



**MONASH** University

**Factors Lifting Apprenticeship Retention Expectations (FLARE)**

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A thesis submitted for the degree of *Doctor of Philosophy* at  
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### Abstract

Despite widespread praise for the effectiveness of the apprenticeship system in easing the transition from education to work, approximately one-third of current trade apprentices seriously consider dropping out. Dropout considerations link to actual dropouts, and also indicate a negative quality of experience which may impact apprentices' quality of learning and engagement. This thesis by three publications, explored how Australian trade apprentices' motivational values help explain the relationship between their experiences, and intentions to persist or drop out of their training (see Figure 1). The theoretical frameworks were primarily expectancy-value theory (EVT) for motivational values, and the Job Demands-Resources model (JD-R) as an organising framework for apprenticeship factors. Contextual differences were hypothesised between trade occupations (i.e., licensed vs. unlicensed) and learning environments (i.e., trade school vs. workplace).

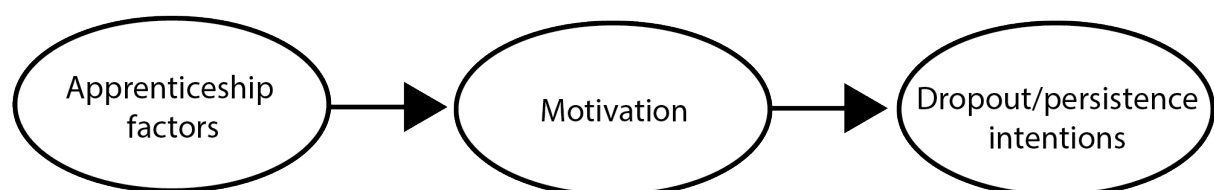
The first publication explored occupational differences in factors predicting dropout considerations between Australian bricklaying ( $n = 369$ ) and plumbing ( $n = 1,016$ ) apprentices using logistic regression analyses on secondary data. The other two publications drew on new data, from a large longitudinal Australian survey of apprentices in bricklaying, carpentry, plumbing and electrical trades ( $N = 2,387$ ) conducted for this thesis. The second publication explored the multidimensionality of values (i.e., intrinsic, attainment, utility, and cost) across trade school and workplace environments in relation to apprentices' intentions to persist. Drawing on findings from publications 1 and 2, the third publication predicted apprentices' dropout considerations over time using latent growth models, and how influential motivational trajectories were influenced by particular apprenticeship factors. The study predicted dropout considerations via a dual motivational process involving workplace interest and work-related anxiety.

Collectively, this research was the first to discriminate the four EVT value constructs across two learning environments within the same domain – trade school and workplace. Results demonstrated interrelated values were important predictors of intentions to persist. Further, factors commonly featured in apprenticeship retention-related literature (i.e., pre-entry characteristics, and apprenticeship experiences in trade school and the workplace) differed between occupations. Importantly, apprentices' motivations were found to be malleable, suggesting employers, trade teachers, and industry groups can support apprentices through activities that promote positive, and reduce negative values in relation to trade school and the workplace.

The examined psychological process in these three studies, helped to explain how trade-specific apprenticeship factors influenced Australian apprentices' planned persistence and dropout considerations, providing a better understanding of levers to target to lift apprenticeship retention.

**Figure 1**

*Psychological Process for Apprentices' Dropout and Persistence Intentions*





## **Publications during enrolment**

Powers, T. E. (2015). Predicting apprenticeship retention: Not all trades are the same. In T.

Griffin (Ed.), *2014 postgraduate research papers: A compendium* (pp. 50-87).

NCVER. <http://hdl.voced.edu.au/10707/364600>

Powers, T. E. (2020). Motivated apprentices: The value of workplace and trade school.

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Powers, T. E., & Watt, H. M. G. (in review). Understanding why apprentices consider

dropping out - Longitudinal prediction of apprentices' workplace interest and anxiety.

*Empirical Research in Vocational Education and Training*.

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

This thesis includes one original chapter in a peer reviewed compendium and two original papers in peer reviewed journals; one published and the other under review. The core theme of the thesis is the motivational process behind apprentices' intentions to remain in or leave their training. The ideas, development and writing up of all the papers in the thesis were the principal responsibility of myself, the student, working within the Faculty of Education under the supervision of Professors Helen M. G. Watt and Paul W. Richardson.

In the case of chapter 6 my contribution to the work involved the following: I designed the study, collected and analysed data and wrote large parts of the manuscript. Professor Helen M. G. Watt contributed to the interpretation of data and provided inputs to writing. Both authors read and approved the final manuscript.

I have renumbered sections of submitted or published papers in order to generate a consistent presentation within the thesis.

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In this thesis by publication, all three studies have been submitted in peer-reviewed publications. Two of the three studies have already been published and are available in the public domain. For the third publication still in review, a pre-publication version of the article is presented in this thesis.

Studies	Publication	Publisher	Quality	Permission	Version in this thesis
1	Powers, T. E. (2015). Predicting apprenticeship retention: Not all trades are the same. In T. Griffin (Ed.), <i>2014 postgraduate research papers: A compendium</i> (pp. 50-87). NCVER.	NCVER	Double-blind peer reviewed chapter	Open access	Published version
2	Powers, T. E. (2020). Motivated apprentices: The value of workplace and trade school. <i>Journal of Education and Work</i> , 33(1), 81-97.	Taylor & Francis	SJR = .73 Q1 journal	“The right to include the article in a thesis or dissertation that is not to be published commercially, provided that acknowledgment to prior publication in the Journal is given.”	Published version
3	Powers, T. E., & Watt, H. M. G. (in review). Understanding why apprentices consider dropping out - Longitudinal prediction of apprentices’ workplace interest and anxiety. <i>Empirical Research in Vocational Education and Training</i> .	Springer Open	SJR = .32		Submitted version

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## Chapter 1 - Introduction

Apprenticeships are widely used internationally (Hogarth et al., 2012) as a means to motivate disconnected youth to reengage with education, reduce youth unemployment (OECD, 2017), and to produce a well-skilled labour force in the construction trades (OECD, 2010a). Trade apprenticeships that combine work and study have proven to be successful in easing the school-to-work transition, showing positive correlations with annual income and likelihood of maintaining employment (OECD, 2009a). The combination of workplace and formal trade school learning sets the apprenticeship system apart from the traditional education system where study precedes work. Incorporating work with apprenticeship study is common globally, including countries such as, Austria, Germany and Switzerland – the so-called “apprenticeship countries” – and Australia, Canada, the Netherlands, New Zealand, the United Kingdom and the United States (OECD, 2010b).

Despite widespread praise for the effectiveness of the apprenticeship system to provide a smooth transition for students from education to work, high rates of trade apprenticeship non-completion over the last two decades have continued to plague the industry (Dickie et al., 2011; National Centre for Vocational Education Research [NCVER], 2018) – in the Australian context these rates range from 44 to 46% (NCVER, 2013, 2019b). While Australian trade apprenticeship training takes place in post-secondary setting, low retention rates are also experienced in countries which host apprenticeship training within secondary schools. Countries such as Norway and Denmark that offer apprenticeships within the secondary school system experience a high take-up, but equally disappointing rates of attrition. For example, almost half of Denmark’s school students take the vocational track of typically 4 years, but only one-third of them complete it, whereas 65% of the students in the academic stream complete their program (Jorgensen, 2013).

Other countries that offer post-secondary apprenticeships, experience similarly low rates of completion as in Norway and Denmark. This includes completion rates of 59% in New Zealand (Ministry of Education, 2017), 47% in the USA (Bilginsoy, 2003), 40% in Canada (Meredith, 2011) and 64% in England<sup>1</sup> (Lamb, 2011).

Countries experiencing low completion rates have explored a variety of interventions. A number of countries, including Australia, England (Gambin & Hogarth, 2016) and Canada (Coe, 2013), have implemented various tax credits and grants, privatised (versus public) trade schools, imposed minimum completion rates (e.g., England requires 50% completion rates for training organisations to maintain accreditation), mentoring programs, and on-site training, with little success in reducing dropouts.

