidence in teaching and behaviour management (i.e., teacher efficacy). Pre-service teachers in Africa are thus likely to use intrapersonal resilience-enabling pathways to resile in teaching despite chronic and cumulative risk factors.

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- Professor Caroline Mansfield (ENTREE PI) and the ENhancing Teacher REsilience in Europe [ENTREE] Project.

Authors' Contributions

All authors co-wrote the manuscript, data were obtained from LE's project at CSR, MAG conducted the statistical analyses and interpretation. All authors reviewed the final manuscript.

Notes

i. "ENhancing Teacher REsilience in Europe (ENTREE) is a project partly funded by the European Commission's Lifelong Learning Programme and is supported by an international team of experts from five European countries and Australia" (Wosnitza, O'Donnell, Morgan, Mansfield, Beltman, Peixoto & Cefai, 2014:3). ENTREE aim to advance professional training modules for pre-service and in-service teachers to enable teacher resilience (Wosnitza et al., 2014). To this end survey measures were employed to explore the relationship between a global scale of resilience (Morgan, 2011) and associated capacities among different countries (Mansfield & Wosnitza, 2015; Peixoto, Wosnitza, Pipa, Morgan & Cefai, 2018). The fourth year intervention in research (FIRE) teacher resilience measure included scales from ENTREE (Mansfield & Wosnitza, 2015; Peixoto et al., 2018; Wosnitza et al., 2014) including the teacher resilience scale (Morgan, 2011) and the teacher efficacy scale (Morgan, 2011; Peixoto et al., 2018). The FIRE teacher resilience measure encompasses domains on (i) teacher professionalism (TR-Prof), (ii) teacher emotion (TR-Emot), (iii) teacher motivation (TR-Mot), (iv) teacher social capacity (TR-Soc), (v) resilience (Resilience) and (vi) teacher efficacy (TeachEff) as well as (vii) contextual resilience questions (Coetzee, 2013; Morgan, 2011; Peixoto et al., 2018; Watt & Richardson, 2007, 2008, 2012; Watt, Richardson, Klusmann, Kunter, Beyer, Trautwein & Baumert, 2012).

ii. Countries are grouped based on income (gross national product [GNP]) by the World Bank classification system (Fantom & Serajuddin, 2016).

iii. The FIT-choice questionnaire is an integrative, compressive, and theoretical framework exploring the choice of teaching as profession (Watt & Richardson, 2007, 2008, 2012; Watt et al., 2012).

iv. Twelve official language distribution in South Africa: Afrikaans (10.6%), English (8.7%), isiNdebele (1.7%), isiXhosa (16.3%), isiZulu (24.4%), Sepedi (10.0%), Sesotho (7.8%), Setswana (8.3%), siSwati (2.8%), South African sign language (0.02%), Tshivenda (2.5%) and Xitsonga (4.7%). Languages are listed alphabetically (Stats SA, 2023).

v. In South Africa teaching phases include the Foundation Phase/Early childhood development FP/ECD (i.e., Grade R–3) for ±5 – 9-years, the Intermediate Phase (IP) (i.e., Grade 4–6) for ±10 – 12-years, the Senior Phase (SP) (i.e., Grade 7–9) for ±13 – 15-years and the Further Education and Training Phase (FET) (i.e., Grade 10–12) for ±16 – 18-years (DBE, RSA, 2021).

vi. Our study focused on the teacher resilience scale (operationalised as self-efficacy) and the teacher efficacy scale on the FIRE teacher resilience measure.

vii. The term "student" as used in the original ENTREE resilience questionnaire (Mansfield & Wosnitza, 2015; Peixoto et al., 2018; Wosnitza et al., 2014) was used in the FIRE teacher resilience measure despite the convention in South Africa to refer to *learners* in the basic education field.

viii. Teacher professionalism (TR-Prof), teacher emotion (TR-Emot), teacher motivation (TR-Mot), teacher social capacity (TR-Soc), resilience (Resilience) and teacher efficacy (TeachEff) as well as contextual resilience variables.

ix. FIRE teacher resilience measure.

x. Within this study the variable "resilience" on the FIRE teacher resilience measure is operationalised as self-efficacy.

xi. Within this study the variable "resilience" on the teacher resilience scale was operationalised as self-efficacy.

xii. To make an informed decision of which question, if any, to remove, the Cronbach's alpha was depicted to four decimal places. If only three decimal places are indicated, removal of any of the following items reduced the Cronbach's alpha from .914 to .904: TE4, TE8, TE10 and TE11.

xiii. This article is based on the doctoral thesis of Carine Jonker.

xiv. Published under a Creative Commons Attribution Licence.

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