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Pre-service Teacher perceptions of LANTITE: Complexity theory in action?

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100-word explanation of how the chapter aligns with the book themes

- Re-shaping teacher identities, practices and positioning in the contexts of globalisation
- Equity and social justice in the policies and practices of teacher education.

The chapter reports on a study where the perceptions of a group of PSTs in Australia, regarding their experiences of the LANTITE, were captured and analysed using the lens of complexity theory. The authors argue that a change to one of the complex sub-systems involved in ITE appears to produce effects in other related sub-systems. A likely unexpected impact was on the formation of graduate teacher identities and capabilities as professional teachers. The potential impact on teaching for social justice and attending equitably to human difference when standards-based education is adopted is another theme that is considered in the chapter.

Definitions of terms

ACER: Australian Council for Educational Research

AITSL: Australian Institute for Teaching and School Leadership

ASCF: Australian Core Skills Framework

ATAR: Australian Tertiary Admission Rank, a nationally equivalent measure of a person's relative ranking within their complete age cohort derived from scaled scores achieved for senior secondary school subjects

First in family: A student who is the first member of their immediate family to study in higher education

ITE: Initial teacher education. A university degree from which a person gains a qualification to be a teacher

LANTITE: Literacy and Numeracy Testing for Initial Teacher Education

Pre-service teacher (PST): A student who is studying an initial teacher education degree

OECD: Organisation for Economic Co-operation and Development

PIACC: Programme for the International Assessment of Adult Competencies

QILT: Quality Indicators for Learning and Teaching

TEMAG: Teacher Education Ministerial Advisory Group

TEQSA: Tertiary Education Quality and Standards Agency

VIT: The Victorian Institute of Teaching

1 Introduction

Teacher testing has been implemented in a number of countries around the world for many years. For example, in the 1970s and 1980s, testing of pre-service teachers was implemented in most states of the USA either as an entry requirement, or at the end of degrees to ensure that teachers met appropriate standards of professional and academic competency (Haney, Madaus & Kreitzer, 1987). In 2000, tests of personal literacy and numeracy were introduced in England and undertaken by ITE students in their final year of study (Department for Education, 2019). More recently, in 2016, the Australian government introduced a national test of personal literacy and numeracy for all higher education students enrolled in education courses that aimed to ensure that only those scoring within the top 30 percent of the population would be allowed to teach. Successful completion of LANTITE is now compulsory for all Australian initial teacher education (ITE) candidates by the time they complete their degree, with Australian teacher education accreditation requiring higher education providers to stipulate how this regime will be implemented in their institution.

Teacher education is, however, a very complex system with many variables that can change outcomes of graduates. The framework used in this chapter is complexity theory, drawing on ideas from Mason (2008), Gough (2012) and Ovens (2017) to highlight how a change to one of the complex sub-systems involved in ITE appears to produce effects both expected and unexpected in other related, critical sub-systems. The aim of this research is to examine the perceptions of this testing regime of a group of Pre-service teachers (PSTs) in a regional university in Victoria, Australia and the impact it has had on them as they form their identities and capabilities as professional teachers. Teacher identity has been found by researchers to be a foundational construct in the development of a teacher's self-efficacy and is influenced by many factors, such as emotion, experience and sociocultural discourse (Beauchamp & Thomas, 2009). Negative or positive, stable or unstable, teacher identities are related to retention, resilience and effectiveness in the classroom (Day, Stobart, Sammons, Kington, & Gu, 2007; Mansfield, Beltman, & Price, 2014).

2 Review of literature

In 2014, the Australian government appointed an advisory group to review and make recommendations on how initial teacher education in Australia could be improved (TEMAG, 2014, p. v). This advisory group made 38 recommendations to the government, who subsequently adopted most of these recommendations. Recommendation 13, which was adopted by the Australian government stated that: "Higher education providers use the national literacy and numeracy test to demonstrate that all pre-service teachers are within the top 30 per cent of the population in personal literacy and numeracy." (TEMAG, 2014, p. viii). This national testing regime is known as LANTITE with the onus for reaching the requisite personal literacy and numeracy standards on teacher education providers and the PSTs themselves, with a pass in the LANTITE now established as a graduation requirement. Consequently, teacher education providers have found it necessary to implement various measures to ensure their students are successful in the LANTITE. For some providers, these include pre-testing teacher education applicants in personal literacy and numeracy and providing formal assistance to PSTs to strengthen their personal literacy and numeracy levels.

This concept that graduate teachers should have strong personal literacy and numeracy competence did not originate with the TEMAG report, but initially appeared in the ITE program standards manual for program accreditation in 2011 (ACER, 2019), with the expectation that the personal literacy and numeracy levels of applicants for teacher education were broadly equivalent to the top 30 percent of the population. The ACER website, (ACER 2019) currently states that the population of comparison

is the ‘adult population’ and that the 70 percent standard is ‘empirically validated’ against the Organisation for Economic Co-operation and Development (OECD) Programme for the International Assessment of Adult Competencies (PIAAC) and aligned with the Australian Core Skills Framework (ACSF), a framework that describes general adult literacy and numeracy standards (ACER, 2019).

Currently, program Standard 3.5 under ‘Program Entry’, states that:

Entrants to initial teacher education will possess levels of personal literacy and numeracy broadly equivalent to the top 30% of the population. Providers who select students who do not meet this requirement must establish satisfactory arrangements to ensure that these students are supported to achieve the required standard before graduation. The National Literacy and Numeracy Test is the means for demonstrating that all students have met the standard. (AITSL, 2019)

Following its inception as a teacher education program requirement in mid-2016 until the end of 2018, according to the Australian Government Department of Education and Training (2019), over 59,000 PSTs had undertaken testing of at least one of the two LANTITE components. The pass rates for first time candidates in 2018 was 90.4% for literacy and 90.0% for numeracy from just over 22,000 candidates in each test. This was down from the 2016 test results where around 95% of students were successful (Australian Government Department of Education and Training, 2019).