There are both personal and community impacts when apprentices drop out or seriously consider dropping out. Apprenticeships in the tertiary setting are primarily employment relationships that are viewed first and foremost as a job by apprentices (Dickie et al., 2011; Harris & Simons, 2005). This study focused on dropout considerations, which are informative to study not only because of their link to actual dropout of students (e.g., Bean & Metzner, 1985; Eicher et al., 2014; Sandler, 2000) and employees (see meta-analyses by Allen et al., 2010; Bauer et al., 2007; Griffeth et al., 2000). Dropout considerations are important to understand in and of themselves as they reflect a negative quality of apprenticeship experience that is undesirable. The entry experience into the workforce is an important influence on an individual's later working life; a good experience facilitates

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<sup>1</sup> Apprentices who drop out in the first 6 weeks are excluded from completion rate calculations which indicates England's 64% completion rate is overstated – by 15% on average, as estimated by Hogarth, T., Gambin, L., Hasluck, C., Hoyos, M., & Owen, D. (2009). *Maximising apprenticeship completion rates*. Learning and Skills Council. <http://hdl.voced.edu.au/10707/249077> . This infers a more accurate comparative figure is 49% for English completion rate (i.e., 64% minus 15%).

workforce integration (OECD, 2009a) and career progression (OECD, 2010b), whereas a poor experience can produce a “scarring effect” (Gambin & Hogarth, 2016) and be difficult to overcome (OECD, 2009a). However, early dropouts are not always undesirable (Stalder & Schmid, 2016), providing an opportunity for individuals to reassess educational and occupational choice that better suit their needs and interest (Schmid & Stalder, 2012). Given such changes can be stressful, early awareness is important for successful reengagement with education (Schmid & Stalder, 2012) and work. Student dropout intentions provide such an early warning and many predictors of student dropout are also reliable predictors of dropout intentions (Eicher et al., 2014). For the community, poor retention rates result in higher public training costs per qualified tradesperson and have been identified as a contributing factor to persistent skill shortages in Australian industries and traditional trades in particular (Karmel & Virk, 2006a; Ray et al., 2000).

Apprenticeship dropout is not always defined or measured in the same way. In the literature, reported statistics mostly refer to dropout during the first episode of training rather than possible eventual completion (Ball & John, 2005; Karmel & Virk, 2006b; Laporte & Mueller, 2013; Stromback & Mahendran, 2010), thus frequently overlooking recommencement figures (Mangan & Trendle, 2017).

Consequently, Australian reporting distinguishes “contract” and “individual” dropout rates, where individual dropout is based on contract cancellations adjusted for average recommencements in the same occupation (Karmel, 2011). While useful at the aggregate level, most studies on the reasons why apprentices leave their apprenticeship do not account for recommencements.

It is estimated that 35% of Australian trade apprentices who initially cancel their apprenticeship contract, recommence their apprenticeship in the same occupation within a five-year period (NCVER, 2020b). For those who do not, only 14% take up further

vocational education within the subsequent six months (NCVER, 2019a). This contrasts markedly with international statistics. For example, a German study found half of the apprentices who had dropped out of their training subsequently re-entered the apprenticeship system (West, 2005). A Swiss study of apprentices who had dropped out ( $N = 902$ ) found 48% had re-entered vocational education one month later (Stalder, 2013, p. 205): approximately half had switched to a different apprenticeship of either higher or lower intellectual requirement, and the other half continued their training in the same occupation with a different provider.

The seeming contradiction between the espoused effectiveness of the apprenticeship scheme and low completion rates raises important questions about why apprentices choose to persist or drop out. This has spawned a great deal of empirical research exploring factors which predict apprenticeship retention/dropout rates. In the context of extant Australian apprenticeship research, several studies have explored wide ranging sets of factors sourced from large-scale surveys (Cully & Curtain, 2001; Dickie et al., 2011; Misko et al., 2007) and/or administrative data collected by government agencies (Ball & John, 2005; Ray et al., 2000; Stromback & Mahendran, 2010), or a combination of both (Callan, 2000). Factors explored in such studies largely relate to individual characteristics (e.g., age, past experience, prior level of education, level of interest) and perceptions of workplace and trade school learning characteristics and experiences (e.g., public vs. private training provider, quality of teaching, firm size, wage, job security). While such studies have identified lists of factors *associated* with apprenticeship retention and dropout, they have not led to generalisable findings which accurately predict apprentices likely to drop out. Worryingly, studies have demonstrated conflicting results (Bednarz, 2014) depending upon the factors included in studies.

Context is often overlooked in quantitative apprenticeship research (Mikkonen et al., 2017). Responding to this concern, the current research explored context in relation to: (a) learning environments, and (b) occupations. Factors situated in trade school and the workplace learning environments commonly feature in apprenticeship research, but with little analyses on their interrelationship. Furthermore, apprenticeship research on retention-related factors overwhelmingly attempts to generalise across apprenticeship occupations, despite findings which highlight differences in completion rates between occupations (NCVER, 2012; Seymour et al., 2012; Stromback & Mahendran, 2010). As an example, licenced trade occupations which require an apprenticeship qualification (e.g., plumbers and electricians) exhibit higher retention rates compared with unlicensed occupations (e.g., carpenters and bricklayers) which do not require a qualification. Such discrepancies in apprenticeship retention rates across occupations suggest factors which associate with retention may also differ across occupational context (Cully & Curtain, 2001; Stromback & Mahendran, 2010).

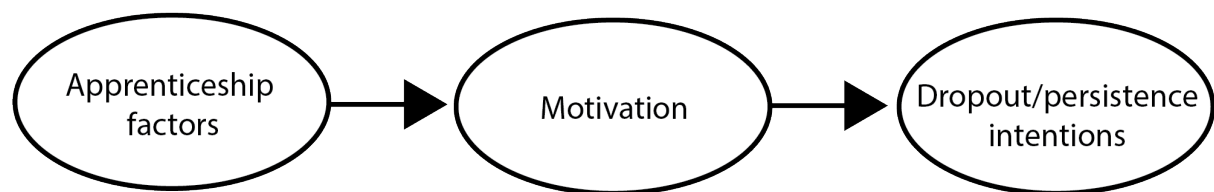
At the individual level, varying perceptions of apprenticeship experiences which have been associated with retention, such as interest, commitment to complete (Callan, 2001; Misko et al., 2007; Mitchell et al., 2008) and stressful treatment (Cully & Curtain, 2001; Misko & Wibrow, 2020; Snell & Hart, 2008) imply a psychological process. This suggests apprenticeship-related factors may inform more proximal socio-cognitive processes in decision making (Bandura, 1989; Weiner, 1979) which give interpretation to how factors may differentially influence individual choice processes. To illustrate, excessive work demands may be a positive challenge for some apprentices, while overwhelming for others (Cully & Curtain, 2001; Van Ruysseveldt & Van Dijke, 2011). Such findings have led to calls for interpretive frameworks (Harris, Willis, et al., 2001; Stromback & Mahendran, 2010) and stronger theory-driven research (Shah, 2017) to make sense of results in apprenticeship research on wide-ranging sets of factors.

Expectancy-value theory (EVT; Eccles-Parsons et al., 1983) provides a major conceptual framework through which to understand how motivational values directly explain individual choice and persistence. EVT has demonstrated motivational values are, in turn, informed by a variety of sources including interpretations of positive and negative experiences, shared beliefs, task-related supports and demands (Wigfield et al., 2016). This provides placement of retention-related factors in apprenticeship research as determinants of motivational values. Such a psychological process may clarify Australian apprentices' decision-making process and why factors are associated with the retention process. For instance, while employer feedback has been positively associated with apprentice retention (Callan, 2001; Harris, Willis, et al., 2001), apprentices may find employer feedback on a task as useful, important, and/or interesting, while others may even find such feedback anxiety provoking. Even though apprenticeship research has acknowledged motivation as important to apprenticeship retention (Harris & Simons, 2005), EVT theory has rarely been empirically applied in the study of Australian trade apprentices' retention-related factors.

### **1.1 Aim of Research & Questions**

This research sought to explore retention-related factors that inform the underlying psychological process concerning Australian trade apprentices' motivations for planned persistence or dropout considerations in their apprenticeship. Although previous research has identified many factors associated with dropout, the lack of empirical findings that accurately predict apprentices seriously considering dropping out may suggest: a) an underlying psychological process that has not been incorporated into extant apprenticeship research, and b) generalising factors across apprenticeship occupations confounds accurate predictions within particular trades. Backed by theory and empirical research, this research posits that apprenticeship retention is informed by apprentices' motivational values, which are, in turn, influenced by trade-specific factors (see Figure 1.1).



**Figure 1.1***Overview of Theoretical Framework*

Consequently, this research aimed to empirically examine apprenticeship factors and apprentices' motivational values within and across apprenticeship trade occupations, that predict apprentices' intentions to persist or seriously consider dropping out. The research explored this aim sequentially through the following research questions:

1. Do trade-apprenticeship factors (individual and training-context characteristics) which predict apprentices' dropout considerations differ between trade occupations?
2. How are apprentices' intentions to persist predicted by motivational values, and do motivational values differ between learning environments (trade school vs. workplace) and occupations (licensed vs. unlicensed)?
3. Does growth in motivational values predict dropout considerations, and is this growth influenced by apprenticeship factors (e.g., lack of information, excessive work, structured teaching, job security)?

This PhD study set out to address the three core research questions, through three published studies. Study 1 drew on data from two separate surveys, funded by the Australian

government<sup>2</sup>, involving a common set of measures, which targeted plumbing ( $N = 1,016$ ) and bricklaying ( $N = 369$ ) apprentices during 2008 and 2009 respectively. Study 1 addressed the first research question by comparing factors associated with apprenticeship dropout considerations (i.e., *I have seriously considered dropping out of my apprenticeship*) across these two occupations, which underpinned the subsequent motivation theory-driven publications.

Studies 2 and 3 both drew on separate data of a longitudinal study of 2,044 Australian trade apprentices collected during 2015 and 2016 by the candidate. This was referred to as the “FLARe Project” (Factors Lifting Apprenticeship Retention), in which carpentry, bricklaying, plumbing and electrical apprentices were surveyed on four occasions roughly six months apart, with the intent to explore their development of motivational values and effects of their perceived individual and learning context factors.

Study 2 addressed research question 2, by probing how motivational values predicted apprentices’ intentions to persist with their apprenticeship, and whether such values were distinct between workplace and trade school learning environments. Such a comparison was possible due to the unique situation where work and study co-occur for apprentices.

Research question 3 was taken up by Study 3 using longitudinal data to explore the growth trajectories of motivational values during the apprenticeship. Growth trajectories were analysed for their capacity to predict dropout considerations, while pre-entry factors explored why such trajectories may differ between individuals (i.e., role model experience, career indecision, lack of information, time spent deciding), or within-person during their

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<sup>2</sup> Department of Education, Science and Training

apprenticeship experience (i.e., excessive work, employer teaching, wage, job security, perceived expertise).

## **1.2 Theoretical Frameworks**

In a broad sense, motivational researchers aim to understand what drives people to action, and why they think and do what they do (Wigfield et al., 2015). A theoretical framework is needed to understand these psychological processes (Lent, 2001; Richardson & Watt, 2010), and how they are affected by the context in which they occur (Eccles & Wigfield, 2020; Wigfield & Cambria, 2010a).

Specifically, the present research draws on expectancy-value theory (EVT, Eccles-Parsons et al., 1983) to explore whether and how motivational values can explain apprentices' intentions to persist or drop out. EVT highlights four subjective task values (STV) as the most proximal psychological determinants of choice: interest, usefulness, importance and costs (e.g., anxiety). Empirical evidence supports the premise that when individuals consider a task highly valued, they are more likely to persist (Wigfield & Eccles, 1992). Past studies have demonstrated STVs to be strong predictors of students' course selection (Wigfield & Eccles, 2000), educational persistence (Meece et al., 1990), and career choice aspirations, for example: science, technology and mathematics fields (Jacobs, 2005; Wang et al., 2013); teaching (Richardson & Watt, 2006); and information technology careers (Zarrett & Malanchuk, 2005).

Within the Eccles et al. model (Eccles, 2005), STVs are in turn influenced by task-related characteristics, and individuals' interpretation of their past and current experience. These may support or undermine STVs. This theoretical framework provides a comprehensive model to study apprentices' psychological process alongside factors commonly associated with apprenticeship retention.

These apprenticeship retention-related factors were further framed within the job demands-resources model (JD-R; Demerouti et al., 2001) in Study 3. The JD-R model distinguishes supportive (resources) from undermining (demands) factors, in the work context, to predict health-impairment and motivational processes (Bakker & Demerouti, 2017; Bakker, Demerouti, Taris, et al., 2003); two linked psychological processes. Past studies have demonstrated these psychological processes mediate the relationship between job resources/demands (e.g., skill variety and work overload) and turnover intentions in a variety of settings (e.g., healthcare, insurance, and home-care employees; Hakanen et al., 2008; Knudsen et al., 2009; Schaufeli & Bakker, 2004). This is consistent with EVT where task-related factors influence motivational values, which in turn predict choice intentions. JD-R informs the analyses by framing apprenticeship retention-related factors as resources and demands which predict different patterns of motivational values. Such consequences may imply different intervention strategies to enhance retention (Schaufeli & Bakker, 2004) or appropriate reconsiderations (Stalder & Schmid, 2016) in the context of Australian trade apprenticeships.

### **1.3 Background on Australian Trade Apprenticeships**

The Australian apprenticeship system is characterised by concurrent on- and off-the-job training which incorporates a national curriculum and a training contract registered with the State or Territory Training Authority. This structure may imply a highly regulated and consistent training regime, but that is only partially correct. While the dual learning environment is utilised for apprenticeships in many other countries such as Germany, Switzerland, Canada, and the U.K. (among others), there are aspects which distinguish the Australian apprenticeship systems. This section provides a description of the Australian apprenticeship system.

Common to all Australian apprenticeships are a registered legal contract of training (signed by the apprentice, employer and a registered training organisation) with paid employment. Australian apprenticeships include on-the-job training and formal trade school training (usually off-the-job) leading to a nationally recognised tertiary qualification to the standards set down in the Australian Quality Training Framework (NCVER, 2011).

### ***1.3.1 Pathways into Trade Apprenticeships***

Australian trade apprenticeships offer Certificate III level qualifications in the tertiary learning context. It is common to enter a trade apprenticeship after completing, or partially completing secondary school. The average age of commencing trade apprentices was 21 years in 2017, with 67% of apprentices aged 15 to 20 years<sup>3</sup>. This sits apart from countries where students are streamed into academic or vocational pathways at an earlier age based on achievement, such as in Switzerland at grade ten and Germany at grade five (Blanden et al., 2005).

There are few barriers to entry into Australian apprenticeships. Apart from the need to find an employer willing to take on an apprentice, there are no prior qualifications, pre-training, or industry entry requirements. Notwithstanding, gaining a trade apprenticeship can be challenging within some occupations, signalling industry-level reasons for differences in retention rates (Cully & Curtain, 2001; Stromback & Mahendran, 2010). In some industries it is quite competitive to gain an apprenticeship (e.g. electrical), while other industries (e.g., bricklaying) find it difficult to attract suitable applicants (Smith & Kemmis, 2013) leading to a recruiting perspective rather than a selection focus. Employers that utilise a rigorous selection process (e.g., several rounds of interviews) tend to have higher completion rates

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<sup>3</sup> Source: VOCSTATS <<http://www.ncver.edu.au/resources/vocstats.html>>, extracted on 05/10/2018.

(Bednarz, 2014) as compared to employers who try to recruit “anyone” to enter (Dickie et al., 2011).

Trades that require a qualification (i.e., licensed trades) appear to be more sought after by those considering an apprenticeship. The electrical and plumbing trades are licenced in Australia, requiring qualification gained through an apprenticeship, to be able to work on a jobsite. Rates of retention are higher for licensed apprenticeships in Australia (NCVER, 2017; Seymour et al., 2012) and abroad: Canada (Coe, 2013), the U.K. (Hogarth et al., 2009), and New Zealand (Mahoney, 2009). Some have suggested that the future earnings implicit in licenced trades explains this higher retention (Karmel & Mlotkowski, 2011). Relatedly, others have argued that retention rates are higher in industries that value formal qualifications as a key “entry ticket” into them (Dickie et al., 2011; Dumont et al., 2017, p. 858). In contrast, countries (and trades) where employers value and reward employment *experience* over formal qualifications tend to have proportionately smaller apprenticeship systems; examples include the U.K. (Wolf, 2011) and Canada (Meredith, 2011). However, the perceived status of an apprenticeship qualification can vary by trades across countries, especially where certain trades have a long-standing tradition of apprenticeship training within the country, such as shipbuilding, engineering, and construction in the U.K. (Miller, 2013).