The introduction of personal literacy and numeracy requirements to teacher education in Australia is similar to the system implemented in England. In 2000, anyone wishing to gain Qualified Teacher Status in England needed to pass the Professional Skills Test; a test of personal literacy and numeracy skills undertaken by ITE students in their final year of study (Department for Education, 2019). However, debate within the UK over the past 10 years around the effectiveness of the scheme resulted in several changes, including unlimited resits and a reduction of the pass mark. More recently, the Minister of State for School Standards released a statement announcing that in 2020, “teacher training providers will become responsible for ensuring that prospective teachers meet the high standards of literacy and numeracy required to be a teacher” (U.K. Parliament, 2019), essentially reverting back to the same scheme Australia had in place before the mandate of the LANTITE. This means that personal literacy and numeracy skills of PSTs are to be developed and assessed within coursework by individual teacher education providers.

2.1 Complexity Theory

Complexity theory was originally developed in scientific fields such as chemistry and physics and was an offshoot of chaos theory (Mason, 2008). Chaos theory highlights how small variations in one part of a system can lead to substantial fluctuations in the behaviour of the whole system. More recently, educationalists have explored complexity theory in a number of different ways and for a number of different purposes. Gough (2012) suggests that:

Complexity invites us to understand that the many processes and activities that shape the world we inhabit are open, recursive, organic, non-linear and emergent: It also invites us to be sceptical, of mechanistic and reductionist explanations, which assume that these processes and activities are linear, deterministic and/or predictable and, therefore, that they can be controlled (p. 42).

Essentially, Gough (2012), espouses that complexity theory offers education professionals a different way of looking at systems and the elements of systems that are essential to educational institutions and the many and diverse ways these systems and elements are connected. In simple terms, according to Mason (2008), changing one input can lead to changes in a range of outcomes. Yuan, Zhang and Yu (2018) characterise teacher collaboration as a complex system and use complexity theory to

explore collaboration and how it interacts with other systems within their school community. The findings reported by Yuan, Zhang and Yu (2018) highlight how changes in one area of a complex system can produce both positive and negative changes to other areas of the same complex system. Ovens (2017), characterises complexity in teacher education as “fascinating, illusive and creative” (p. 38) and uses a framework of complexity theory to explore facets of professional learning and assessment in ITE, as a means to enact what he calls “transformative pedagogy” (p. 39).

The previously discussed studies by Gough (2012), Yuan, Zhang and Yu (2018) and Ovens (2017) suggest that educational institutions such as universities and schools can be considered complex organisations. As complex organisations, they have a number of systems operating in a way that delivers educational programs to students, thus suggesting that complexity theory is an appropriate lens to view them through. In the case of ITE, the systems would have both competing and complementary objectives. Sanger and Giddings (2012) argue that complex systems generally consist of a number of sub-systems that can interact with each other on a number of levels and in multiple ways. ITE would fit into this definition as there are sub-systems such as policy (which state and federal governments and the university have input into), accreditation (involving both state teacher accreditation bodies and federal bodies (AITSL) as well as the Tertiary Education Quality and Standards Agency (TEQSA)), curriculum (involving a university and its faculties), professional placement (involving a university and schools) and teaching (involving a university and individual academic staff). As previously argued, Complexity theory suggests that causation in education is complex and that outcomes can be influenced by a myriad of factors (Mason, 2008).

Outcomes in ITE are important with universities charged with developing their graduate teachers so they can demonstrate the AITSL teacher standards (AITSL, 2018). These teacher standards require graduates to demonstrate competence in areas such as content and pedagogy knowledge, creating safe and engaging learning environments, developing suitable material for learners, and engaging professionally with a range of stakeholders.

2.2 Teacher identity

An increased demand for teacher quality has created a renewed interest in the research of teacher identity. Several definitions can be found, yet many agree that teacher identity is integral to the development of self-efficacy, purpose, motivation, future orientation and position within the education community (Beauchamp & Thomas, 2009; Day & Kington, 2008; Day et al., 2007; Hong, Greene, & Lowery, 2017; Wenger, 1998). In an ever-changing landscape of accountability and uncertainty, teacher identities are also in a constant state of flux and influenced by factors such as reform, political agendas and societal expectations. Therefore, identity development is an active process of exploration, reflection and dialogue; an experience in which PSTs need to be agentic to construct their sense of self as a professional (Coldron & Smith, 1999). There is, however, limited room for teacher agency in Australia’s current political climate. Beijaard, Meijer and Verloop (2004) contend that conformity and compliance with imposed standards essentially threatens teachers’ locus of control in their own professional identity formation.

Similarly, Hargreaves (2000) describes the role of external forces through four categories of teacher professionalism which explain the identity development of the teacher within a sociocultural context: the pre-professional, the autonomous professional, the collegial professional and, the ‘post-modern professional’. The latter is marked by economic globalisation and the marketization of education which, Buchanan (2015) argues is reflected “in the recent reforms and policies that tightly regulate

teachers' work and roles, and view teachers as technicians who implement decisions made by others who are far away from the actual classrooms" (p. 702). Taking Buchanan's point further, government decisions about requisite teacher capabilities and suitability to teach can be considered in relation to the post-modern professional context.

In exploring teacher identity through the lens of complexity theory, current political policy and reform in Australia can be identified as a change to an important teacher education sub-system. This lens provides the stimulus to ask important questions about the impact of the LANTITE on PSTs' identity development as education professionals as well as understand trends experienced in other countries.

2.3 Social Justice and High-Stakes Testing

High-stakes tests are used to inform important decisions, and in the context of this paper, such test scores determine outcomes such as registration with teaching authorities and graduation. As policies and reform agendas emerge and re-emerge, high-stakes testing has become the tool for measuring their impact. However, several researchers have found there to be adverse effects on minority and disadvantaged students (Au, 2008; Horn, 2003; Hursh, 2005; Madaus & Clarke, 2001). For example, studies from the United States have found African American, Latino and students with disabilities are particularly overrepresented in high-school drop-out rates since reforms were introduced to raise education standards in the 1990s (Hursh, 2005). It has also been established that family income is strongly correlated with test scores, meaning those from disadvantaged backgrounds generally underperform and are therefore less likely to have opportunities afforded by success in such tests, such as entry to college or university (Emler, Zhao, Deng, Yin, & Wang 2019).

The influence high-stakes testing has on learning content and knowledge is also linked, where Au (2008) argues that "student identities that lay outside the test-based norms are thus 'subtracted' from the curriculum" (p. 641). Consequently, those who "think and learn in ways that differ from the dominant cultural norms" are marginalised (Um, 2019, p. 76).

Some of these concerns were raised by the National Research Council (1999) who made a series of recommendations related to the National Assessment of Educational Progress (NAEP) which included that an "educational decision that will have a major impact on a test taker should not be made solely or automatically on the basis of a single test score" (p. 3). More than twenty years later, the nexus between high-stakes testing and social justice is still an issue, particularly in Australia where high-stakes, policy-driven initiatives such as LANTITE have potentially profound implications for the futures of aspiring teachers (Klenowski & Wyatt-Smith, 2012).

3 Research context

The context for this work is ITE in a regional university in Victoria, Australia. Federation University Australia, is a regional multi-campus university that has a large 'first in family' cohort. Federation University's School of Education develops classroom ready teachers who usually teach in regional and remote areas (Plunkett & Dyson, 2011). In recent years, the Quality Indicators for Learning and Teaching survey findings show undergraduate and postgraduate students score Federation University above the national average for teaching quality in areas including learner engagement, student support and skills development (QILT, 2019a). The QILT findings also rate Federation University well above average in gaining employment after graduation (QILT, 2019b). The PST cohort in this study come largely from areas in regional and remote Victoria. For almost a decade the School of Education at

Federation University has supported its PSTs by using internal testing to identify students who needed additional work to build their personal skills in either numeracy or literacy. Additional support has been provided in a range of forms including first, small group skill development sessions and, second, the development of learning plans for individuals with a focus on self-directed learning and, third, check in sessions to ensure that the plan is having the desired effect of building personal numeracy and literacy skills. Class sizes in tutorials for PSTs are generally lower than 25 allowing the lecturers and tutors to get to know their learners well and cater for them in a way that develops them in all areas, including personal literacy and numeracy.

4 Research method

The purpose of this study was to investigate PST perceptions of the LANTITE testing regime. The mixed-methods oriented research involved the online collection of survey data following ethics approval from the Federation University Human Research Ethics Committee. Only quantitative data from the study is reported in this paper. Participants were undergraduate ITE students (n=61) in their final year of study who had successfully completed both the literacy and numeracy test components of LANTITE. These PSTs were approached through a course studied as part of their final year program and invited to participate anonymously in the online survey. The response rate (51% of PSTs who were invited to complete the survey) was higher than expected and demographic data indicated representation across a range of programs and age groups.

Survey questions developed by the researchers were designed to investigate PSTs' perceptions of the LANTITE, and the potential impact of the test on identities and capabilities as teachers entering the profession. The survey was created through the use of Google Forms and participants were given the option to provide their personal details if they wished to be contacted at a later stage. The survey consisted of eight questions pertaining to the literacy component of the LANTITE and eight relating to the numeracy component, followed by six general questions regarding the test as a whole. The PSTs were asked about their preparedness for the test, their confidence before and after sitting the test, whether they found the test stressful, and if completing the test contributed to their preparedness to be a teacher. All questions were required and were answered using a five-point ordinal Likert scale describing one as 'strongly agree' and five as 'strongly disagree'. Likert scales are widely used to measure attitudes and opinions with a greater degree of nuance than a simple yes or no question. They are one of the most reliable ways to measure perceptions and attitudinal patterns (Oppenheim, 1992). Raw data was downloaded from the Google Form and converted to an Excel spreadsheet. Formulas were used to tabulate, organise and prepare data into graphs for analysis.

5 Results

The following results summarise PST responses (n = 61) to a number of the survey items. Results are shown in graphs (Figures 1-4) showing the breakdown of Likert scale responses. Raw data is reported through tables and graphs with reported outcomes listed as percentages.

The first area to be discussed is around PSTs' confidence before and after the literacy and numeracy testing. The PSTs were asked to rate their agreement with the statement: "Before the test, I felt confident about my literacy ability". A similarly worded statement was included about confidence in numeracy. Figure one shows the confidence levels of PSTs before official literacy and numeracy testing.

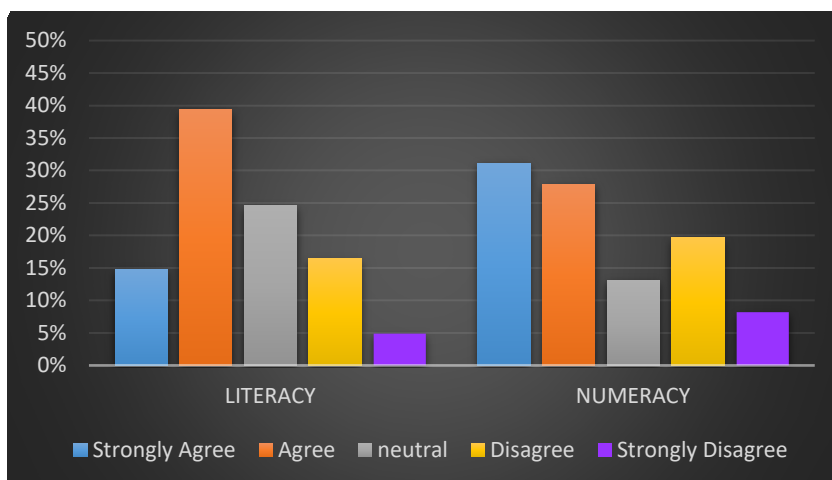


Figure 1: Reported confidence of pre-service teachers before they attempted LANTITE.