### ***1.3.2 Trade School Training***

A registered training organisation (RTO) must oversee the delivery and assessment of the formal training for Australian apprenticeships. This is highly regulated within Australia. The apprenticeship framework and curriculum are overseen by the federal level of government (the Commonwealth) while States and Territories provide funding. *Public* RTOs, referred to as Technical and Further Education (TAFE) institutes are managed by the States

and Territories. *Private* RTOs exist in Australia but are not prevalent in trade training delivery.

Despite a strong national curriculum, differences in RTO funding have led to differences in qualification requirements between States and Territories. Even though the national curriculum designates subjects (i.e., referred to as units) and the competencies which must be covered, not all States and Territories mandate the same subjects within a trade. The primary driver for such State and Territory differences in subjects delivered is funding; translated into funded contact hours allotted for a trade qualification. This can result in substantial differences in funded hours, and therefore subjects, required to obtain a qualification between jurisdictions. For example, funded contact hours for plumbing trade school ranged from 831 (in Tasmania) to 1,554 (in Queensland) and designated different sets of subject requirements from the national qualification (Powers & Walker, 2006).

Australian apprentices attend trade school one day per week or, in week blocks which make up roughly 20% of their worktime. Learning by distance, on-line, or fully on-the-job is provided for within the Australian vocational education and training (VET) system, but occurs rarely within the construction trades. Conspicuously, some States and Territories require a minimum level of face-to-face contact hours to access funding. This reflects the general view that fully on-the-job training is considered substandard (Smith et al., 2011), but whether this is actually true has not been systematically researched.

Assessments in trade school are overseen by RTOs with few final, or summative examinations. Such examinations were more common in the past and were conducted by State training authorities or other external bodies. The current rationale is that the national curriculum should provide sufficient quality assurance for each assessed competency. Notwithstanding, some contend that the quality of training has been diminished as a result (Smith & Kemmis, 2013). Final examinations are required for only a few licenced trades such

as electrical and plumbing in Australia, but only in certain jurisdictions. This contrasts with the strict final assessments conducted in other countries such as Germany and Canada.

### ***1.3.3 Workplace Training***

There is little regulation of Australian employers who may take on an apprentice, or oversight of the provision of their workplace training (Smith & Kemmis, 2013). While employers are expected to provide a beneficial learning environment, the system relies heavily on the goodwill of employers (Snell & Hart, 2007). This is particularly concerning, since workplace-related reasons are the most commonly cited for apprentices not completing their apprenticeships in Australia (see reviews, Bednarz, 2014; Nelms et al., 2017). Countries with similarly unregulated on-the-job oversight also note these reasons for apprenticeship dropouts: the U.K. (Berglund & Loeb, 2013) and New Zealand (Alkema et al., 2016) are examples. There is evidence that many Australian employers believe that apprenticeship training will increase their business performance (Powers, 2013), but do not fully understand their responsibilities to train (Harris, Simons, et al., 2001) or how to effectively implement workplace training (Smith, 2000). Apprentices' skill development on-the-job can therefore be inconsistent, and some employers even actively avoid providing training when they perceive it as unproductive use of their time (Meredith, 2011). The lack of regulated employer guidance for workplace training may lead employers to protect production levels by assigning apprentices to simple tasks with diminished learning opportunities (Gurtner et al., 2011; Savoie-Zajc & Dolbec, 2003). Without active employer training, the initiative to ask for assistance often lies with the apprentice (Brooker & Butler, 1997), which can be met with varied responses including employer's impatience when there is a focus on production over training (Smith, 2000).

There are other countries that regulate workplace training of apprentices, to some degree. This may involve setting maximum ratios of qualified workers to apprentices



(Canada), or some form of trainer certificate (Germany and Switzerland). Such trainer certification often delivers employer training on topics such as selection, contracting an apprentice, and preparing apprentices for external exams. Although such training can contain limited pedagogical training (Filliettaz, 2010), or guidance on how much time should be committed to workplace training, it does provide some delineation of the employer's teaching role.

While employer certification requirements may seem to be a barrier to hiring an apprentice, countries which have such employer regulation (e.g., Switzerland and Germany) attract a large proportion of the population into apprenticeship training. The societal status of the apprenticeship system is high in these countries, and most companies show preference for hiring certified workers as opposed to an unqualified person with experience in the trade (Dumont et al., 2017; Smith & Kemmis, 2013). This stands in contrast to Australia where workplace experience is considered the primary indicator of vocational skills as opposed to a qualification (Sappa et al., 2016).

#### **1.4 Contribution and Significance**

This study makes several contributions that have been long called for in the extant Australian literature on apprenticeship retention, including clear grounding in theoretical frameworks (Harris & Simons, 2005; Stromback & Mahendran, 2010), and the exploration of contextualised determinants of apprenticeship decision making process (Karmel & Roberts, 2012; Mikkonen et al., 2017).

Drawing on EVT and its integration with the JD-R model, this thesis is significant in apprenticeship research by incorporating motivational values from expectancy-value theory in the psychological processes to explain more fully the effect of factors long associated with apprenticeship retention. The JD-R model provides a framework for analysing apprenticeship factors as supportive (resources) or undermining (demands) determinants of motivational

values providing a theoretical lens to better understand the psychological process. There are theoretical and practical implications to this research.

From a practical perspective, if motivational values are key to apprentices' intentions to persist or drop out, then extant literature on retention-related factors must pivot toward indirect influences through motivational values. This would change the focal lever for educators and policymakers, to target factors which are pro-motivational. Potential differences in how motivational values may predict retention across learning environments (trade school versus on-the-job) and occupations, could enable tailored interventions. Heeding calls to consider context more explicitly (Eccles & Wigfield, 2020), this research sought to better understand why trade apprentices may consider dropping out.

Theoretical implications include exploration of motivational values across trade school and workplace learning environments. Investigating whether values are distinct or additive across the two concurrent learning domains will inform the interplay between these two and provide greater clarity as to the factors which influence the formation of these motivational values.

## **1.5 Thesis Structure**

The thesis is structured in the following manner: The following chapter presents the literature review (Chapter 2) which underpins the theoretical approaches to the published studies. Chapter 3 presents an overview of the data sources, measures and methods of analysis and the rationale for such approaches in the context of the multiple studies. Chapters 4 to 6 present each of the three publications that targeted the three research questions. Finally, Chapter 7 presents an overarching discussion of the findings, implications and concluding remarks for improving apprenticeship retention.

## **Chapter 2 - Literature Review**

This chapter examines apprenticeship research on retention-related factors and literature concerning individuals' psychological motivational process. The first section of this chapter addresses extant research in the Australian setting on trade apprenticeship factors associated with retention and dropout. This is followed by a section presenting the theoretical lenses employed in this study, beginning with an examination of subjective task values (STVs) from expectancy-value theory (Eccles-Parsons et al., 1983) in their motivational role to predict apprenticeship intentions to persist or dropout. The third section explores the role of context in relation to between-person differences across occupations (i.e., licensed and unlicensed) and within-person differences across learning environments (i.e., trade school and workplace). Finally, the job demands-resources model (JD-R, Demerouti et al., 2001) is examined to frame previously identified factors as demands and resources to better understand the process by which apprentices come to value some activities over others.

### **2.1 Australian Apprenticeship Retention-Related Literature**

There has been no shortage of large-scale studies examining numerous aspects of the apprenticeship experience associated with high dropout rates among apprentices in Australia. Cognisant of the financial waste and economic impact (Karmel & Rice, 2011), government agencies at federal and state levels have worked to collect data and fund research on the vocational education system within Australia. Consequently, there is a rich source of apprenticeship literature in Australia which explicitly aims to determine the reasons for apprentices' commencements, dropouts and completions. This apprenticeship literature reviewed here is remarkable for its breadth of "factors" explored. Within this apprenticeship literature, factors refer to a wide range of predictors or correlates of retention/dropout rates such as personal characteristics, demographics, attitudes, sources of influence (e.g., parents,

mentors, information about apprenticeships), and characteristics of the training (e.g., block vs. day release, occupation, work conditions, pay).