Figure one shows that a slight majority of PSTs (54% literacy; 59% numeracy) agreed they felt confident in their abilities in literacy and numeracy before they attempted the LANTITE test, compared with those (21% literacy; 28% numeracy) who stated that they lacked confidence before sitting the test. Figure two shows the confidence of PSTs after they attempted LANTITE, but before they received their results. The survey item was, “After the Literacy test (but before receiving my result), I felt confident that I had passed the test.” Again, a similarly worded statement was used regarding numeracy confidence.

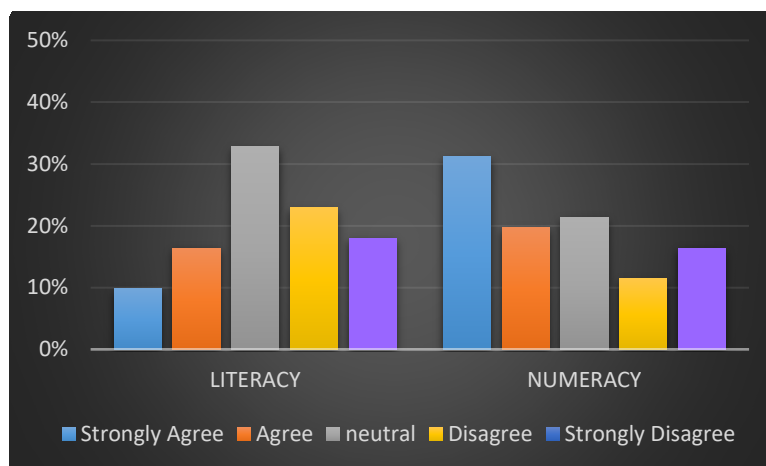


Figure 2: Reported confidence of pre-service teachers after they attempted LANTITE but before they received their results.

Figure two shows that many PSTs became less confident after completing the test, but before results were released. The results for literacy showed a significant decrease in confidence with strongly agree/agree responses dropping from 54% before testing to 26% after testing. Numeracy did not show as high a reduction in reported confidence, dropping from 59% to 51%. This indicates that the LANTITE testing process reduced PST confidence in their own ability, somewhat in numeracy, but more dramatically in literacy, for approximately a quarter of the respondents.

Stress was another factor investigated in the survey, with PSTs asked how stressful they found the LANTITE process. PSTs were asked to indicate their agreement with the statement, “I thought that the literacy test was stressful”. A similar statement was used regarding the numeracy test. Figure three shows the breakdown of responses.

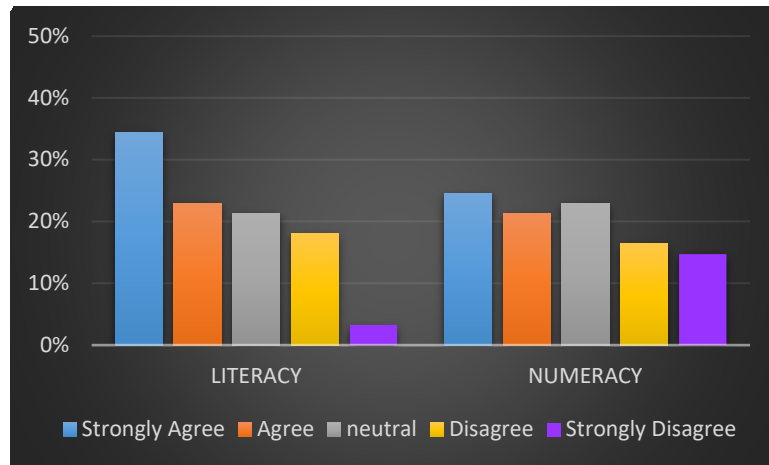


Figure 3: Reported stress levels of pre-service teachers in literacy and numeracy.

Figure three shows that PSTs were more stressed about literacy testing than numeracy testing with 57% reporting the literacy testing as stressful, while 46% reported that the numeracy testing was stressful. This stress appeared to be due to the actual testing itself as only 65% of PSTs stated that they were able to get a test venue and a test time that they found suitable.

In terms of the time they needed to complete the survey, a majority of PSTs (62% literacy; 61% numeracy) reported that they had sufficient time to complete each component of the testing.

PSTs also reported on whether or not they believed that they had the necessary strategies to successfully complete LANTITE. PSTs were asked to rate their agreement with the statement: “In the literacy test, I believe that I had the necessary strategies to pass”. Figure four shows the PST responses about having these strategies.

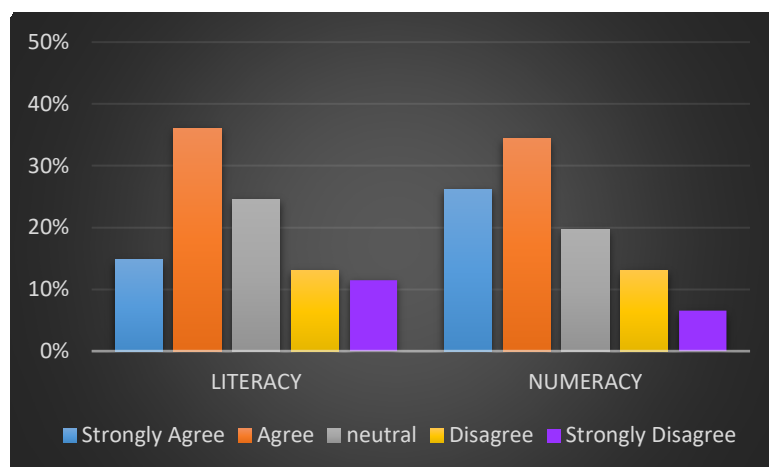


Figure 4: Reported beliefs of pre-service teachers about having strategies to complete LANTITE successfully.

Figure four shows that a slight majority of PSTs (51% literacy, 60% numeracy) believed that they had the necessary strategies to successfully complete LANTITE. , A significant percentage of PSTs (24% literacy; 20% numeracy), however, registered for LANTITE testing, yet reported that they felt that they did not have the necessary strategies to be successful.

When examining confidence levels according to the number of times the test had been attempted, it was found that PSTs who sat the LANTITE twice had increased confidence levels after their test experience compared with those who had only attempted it once (Table 1). However, those who had sat the test twice had less confidence before the test compared with those experiencing it for the first time.

Table 1

Comparison between number of LANTITE attempts by survey item

<u>Survey item</u>	<u>*1 attempt % Strongly agree or agree</u>	<u>*2 attempts % Strongly agree or agree</u>
<i>Before the test, I felt confident about my literacy ability.</i>	57	44
<i>After the Literacy test (but before receiving my result), I felt confident that I had passed the test.</i>	22	56
<i>I thought that the literacy test was stressful.</i>	57	56
<i>Before the test, I felt confident about my numeracy ability.</i>	61	56
<i>After the Numeracy test (but before receiving my result), I felt confident that I had passed the test.</i>	49	56
<i>I thought that the numeracy test was stressful.</i>	49	33
<i>Note: Only ‘strongly agree’ and ‘agree’ responses are included to show comparison.</i>		
<i>* PSTs who had one attempt N=51 and PSTs who had attempted LANTITE twice N=9</i>		

Respondents reported the numeracy component to be less stressful if they had attempted it twice but reported stress for the literacy component did not change significantly when the PST had attempted twice. Confidence levels before the test, for both literacy and numeracy, decreased for those who sat the test twice.

5.1 Limitations

The results reported in this chapter have a number of limitations associated with them. First, the results consist of the perceptions of a small (n=61) sample from one regional university. This sample size would represent approximately 15% of the number of PSTs from the university who sit the LANTITE each year. Second, the responses that were collected from the survey provide a snapshot of the perceptions of a particular group of PSTs at a specific point in time.

Another limitation includes the use of self-reported data. Although respondents were given complete anonymity, there are still risks relating to the use of self-reporting instruments that respondents might provide socially desirable answers (Oppenheim, 1992). Memory decay over time also has potential to impair the accuracy of recall, however, the current study was conducted as close as possible to the completion of the LANTITE test window.

6 Discussion

Teacher identity is an important component of initial teacher education courses as it is essential to the development of confidence in teaching, self-efficacy, motivation and purpose (Beauchamp & Thomas, 2009; Day & Kington, 2008; Day et al., 2007; Hong, Greene, & Lowery, 2017; Wenger, 1998). Through the introduction of the LANTITE, the authors of this chapter contend that for many PSTs, teacher identity is being adversely affected. Federation PSTs reported more confidence (54% literacy; 59% numeracy) before they sat the LANTITE tests, while fewer (21% literacy; 28% numeracy) stated that they lacked confidence. This can be compared to the 26% (dropping from 54%) of PSTs who reported confidence in literacy and the 51% (dropping from 59%) of PSTs who reported confidence in numeracy after LANTITE testing. PSTs reported an increased lack of confidence in their personal literacy after LANTITE testing (41%), while numeracy remained very similar (27%) to the reported lack of confidence before testing. This result indicates that for about a quarter of the PSTs the LANTITE test process diminished their confidence in their own ability, significantly in literacy, and, to a lesser extent in numeracy. This might have been due to the test not meeting the PSTs' expectations or their inability to be confident about the accuracy of their responses.

The initial lack of confidence in literacy (54%) compared to numeracy (59%) skills might be due to students' perceptions of their literacy and numeracy education. Further research would need to be carried out with PSTs to find out what influences their perception of their personal literacy and numeracy skills.

The majority of PSTs reported that they had the necessary strategies to successfully complete LANTITE (51% literacy, 60% numeracy who agreed, compared with 24% literacy and 20% numeracy who disagreed). An interpretation is that these students were optimistic that the experience of sitting the test would assist them in a subsequent attempt, or perhaps they had a small window of time in which to gain a successful result, having waited until late in their course to sit the test. One of the difficulties in preparing PSTs for the tests is that the test conditions, including the pressure of the high-stakes for achieving a pass, can't be easily replicated. Nonetheless, it is concerning that a significant percentage of PSTs (24% literacy; 20% numeracy) registered and paid for LANTITE testing and reported that they felt that they lacked the strategies to ensure a successful outcome.

Stress was another factor investigated and reported on by PSTs through the survey, with more PSTs reporting their stress about literacy testing (57%) than numeracy testing (46%) (see Figure 3). Stress continued to be a factor when sitting the test for the second time (see Table 1). The knowledge that there are only a limited number of re-sits permitted, coupled with prior experience of failing the test, might have been a contributing factor in lowering confidence and self-efficacy.

The conditions of setting up a test opportunity might have contributed to PSTs' stress as 35% of respondents stated that they were not able to get a test venue at a nearby location at a test time that they found suitable. It must be noted that a number of Federation students have travelled to Melbourne or Adelaide to sit the test when they were unable to access a local testing option. Adelaide is an eight hour drive from the Mount Helen Campus.