Given this wide remit, several studies have been funded by federal (Ball & John, 2005; Cully & Curtain, 2001; Karmel & Mlotkowski, 2010a; Misko & Wibrow, 2020; Ray et al., 2000), state governments (Callan, 2000; Dickie et al., 2011; Misko et al., 2007; Seymour et al., 2012; Stromback & Mahendran, 2010), and industry organisations (Mitchell et al., 2008). Several government-funded studies have been coordinated by the National Centre for Vocational Education Research (NCVER), which is a not-for-profit Australian company owned by state, territory and federal ministers responsible for training<sup>4</sup>. As an independent body responsible for collecting, managing, analysing and communicating research about VET, much of apprenticeship research presented here is grey literature; outside traditional commercial or academic publishing (Schopfel & Farace, 2010). Notwithstanding, several studies included in this apprenticeship literature review are also published in academic journals (e.g., Gow, Hinschen, et al., 2008; Harris & Simons, 2005; Snell & Hart, 2008).

Although these research initiatives have highlighted a wide range of factors associated with apprenticeship completions and dropouts, by and large, research has not identified a generalisable set of factors which accurately predict successful completions or dropouts. The following sub-sections reviews the apprenticeship literature and identifies the gap the present set of studies seeks to address.

### ***2.1.1 Common Factors Associated with Retention and Dropout***

Over the last two decades, a large body of Australian research into the wide range of factors associated with apprenticeship retention and dropout rates has largely been framed by

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<sup>4</sup> This research was supported by NCVER through a “PhD Top-up Scholarship”.

stakeholder groups. For instance, most studies with large datasets involving several factors – including quantitative (Cully & Curtain, 2001; Ray et al., 2000; Stromback & Mahendran, 2010) and qualitative approaches (Harris & Simons, 2005; Misko & Wibrow, 2020; Snell & Hart, 2008) – have often categorised factors under headings which include:

- individual/personal,
- trade school, and
- employer.

This categorisation has also featured strongly in international studies, including examples from the U.K. (Gambin & Hogarth, 2016; Hogarth et al., 2009), Finland (Virtanen et al., 2014), and New Zealand (Alkema et al., 2016). These three headings represent the key stakeholders most directly involved in apprenticeship training. In Australia, they are the signatories to the registered legal training agreement required for an apprenticeship (NCVER, 2011). The stakeholder perspective in research likely derives from methodological approaches by which data have been sourced. Interviews, focus groups, and surveys are commonly used by researchers as methods of collecting data from apprentices, trainers, and/or employers (e.g., Callan, 2001; Cully & Curtain, 2001; Dickie et al., 2011; Mitchell et al., 2008). Alternatively, many research studies utilise administrative datasets (e.g., Ball & John, 2005; Ray et al., 2000; Stromback & Mahendran, 2010) reported by trade schools to state and nationally managed data collection agencies (e.g., Total VET Activity is reported to NCVER). Studies that utilise such datasets also tend to present findings under stakeholder categories, given they primarily focus on apprentices' demographic information (e.g., age, gender, prior educational attainment, location, pre-apprenticeship courses) and recorded training characteristics (e.g., qualification, registered training organisation, mode of delivery, location, industry sector, employer type and size).

Common apprenticeship retention-related factors sourced from Australian studies over the last two decades are presented in Table 2.1. These studies included large samples, several apprenticeship factors across stakeholders, and were often commissioned by government agencies (see Appendix A for studies associated with each factor).

**Table 2.1***Common Australian Apprenticeship Retention and Attrition Factors*

Individual	Training provider	Employer
Gender	Provider type – TAFE, private	Geographic location
Age		Matching expectations
SES	Facilities and equipment	Firm size
Prior level of schooling	Duration of training	Firm type - GTO or direct
Geographic location	Mode – block vs. day	Occupation/industry
Cultural background	Relevance to current workplace	Secure employment
Personal traits or attributes	Quality of teaching	Quality of training
Strong interest in occupation	Training support	Structured training
Determined to complete	Satisfaction with teachers' knowledge	Task variety
Prior work experience	Difficulty of course	Employer feedback
Pre-apprenticeship	Valuing of qualification	Employer support
Informed about apprenticeship		Appropriate learning of skills
Consideration of alternative occupations		Meaningful work
Realistic expectations		Good relationship with employer
Personal problems		Working conditions
Personal support to cope with changes/problems		Work hours
Supportive family & networks		Wages
		Emotional challenges (e.g. bullying)
		Respect and recognition

*Note.* Developed from Australian studies since 2000 which explored a wide range of factors associated with Australian apprenticeship retention and dropout. See Appendix A for associated studies.

### ***2.1.2 The Multivariate Modelling Challenge***

There is strong agreement among apprenticeship researchers in Australia that a range of interrelated factors impact retention (Harris & Simons, 2005; Nelms et al., 2017; Stromback & Mahendran, 2010). However there is little examination of how these factors interrelate (Mitchell et al., 2008). This concern is mirrored by apprenticeship researchers in other countries, such as the U.K. (Gambin & Hogarth, 2016), Canada (Crocker et al., 2010), and Switzerland (Negrini et al., 2016; Schmid & Stalder, 2012). While lists of retention-related factors provide an important “starting point”, there are calls for a greater understanding of how these factors relate to one another as part of an explanatory system (Harris & Simons, 2005, p. 356). Without a theoretically derived set of factors or order of hierarchical regression, important and practical findings may be overlooked when too many competing factors are modelled indiscriminately. Even excluding important factors may have detrimental consequences methodologically (i.e., missing variable bias, McCallum, 1972).

### ***2.1.3 Mixed Results in Australia***

Results depend upon which factors are included or excluded in apprenticeship research, with examples involving employment size, apprentice age, location, pre-apprenticeship training, wages, and employment arrangement. For instance, there is evidence that apprenticeship attrition is lower for larger employers with more apprentices as compared with small employers with only one apprentice (Bednarz, 2014). However, this is not consistently the case across occupation (Karmel & Roberts, 2012). Similarly, studies have shown older apprentices to be less likely to dropout (Ball & John, 2005), while other studies have found age effects to be minor (Callan, 2000), or unrelated, when controlling for many other factors (Stromback & Mahendran, 2010). Even with similar control factors, some studies have found that apprentices in rural areas are more likely to complete (Ball & John, 2005; Snell & Hart, 2008), while others found only marginal effects of location (Callan,

2000; Ray et al., 2000). Interviews with apprentices suggest challenges for rural apprentices may have opposing effects: rural challenges such as travel to trade school, and finding suitable accommodation may undermine retention, whereas the lack of alternative employment may heighten apprentices' determination to continue (Harris, Simons, et al., 2001). Studies have also revealed inconsistent outcomes for apprentices who took a *pre*-apprenticeship program prior to their apprenticeship. As might be expected, certain studies indicated higher completion rates (Seymour et al., 2012; Stromback & Mahendran, 2010), whereas others were unable to find any significant differences in apprenticeship completion rates (NCVER, 2010).

Apprenticeship wages have demonstrated inconsistent relationships with completion rates (Bednarz, 2014). In Cully and Curtain's (2001) study of non-completing apprentices, 54% left because they were being treated as cheap labour. In a similar study, Callan (2000) reported 36% of apprentices dropped out because of low wages. Qualitative research affirms low apprenticeship wages as one of the most common reasons nominated by apprentices for their departure (Dickie et al., 2011; Harris & Simons, 2005; Snell & Hart, 2007). Yet, in the national Apprentice and Trainee Destination Survey (NCVER, 2010), apprentices' wages were rated as of low importance to satisfaction and only emerged as a stronger factor when other aspects of the apprenticeship were perceived as unfair (Dickie et al., 2011). For instance, in a mixed methods study involving apprentice focus groups, interviews, and surveys ( $N = 1,200$  apprentices; including 900 current apprentices and 300 who had dropped out), apprenticeship wages were perceived in different ways (Dickie et al., 2011). For apprentices with high intentions to complete their apprenticeship, "merit or competency based pay is recognition of their motivation and achievements; for some discontinued apprentices, artificially structured pay scales are symptomatic of other unfair practices" such as pay scales based on time served or lower pay rates relative to their working peers (Dickie



et al., 2011, p. 30). Other researchers have claimed that the premium attached to future wages as a qualified tradesperson is more influential than the training wage (Karmel & Mlotkowski, 2011), and that lower apprenticeship wages can be perceived in a more positive light, as a fair trade-off for workplace training (Cully & Curtain, 2001; Dickie et al., 2011).

Direct versus indirect employment has also attracted interest with inconsistent implications for retention. Trade apprentices may be employed directly by a qualified tradesperson, or indirectly through a group training organisation (GTO). GTOs place apprentices with a host employer and charge a small premium over apprenticeship wages in return for administration, some supervision and pastoral care, and the flexibility for the host employer to return the apprentice if they run out of work. This can also benefit the apprentice. For example, carpentry apprentices felt their GTO helped solve issues around a lack of work variety and poor working conditions (Harris, Simons, et al., 2001). Studies using large government datasets have reported inconsistent results while controlling for multiple factors (e.g., age, sex, prior education, indigenous background, employer size); sometimes presenting GTOs with slightly higher (Karmel & Roberts, 2012) or sometimes lower completion rates (Seymour et al., 2012; Stromback & Mahendran, 2010). Findings of lower completions for GTOs have raised concerns since GTOs offer many of the characteristics which have previously been found to be associated with increased completion rates, such as work variety, support, and mentoring (Bednarz, 2014; Nelms et al., 2017). While it has been suggested that tradespeople who employ directly are afforded greater control (Nechvoglod et al., 2009), anecdotal evidence suggests employers poach committed and capable apprentices away from a GTO employment arrangement in order to save costs.

While studies have indicated apprentices are motivated to complete their studies by extrinsic factors related to wages, working hours (Misko et al., 2007; Snell & Hart, 2008), and attaining a qualification (Cully & Curtain, 2001; Harris & Simons, 2005), intrinsic

factors such as personal interest in the work and an abiding commitment to succeed (Callan, 2001; Misko et al., 2007; Mitchell et al., 2008) appear to play an important role in retention. However, such attitudes are influenced by family, friends (Callan, 2001) and employers (Bednarz, 2014; Dickie et al., 2011) in ways that can be supportive or undermining through their influential views on occupational status, knowledge concerning the occupation, including working conditions, pay (Dickie et al., 2011) and familiarity with the role (Karmel & Roberts, 2012). There are indications that influencers appear to differ across industries in the VET sector (Callan, 2001; Misko & Wibrow, 2020). In contrast, Cully and Curtain's (2001) survey of apprentice dropouts found no clear association between dropouts and how informed apprentices were about their occupation and the working environment. Elsewhere, researchers have argued apprentices are well informed about the occupation, but lack sufficient information about the employer (e.g., Switzerland; Stalder & Schmid, 2016).

Anxiety provoking factors experienced by apprentices during their on- and off-the-job training have also demonstrated varying association with retention. A variety of stress-related factors associated with work conditions have been associated with dropout (Cully & Curtain, 2001; Misko & Wibrow, 2020) including bullying (Callan, 2000), a lack of supervision (Misko & Wibrow, 2020; Snell & Hart, 2008), harassment at work (Harris & Simons, 2005), and interpersonal issues with employers and work colleagues (Dickie et al., 2011; Misko et al., 2007). However, other researchers have found little difference on these factors when directly comparing apprentices who remain and those who drop out (Snell & Hart, 2008). Anxiety has also been associated with apprentices who experience trade school difficulties with learning the theory and technical aspects of their trade (Misko & Wibrow, 2020), but such perceptions have not consistently predicted retention or dropout intentions (Gow, Warren, et al., 2008). Others have argued that such anxiety-provoking factors across trade school and workplace learning environments are cumulative, whereby apprentices may cope

with some of these stressful demands, especially when there are countervailing supports or rewards in the not-too-distant future (Harris & Simons, 2005).

The quality of training in the workplace and trade-school has been associated with retention and dropout rates (Callan, 2000, 2001; Harris & Simons, 2005; Snell & Hart, 2008). However, different contexts afford different learning opportunities depending on the methods utilised and opportunities available (Butler & Brooker, 1998; Fuller & Unwin, 2011). Workplace learning is often viewed as active, practical, experiential, while trade school is perceived as passive, conceptual and reflective (Harris, Simons, et al., 2001). While some argue for higher integration between trade school and workplace training programs (Harris & Simons, 2005), others argue this is challenging given the two learning environments hold differing focus – a production focus at work and practice emphasis in trade school (Butler & Brooker, 1998). This may suggest that what apprentices find interesting or stressful in the workplace may differ from their experience in trade school.

#### ***2.1.4 Untangling the Results***

The mixed results from Australian apprenticeship research suggest retention-related factors cannot be generalised across individuals and contexts. Results may suggest that a stronger guiding framework is needed beyond the stakeholder perspective – individual, trade school providers and employers of apprentices – that seeks to frame the decision making process for dropouts that accounts for their different learning context, occupational context, and how they interpret their experiences across these two areas of contexts. There appears to be cognitive interpretation of factors that signals a psychological process that motivates individuals to persist or drop out. It is the contention of this research that framing contextualised factors within this psychological process will explain not only how, but why apprentices form intentions to dropout or persist.

#### *2.1.4.1 The Psychological Process*

There have been calls for a better understanding of “unobserved factors” which underlie the observable demographic and learning environment characteristics commonly analysed in apprenticeship research (Stromback & Mahendran, 2010). Without naming these “unobserved factors”, Stromback and Mahendran (2010) noted that observed factors such as age, gender and level of schooling “do not affect the probability of completion directly. Rather, persons of a certain gender, age and level of schooling tend to have some common characteristics, preferences and opportunities that lead them to make similar choices” (p. 78).

While interest and anxiety-related factors appear prevalent in the Australian apprenticeship literature, they may signal a useful psychological mechanism by which individual and training characteristics are interpreted. Subjective task values (Eccles-Parsons et al., 1983; Eccles, 2005, 2009) have been used meaningfully to predict why situated experiences and individual factors (Eccles & Wigfield, 2020) influence academic and career choice decisions.

There is a rich literature on motivation that has examined its role in education-related choices. Given the rate at which trade apprentices choose to leave their training, a motivational theory that predicts achievement-related choice seems well suited to a better understanding of the retention process. Although motivation is regularly discussed as fundamental to apprenticeship retention and dropout decisions in Australian apprenticeship literature (Alkema et al., 2016; Colquitt et al., 2000; Harris & Simons, 2005; Snell & Hart, 2008), motivation is used as an umbrella term in relation to underlying observable changes in initiation, engagement and persistence (Kanfer et al., 2017). These references to motivation and “unobserved factors” imply the need to explore the psychological motivational processes underpinning the common researched factors summarised in Table 2.1.

#### *2.1.4.2 Differing Contexts*

Much retention-related research has been conducted on apprentices as a collective, despite known differences in retention rates at the occupational level (Ball & John, 2005; NCVER, 2012). Harris and Simons (2005) were explicit in their view that the process of retention “can only be fully understood within the context of a particular occupation’s culture” and that analyses of factors affecting attrition across all apprenticeships can only be general (p. 360).

Further, factors across trade school and workplace contexts are commonly analysed together with little concern for how they may interrelate. As such, contexts that explain between- and within-person difference in retention are largely underappreciated (Johns, 2006) and not explicitly theorised in apprenticeship research (Mikkonen et al., 2017).

#### *2.1.4.3 Framing Factors as Resources and Demand*

Much of apprenticeship research into retention has been empirically rather than theoretically driven. This has raised calls from researchers regarding the need for an interpretative framework (Stromback & Mahendran, 2010), that elucidates the reasons apprentices choose to stay in or leave their training (Shah, 2017). Apprenticeship factors commonly derive from studies focused on either retention (Callan, 2001; Harris & Simons, 2005; Stromback & Mahendran, 2010) or dropouts (Callan, 2000; Cully & Curtain, 2001; Ray et al., 2000; Snell & Hart, 2008). By nature, this uncovers factors which are supportive or undermining of apprenticeship retention. Framing such factors as resources and demands (see discussion of JD-R model later) may provide a more informed understanding of the dropout decision process for Australian apprentices.