In terms of the time needed to complete the LANTITE, around four out of every 10 PSTs who completed the survey (38% literacy; 39% numeracy) indicated they had insufficient time to complete the component of the testing. This raises questions as to the relevance of the particular time frame that was selected for the test to be conducted, and could be a factor in why the reported stress levels were as high as they were.

Complexity theory highlights how changes to one system can have such unintended consequences (Yuan, Zhang and Yu, 2018). The authors of this chapter contend, in this case, that the Australian government's implementation of a literacy and numeracy testing regime into the ITE system, that was intended to ensure the personal literacy and numeracy standard of graduating teachers (TEMAG, 2014), has, in fact, led to undesirable and unintended consequences around stress and confidence levels in a significant number of teacher education students. These increased stress levels and decreased confidence levels could, in turn, be a factor in how the PST sees themselves as a teacher at a point near the middle (or latter part) of their degree; a time when, as Beltman, Glass, Dinham, Chalk, and Nguyen (2015) suggest, their teacher professional identity is still being formed. The development of teacher identity is just one of many complex sub-systems within the ITE system that might be impacted. Further research would be needed to identify other related ITE sub-systems that might have been impacted by the introduction of LANTITE.

Woods and Carlyle (2002) describe an 'identity passage' through which a teacher journeys, especially in times of stress. In the first phase, a traumatic separation occurs between one's sense of self and society which includes a sense of loss. In PSTs experiencing the LANTITE, this is potentially reflected as the loss of autonomy, as well as diminished self-confidence. The second phase is characterised by feelings of "hitting rock bottom" (Woods & Carlyle, 2002, p. 177) and is where support is crucial in order to re-emerge with a renewed sense of self. In preparing for the LANTITE, particularly after having failed once before, PSTs often need to seek counselling or tutoring to rebuild confidence and self-efficacy. Once adjustments are made to cope with the trauma, the third phase describes a reconstruction of identity. Though some PSTs might leave their test experience with a sense of accomplishment, those who have experienced stress and identity fragmentation might choose to give up their pursuit of a career in teaching or might carry these stresses into teaching.

The impact of stress on teacher identity is also explored by Sutin, Costa, Wethington, and Eaton (2010), where stressful events can be perceived as either a turning point or a lesson learned. The present study found that some PSTs were confident in their personal literacy and numeracy skills before taking the test, yet reported their experience during the LANTITE as stressful and beyond their expectations. This is not an unknown phenomenon in pre-service teaching. Cognitive dissonance is often experienced when ideals and reality are incongruent (Festinger, 1957), and could have negative effects on identity development, leading to stress and depression (Hargreaves, 1998). A conflict between one's perceived abilities and reality could raise questions in a PST's mind about their suitability for the profession or serve as a *turning point*. Furthermore, a PST might re-examine their beliefs about what a teacher needs to know as a result of their test taking experience, essentially devaluing their coursework or placement unless it explicitly prepared them for the LANTITE (Beauchamp & Thomas, 2011). Whether the test experience is positive or negative, the *lesson learned* might be that what is important to know in becoming a teacher is simply the content of high-stakes tests such as LANTITE.

Incongruent values and beliefs threaten the fabric of identity and create an emotional and vulnerable state, which, according to Day et al (2007) is characterised by "a lack of a strong sense of agency, a sense of helplessness, submissiveness or compliance which might be short or longer-term depending

upon the extremity of the scenario experienced and the strength of belief and purpose.” (p. 108). PSTs might not agree with the purpose of the LANTITE, but they have no choice but to accept and comply with the inescapable conditions of entry to the profession. Wenger (1998) describes such constraints as being detrimental to both teacher identities and their connection to community. Negotiating professional identity in a standards-based discourse is dependent on one’s power or agency within the social space (Beauchamp & Thomas, 2009).

When viewed from an agency perspective, the current study might provide evidence that the identities of PSTs in the context of high-stakes testing is at threat of erosion, particularly when confidence is diminished following failure of the LANTITE. A decrease in self-efficacy and increase in test anxiety also has potential to thwart further attempts (Chapell et al., 2005). Further, the capacity to apply a social justice lens and effectively attend to the educational complexities associated with human difference, a discourse that is at odds with standards-based education, might be impaired.

6.1 Implications

This research has highlighted several issues associated with the introduction of LANTITE for all ITE candidates. These include:

- The decline in PSTs perceptions of their own personal literacy and numeracy skills before and after the literacy and numeracy testing. This is of concern as the introduction of the testing regime was designed to ensure an agreed standard of personal literacy and numeracy in graduate teachers.
- The self-reported levels of stress experienced by students through the LANTITE process. Increasing PST’s stress levels is not a desirable outcome. More data needs to be collected to find what the stress points are for PSTs so that strategies for mitigation of these stress levels can be investigated.
- The potential for the previous two issues to affect how PSTs view their own teacher identity. The question of teacher identity development and the effects of LANTITE need to be further researched.
- The notion that changes can be made to complex sub-systems of ITE without first investigating what effects might occur to other associated systems as a result of the changes.
- The high-stakes for students in passing LANTITE and the high importance attributed to measuring personal literacy and numeracy has the potential to narrow other aspects of the ITE curriculum.

Further research is needed to better understand student perceptions of these issues pertaining to the introduction of LANTITE for ITE candidates in Australia.

7 Conclusion

After investigating PST perceptions of LANTITE through the lens of complexity theory (Ovens, 2017), the authors argue that the introduction of the LANTITE testing regime into initial teacher education has added another ‘cog’ in what is already a complex education system. The findings of this study suggest that LANTITE has caused increased stress levels, identity erosion and the marginalisation of some PSTs. The consequences, intended or not, are likely to have a negative effect on teacher identity as a foundational construct in a teacher’s self-efficacy. In conclusion, such a

regime promotes a discourse of ‘inputs’ and ‘outputs’ (Barnes & Cross, 2018) essentially devaluing other aspects of the ITE curriculum.