The following section outlines the motivational theory used to guide examinations of the psychological process for apprentices’ choice to persist or dropout. After tapping these individual processes, contextual processes are described in the proceeding section, where the

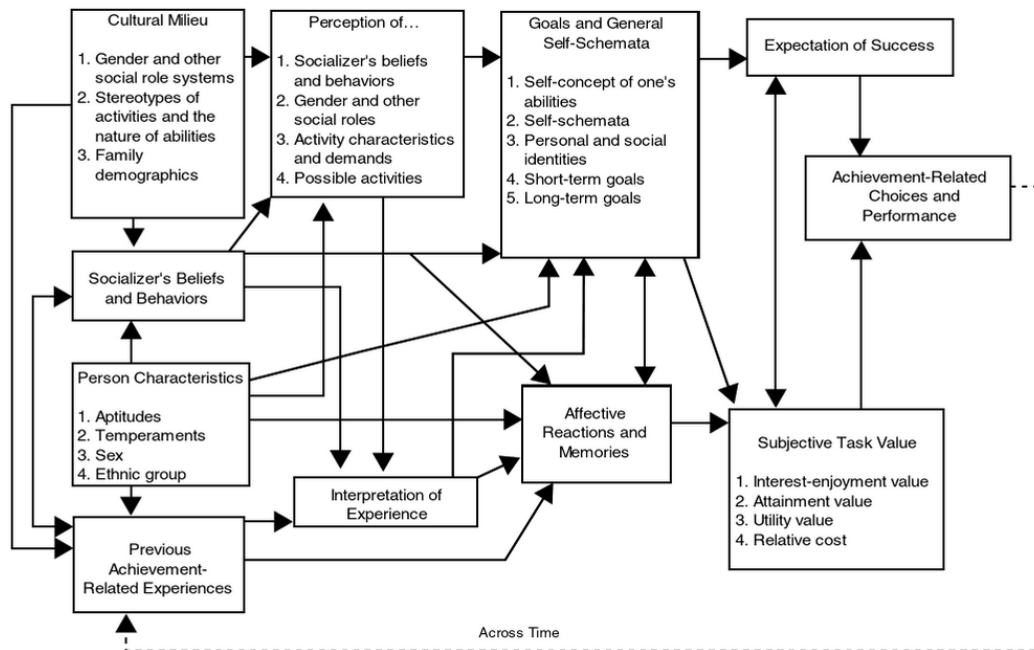
focus is on two categories of context: a) occupations, and b) learning environments (i.e., trade school and workplace). The final section outlines a theory-driven model (i.e., using the job demands-resources model) that provides an interpretative framework for commonly studied factors in the apprenticeship literature.

## **2.2 Subjective Task Values and Choice**

Employers, trade teachers, and apprentices widely believe that apprentices' motivation is a central factor in their apprenticeship retention (Harris & Simons, 2005). The Eccles et al. expectancy-value theory (EVT; Eccles-Parsons et al., 1983; Eccles, 2009) is one of the foremost comprehensive and influential motivational theories for explaining individual choice, persistence, and performance in achievement-related tasks (i.e., educational and occupational domains). EVT describes achievement-related choices as most directly predicted by two sets of beliefs: (1) a person's expectancy of success, and (2) the extent to which an individual values the activity. Since Atkinson's first presentation of expectancy-value theory (1957), EVT has moved beyond the early notions of probabilities of success and values defined as the relative attractiveness of succeeding on a given task. This earlier framing of value was generalised as the measure of a goal's attractiveness or unattractiveness in relation to other options; more conceptually linked to goal theory (Dweck, 1986). Eccles et al.'s expectancy-value theory defines expectancies and value components in richer ways with links to antecedent influences including: cultural norms, past experiences, support and expectations of important others, personal goals, perceptions of task requirements, and background characteristics (Wigfield et al., 2016). Expectancies and values are posited to influence achievement choices directly, and in turn to be affected by other determinants. Figure 2.1 shows the Eccles et al. EVT model.

**Figure 2.1**

*Eccles and Colleagues' Expectancy-value Model of Achievement, Performance, and Choice*



*Note.* Sourced from “Expectancy-value theory”, by Wigfield, A., Tonks, S., & Klauda, S. 2016, in K. Wentzel and D. Miele (Eds), *Handbook of Motivation at School*, p. 56. New York, NY: Routledge.

This model provides a strong conceptual framework for thinking broadly about apprentices' motivated choice to persist or drop out for the following reasons. First, it incorporates many beliefs, values, and characteristics located in apprenticeship research previously discussed. Second, EVT includes socialisers such as parents, teachers, and mentors that can influence the development of motivation. Third, broad cultural influences are an essential part of the model, which can influence the socialisation process and individual beliefs and values (Wigfield et al., 2015). Fourth, the model has more recently emphasised the importance of the immediate context in which decision are situated (Eccles & Wigfield, 2020).

Although expectancies and values are both included in EVT as the most proximal determinants of achievement-related choices, this research focused on values and their interplay in predicting apprentices' intentions to persist or dropout. Prior studies have demonstrated expectancies of success and values are mutually reinforcing (Eccles, 2009) and highly correlated (Pinxten et al., 2014). This positive correlation appears to increase with age (Wigfield et al., 1997) and exhibit highly similar changes over time within the same domain (Archambault et al., 2010; Wang et al., 2017). Furthermore, Eccles and colleagues highlight the critical nature of values in occupational choice when expectations of success are similar across various domains (Eccles, 1994, 2011; Eccles et al., 1999). For these reasons, this research focused on values.

### ***2.2.1 Subjective Task Values (STVs)***

A wealth of studies has demonstrated students' subjective task values (STVs) within particular academic domains predict their persistence and academic choices over time (for reviews, see Eccles, 2005; Wigfield et al., 2009). EVT describes four types of values: intrinsic, attainment, utility, and costs. Intrinsic value relates to the interest and enjoyment the individual gains from a task. This relates to interest as described by Hidi and colleagues, although they examine a broad spectrum from momentary psychological affective states to more enduring dispositions (Hidi, 2006; Krapp et al., 1992; Renninger et al., 1992). Eccles' definition of intrinsic value is associated with interest directly associated with the task.

Attainment value is defined as the importance an individual assigns to doing well on a task (Eccles-Parsons et al., 1983) and has been linked to identity issues, "when individuals view them as central to their own sense of themselves, or allow them to express or confirm important aspects of self" (Wigfield et al., 2009, pp. 57-58). As a result, the operationalisation of attainment has incorporated multiple perspectives (Eccles-Parsons et al., 1983), which are often overlooked in the literature. An individual's sense of self may pertain



to occupational identity, ability in scholastic pursuits, social acceptance, or a host of identity needs as the individual interacts with the perceived qualities of the task. For example, tertiary students may find their situated learning experience important to their learner identity (i.e., it is important to know this), leadership identity (i.e., as a student representative, I am a leader among my peers), or occupational identity (i.e., I am a carpenter, versus I am a student).

Utility value relates to how a task may be useful to an individual, such as assisting an individual's plan in reaching some future goal (Eccles-Parsons et al., 1983), which may, or may not be directly related to the nature of the task at hand. While utility value is most often described as a means to an end, or an extrinsic reason for engaging in a task (Ryan & Deci, 2016; Wigfield & Eccles, 2000), others have argued that utility value can be intrinsic or extrinsic depending upon the reason why a task is perceived as useful (Malka & Covington, 2005; Simons et al., 2004). For example, taking on an apprenticeship to satisfy a regulatory requirement (i.e., obtaining a licence to practice) may be perceived as extrinsic in nature. Alternatively, perceiving the utility of an apprenticeship qualification as a means of attesting to an individual's professional competence may be perceived as intrinsic in nature (Jorgensen, 2013).

Cost value is conceptualised in terms of the perceived negative consequences of engaging in a task, or "the cost of success or failure" (Eccles-Parsons et al., 1983, p. 93). Originally, Eccles and colleagues outlined costs from three sources: (1) the amount of effort required, (2) the opportunity cost of giving up time from other valued activities, and (3) emotional cost that stems from the psychological meaning of failure. Although cost was theorised as important to choice (1983), until the last few years there had been less empirical work involving cost as compared with intrinsic, attainment, and utility STVs (Flake et al., 2015; Gaspard, Dicke, Flunger, Schreier, et al., 2015; Perez et al., 2014; Watt et al., 2019; Wigfield & Cambria, 2010a).

### ***2.2.2 Interrelationships between STVs***

Subjective task value (STV) measures were initially developed for normative groups of school students in particular knowledge domains (e.g., mathematics and English). STVs have been operationalised in different ways for varying reasons and purposes including:

- 1) separate STV factors,
- 2) combining STVs (into a single factor), and
- 3) expanding the set of STVs to include a wider array.