Two recent trends in ITE show increasing emphasis on what Gough describes as “measuring educational outcomes ...often accompanied by the rhetoric of ‘raising standards’” (Gough, 2012, pp. 46-47). However, a change in one complex sub-system produces effects (both expected and unexpected) which might undermine the original purpose of the reform. The LANTITE testing regime was designed to ensure teachers entered the profession with strong personal literacy and numeracy skills yet, from the results of this research it is likely that teacher identity and self-efficacy might be undermined. Complexity theory invites us to be sceptical of reductionist approaches and processes which have potentially deleterious effects.

What it means to be a teacher has changed with the introduction of the LANTITE in Australia. A ‘good’ teacher now needs to possess personal literacy and numeracy skills reflecting the top 30 percent of the population (TEMAG, 2014). This gate-keeping measure may be seen to place the value of personal literacy and numeracy skills above anything else; without passing the test, despite possessing other highly desirable skills, expertise and attributes for teaching, one is not permitted to teach. In fact, the PST is denied the ability to graduate from their teaching degree. Given the high-stakes of the LANTITE, it is arguably one of the most stressful situations a PST must face in their degree.

Masters (2017), with reference to measuring various learner attributes in education, poses the question, ‘Can we measure it?’ Given the findings of this study, a more pertinent question pertaining to the personal literacy and numeracy of graduate teachers might be, ‘Should we measure it?’ This current climate of accountability thrives on the notion that what can be counted, counts, with scant attention to the possible broader implications for graduate teachers. Given the stressful nature of the LANTITE and the important role of teacher identity in a PST’s development, it is important to understand how higher education providers can support PSTs’ reflexivity and resilience. Dissonance can be an opportunity for growth and learning when appropriate supports are in place. In reality, teaching is a dynamic and complex profession where stress and dissonance are part of everyday experiences which demand far more than just possession of personal literacy and numeracy skills determined to be in the top 30 percent of the population. Teacher Education courses must educate their students in a wide range of areas so PSTs can emerge with teacher identities that allows them to develop their own students to their fullest potential.

References

- Au, W. W. (2008). Devising inequality: A Bernsteinian analysis of high-stakes testing and social reproduction in education. *British Journal of Sociology of Education*, 29(6), 639-651. doi: 10.1080/01425690802423312.
- Australian Council for Educational Research (ACER). (2019). Literacy and numeracy test for initial teacher education Students. <https://teacheredtest.acer.edu.au/>
- Australian Government Department of Education and Training. (2017). Literacy and numeracy test for initial teacher education students: Assessment framework. Retrieved from: <https://teacheredtest.acer.edu.au/files/Literacy-and-Numeracy-Test-for-Initial-Teacher-Education-Students-Assessment-Framework.pdf>

- Australian Government Department of Education and Training. (2019). Literacy and Numeracy Test for Initial Teacher Education Students. <https://www.education.gov.au/literacy-and-numeracy-test-initial-teacher-education-students>
- Australian Institute of Teaching and School Leadership (AITSL). (2018). Accreditation of initial teacher education programs in Australia: Standards and Procedures. <https://www.aitsl.edu.au/tools-resources/resource/accreditation-of-initial-teacher-education-programs-in-australia---standards-and-procedures>
- Australian Institute of Teaching and School Leadership (AITSL). (2019). Teacher standards. Accessed November 2019 at: <https://www.aitsl.edu.au/teach/standards>
- Beauchamp, C., & Thomas, L. (2009). Understanding teacher identity: An overview of issues in the literature and implications for teacher education. *Cambridge Journal of Education*, 39(2), 175-189. doi:10.1080/03057640902902252.
- Beauchamp, C., & Thomas, L. (2011). New teachers' identity shifts at the boundary of teacher education and initial practice. *International Journal of Educational Research* 50. 6-13. <https://doi.org/10.1016/j.ijer.2011.04.003>
- Beijaard, D., Meijer, P. C., & Verloop, N. (2004). Reconsidering research on teachers' professional identity. *Teaching and Teacher Education* 20(2), 107-128. doi:10.1016/j.tate.2003.07.001.
- Beltman, S., Glass, C., Dinham, J., Chalk, B., & Nguyen, B. (2015). Drawing identity: Beginning pre-service teachers' professional identity. *Issues in Educational Research*, 25(3), 225-245. <http://www.iier.org.au/iier25/beltman.html>
- Buchanan, R. (2015). Teacher identity and agency in an era of accountability. *Teachers and Teaching*, 21(6), 700-719. doi:10.1080/13540602.2015.1044329.
- Chapell, M. S., Blanding, Z. B., Silverstein, M. E., Takahashi, M., Newman, B., Gubi, A., & McCann, N. (2005). Test Anxiety and Academic Performance in Undergraduate and Graduate Students. *Journal of Educational Psychology*, 97(2), 268-274. doi:10.1037/0022-0663.97.2.268.
- Coldron, J., & Smith, R. (1999). Active location in teachers' construction of their professional identities. *Journal of Curriculum Studies*, 31(6), 711-726. doi:10.1080/002202799182954.
- Day, C., & Kington, A. (2008). Identity, well-being and effectiveness: the emotional contexts of teaching. *Pedagogy, Culture & Society*, 16(1), 7-23. doi:10.1080/14681360701877743.
- Day, C., Stobart, G., Sammons, P., Kington, A., & Gu, Q. (2007). *Teachers matter: Connecting work, lives and effectiveness*. Buckingham, UK: McGraw-Hill Education.
- Department for Education. (2019). Professional skills tests - The process for taking the professional skills tests.. Retrieved 3 December 2019, from <http://sta.education.gov.uk/professional-skills-tests/the-process-for-taking-the-professional-skills-tests>
- Emler, T. E., Zhao, Y., Deng, J., Yin, D., & Wang, Y. (2019). Side effects of large-scale assessments in education. *ECNU Review of Education*, 2(3), 279-296. <https://doi.org/10.1177/2096531119878964>
- Festinger, L. (1957). *A theory of cognitive dissonance*: Stanford, CA: Stanford University Press.
- Gough, N. (2012). Complexity, complexity reduction and methodological borrowing in educational inquiry. *Complicity: An International Journal of Complexity and Education*, 9, 41-56. <https://doi.org/10.29173/cmplct16532>
- Haney, W., Madaus, G., & Kreitzer, A. (1987). Charms talismanic: Testing teachers for the improvement of American education. *Review of Research in Education*, 14(1), 169-238. <https://doi.org/10.3102/0091732X014001169>
- Hargreaves, A. (1998). The emotional politics of teaching and teacher development: With implications for educational leadership. *International Journal of Leadership in Education*, 1(4), 315-336. doi:10.1080/1360312980010401.

- Hargreaves, A. (2000). Four ages of professionalism and professional learning. *Teachers and Teaching*, 6(2), 151-182. doi:10.1080/713698714.
- Hong, J., Greene, B., & Lowery, J. (2017). Multiple dimensions of teacher identity development from pre-service to early years of teaching: A longitudinal study. *Journal of Education for Teaching: International Research and Pedagogy*, 43(1), 84-98. <https://doi.org/10.1080/02607476.2017.1251111>
- Hursh, D. (2005). The growth of high-stakes testing in the USA: Accountability, markets and the decline in educational equality. *British Educational Research Journal*, 31(5), 605–622. <https://doi.org/10.1080/01411920500240767>
- Klenowski, V., & Wyatt-Smith, C. (2012). The impact of high stakes testing: The Australian story. *Assessment in Education: Principles, Policy & Practice*, 19(1), 65–79. <https://doi.org/10.1080/0969594X.2011.592972>
- Madaus, G., & Clarke, M. (2001). The adverse impact of high stakes testing on minority students: evidence from 100 years of test data. <https://eric.ed.gov/?id=ED450183>
- Mansfield, C., Beltman, S., & Price, A. (2014). ‘I’m coming back again!’ The resilience process of early career teachers. *Teachers and Teaching*, 20(5), 547-567. doi:10.1080/13540602.2014.937958.
- Mason, M. (2008). What is complexity theory and what are its implications for educational change? *Educational Philosophy and Theory*, 40(1), 35-49. <https://doi.org/10.1111/j.1469-5812.2007.00413.x>
- Masters, G. (2017, 31 July). But can we measure it? *Teacher Evidence + Insight + Action*. <https://www.teachermagazine.com.au/columnists/geoff-masters/but-can-we-measure-it>.
- National Research Council (1999). High Stakes: Testing for tracking, promotion, and graduation. Washington, DC: The National Academies Press. <https://doi.org/10.17226/6336>.
- Oppenheim, A. N. (1992). *Questionnaire design, interviewing and attitude measurement* (new ed.). London, NY: Pinter Publishers.
- Ovens, A. (2017). Putting complexity to work to think differently about transformative pedagogies in teacher education. *Issues in Teacher Education*, 28-51. <https://eric.ed.gov/?id=EJ1157529>
- Plunkett, M., & Dyson, M. (2011). Becoming a teacher and staying one: Examining the complex ecologies associated with educating and retaining new teachers in rural Australia. *Australian Journal of Teacher Education*. 36(1), 31-47.
- Quality Indicators for Learning and Teaching (QILT). (2019a). QILT surveys. Student experience. <https://www.qilt.edu.au/qilt-surveys/student-experience>
- Quality Indicators for Learning and Teaching (QILT). (2019b). QILT surveys. Graduate employment. <https://www.qilt.edu.au/qilt-surveys/graduate-employment>
- Sanger, M., & Giddings, M. (2012). A simple approach to complexity theory. *Journal of Social Work Education*, 48(2), 369-376. <https://doi.org/10.5175/JSWE.2012.201000025>
- Sleeter, C. (2008). Equity, democracy, and neoliberal assaults on teacher education. *Teaching and Teacher Education*, 24(8), 1947-1957. <https://doi.org/10.1016/j.tate.2008.04.003>
- Sutin, A. R., Costa, P. T., Wethington, E., & Eaton, W. (2010). Perceptions of stressful life events as turning points are associated with self-rated health and psychological distress. *Anxiety, Stress, & Coping*, 23(5), 479-492. doi:10.1080/10615800903552015
- Teacher Education Ministerial Advisory Group (TEMAG). (2014). *Action now: Classroom ready teachers*. Retrieved March 2015 from <http://docs.education.gov.au/node/36783>
- U.K. Parliament. (2019). Teacher Training. <https://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2019-07-16/HCWS1728/>
- Um, S. J. (2019). Politics of hybridity: Teaching for social justice in an era of standards-based reform. *Teaching and Teacher Education*, 81, 74-83. <https://doi.org/10.1016/j.tate.2019.02.011>

- Valente, J., & Collins, K. (2016). [Dis]Ableing educational inequities: A disability studies in education perspective. *Review of Disability studies: International Journal*, 12(1), 1-19. <http://hdl.handle.net/10125/58659>
- Wenger, E. (1998). *Communities of practice: learning, meaning, and identity*. Cambridge, UK: Cambridge University Press.
- Woods, P., & Carlyle, D. (2002). Teacher identities under stress: The emotions of separation and renewal. *International Studies in Sociology of Education*, 12(2), 169-190. doi:10.1080/09620210200200089
- Yuan, R., Zhang, J., & Yu, S. (2018). Understanding teacher collaboration processes from a complexity theory perspective: A case study of a Chinese secondary school. *Teachers and Teaching*, 24(5), 520-537. <https://doi.org/10.1007/s12564-019-09584-2> .