The first approach reflects Eccles and colleague's original theoretical model of four STV constructs (Eccles-Parsons et al., 1983) and has been utilised across numerous studies (e.g., Conley, 2012; Eccles & Wigfield, 1995; Gaspard, Dicke, Flunger, Schreier, et al., 2015; Luttrell et al., 2010). However, discriminating the four STVs within studies has sometimes been challenging due to high correlations among STVs. This is particularly so for homogenous populations, such as selective schools and for tertiary students who have self-selected into fields of study. Correlations higher than 0.7 appear more often where students are grouped by ability (e.g., upper-track schools in Germany, Gaspard, Dicke, Flunger, Schreier, et al., 2015; Guo et al., 2016; Trautwein et al., 2012) as compared to normative student populations (Conley, 2012). Relatedly, STVs are rarely measured separately in studies on self-selected tertiary-level course students. The homogenous make-up of the sample with a narrower selection of courses may lead to STV measures with less variance and/or ceiling effects given students have already committed to a specific major. The author could not locate any research of students enrolled in a common tertiary-level major which examined each of intrinsic, attainment, utility and cost as separate constructs within the same model. Only in studies of general domains were separate STVs utilised in tertiary settings. Two examples include (1) a study on mathematics literacy STVs for undergraduate students not enrolled in math classes (Luttrell et al., 2010), and (2) STVs of future graduate education

(Battle & Wigfield, 2003). In the current research, Study 2 addressed this gap in the literature by modelling intrinsic, attainment, utility, and cost for trade apprentices, thus seeking to provide a nuanced understanding of the relationship between values and tertiary-level education planned persistence (Eccles & Wigfield, 2020; Watt et al., 2019).

The second approach of combining STV factors has sometimes been necessitated because of high intercorrelations, or as a planned methodological approach. In the first instance, attainment value is commonly combined with intrinsic or utility value. The specific combination appears to stem from the differing operationalisation of attainment value. For instance, when attainment value is operationalised generally (e.g., *how important is being good at ...*), it is common to see utility combined with attainment value (e.g., Musu-Gillette et al., 2015; Simpkins et al., 2006; Watt et al., 2012) since the focal reason for importance is nonspecific and may be extrinsic (e.g., because I need this job). Alternatively, when attainment value is operationalised by high personal significance (e.g., *... is important to me personally*), it has been combined with intrinsic value (e.g., Battle & Wigfield, 2003; Marsh et al., 2005). It has been suggested that intrinsic and personal importance are linked by an internally generated cognitive process that involves reflective appraisal at a higher order (Ryan, 1993) expressing important aspects of self (Wigfield et al., 2016).

Alternatively, STV factors have been intentionally combined (i.e., a priori) recognising their covariance as substantively useful and meaningful with respect to predicted outcomes. Most common to this approach is the combination of intrinsic, attainment, and utility measures into a single factor profiting from their positive covariance, although there is little theoretical basis for combining only these three values. This has led Hulleman and his colleagues (Barron & Hulleman, 2015; Kosovich et al., 2015) to argue that these three STVs are conceptually separate from cost. Notwithstanding, EVT has long posited that intrinsic,

attainment, utility, and cost values are theoretically important in achievement-related choice (Eccles-Parsons et al., 1983; Eccles & Wigfield, 2020).

Collapsing STVs into a combined factor may on the one hand conflate important theoretical constructs, while on the other, provide a pathway to model “overall” task value (Guo, Wang, et al., 2018; Jacobs et al., 2002) on outcomes. For instance, Guo and colleagues (2016) explored a general STV factor (i.e., all four inclusive of cost) defined with loadings from all STV items (standardised  $|\lambda| = .19$  to  $.85$ ,  $M = .51$ ) for academical-track German secondary students, that produced strong model fit. Their study demonstrated the general STV factor was a stronger predictor ( $\beta = .38$ ) of mathematics grades, than individual STV factors ( $\beta$  ranged from  $.15$  to  $.26$ ).

A third approach to operationalising STVs has involved further differentiating STVs into more factors. Intrinsic, attainment, utility, and cost values were explored in a study by Gaspard et al. (2015). While intrinsic value remained unidimensional in this study, the other three STV components demonstrated sub-constructs in a second-order factor analysis. Attainment value differentiated into two sub-constructs described as importance of achievement and personal importance. Utility value differentiated into utility for school, work, social life, daily life, and future life. Cost distinguished between effort required, emotional cost, and opportunity cost. Subsequent use of the sub-constructs demonstrated good generalisability (i.e., strong measurement invariance) across five academic subjects, grade level, and gender groups (Gaspard et al., 2017).

### ***2.2.3 Utilising Different Operationalisations of STVs***

The three approaches to operationalising STV measures just reviewed offer varying approaches to the study of trade apprentices’ motives, which are explored in this section. The study of intrinsic, attainment, utility and cost values have demonstrated their capacity to predict intentions (Eccles & Midgley, 1989) and actual decisions to persist in course studies

(Wigfield et al., 2016), as well as intentions to pursue course-related careers (Frome et al., 2006; Jones et al., 2010; Watt, 2006; Watt & Eccles, 2008). As far back as 30 years ago, Eccles (1987) theorised that STVs are pivotal, if not causal, in occupational choice. However, the interplay among STVs is still not well understood (Eccles & Wigfield, 2020; Eccles et al., 1989; Wigfield et al., 2009) and is a key focus of this study.

Differentiation of STVs into additional subconstructs highlights their additional multidimensionality. Gaspard et al. (2015) suggested the overall correlation pattern demonstrated that their further differentiated constructs assessed value at different levels of specificity. For example, the subfactor *personal* attainment value (i.e., associated with identity) was related to almost all other subfactor constructs. This subfactor was viewed as a more general source of value when compared to other subfactor values that were associated with work, or other life domains. Thus, even though STVs can be further differentiated, their level of specificity should match the situated research (Eccles, 2009; Johns, 2006). This mirrors the literature on self-efficacy that argues predictions are best when measures and outcomes are contextually bounded (Bandura, 1986, 1997) and problematic when assessed at incongruent levels of specificity (Bong, 2006). As such, while more specific delineation of STVs is possible, it may not be useful when poorly matched to the level of the outcomes under investigation.

An overarching STV construct may be better suited when the outcome is a choice between domains. A combined STV factor has been employed in comparing motivational values across domains; including cross-sectional (e.g., across 5 school subjects, Gaspard et al., 2017), longitudinal (Jacobs et al., 2002), and person-oriented studies that uncover different intraindividual patterns (Chow et al., 2012; Guo, Wang, et al., 2018). While intrinsic, attainment, utility and cost values are “described” separately in virtually all EVT-related studies, overall task valuation is emphasised more generally when comparing multiple

domains. For instance, recent studies have asked whether *general* value (i.e., combined STVs) of diverse school subjects differentially predicts occupational aspirations and participation at future timepoints (Chow et al., 2012; Guo, Wang, et al., 2018). By utilising a general STV factor, these studies demonstrated that higher relative general STVs for mathematics and science subjects generally related positively to future science-related occupational participation, while higher valuing of language and arts subjects did not.

To summarise, EVT identifies subjective task values (STVs) as mediating psychological factors between achievement related choices and antecedents. The application of this critical lens to the persistent challenge of high apprenticeship attrition highlights how a psychological process may explain why apprentices develop intentions to persist or drop out. However, the operationalisation of STV must be appropriate to the level of specificity of the research questions and outcomes under investigation.

### **2.3 Contextual Nature of Motivated Learning**

The dual nature of apprenticeship training provides an important area of educational research if “a main reason for formal education is to facilitate learning in situations outside school”, as claimed by Klausmeier in his classic education psychology text (1961, p. 352). Many have called for a better understanding of apprenticeship retention via greater delineation of contextual settings (Harris & Simons, 2005; Nielsen, 2016). Motivation is a process which can vary across environments depending upon the contextual characteristics (Kyndt et al., 2011; Schunk et al., 2014). Despite such acknowledgements, researchers recognise more work needs to focus on contextual influences that inform the processes by which individuals form their STVs (Eccles & Wigfield, 2020). In a recent review of empirical research concerning VET workplace learning, most studies “failed either to take into account the specific features of different vocational fields or to compare the guidance afforded to

learners in the different learning environments of specific vocations” (Mikkonen et al., 2017, p. 20).

The following subsections review two key contexts in apprenticeship training: occupations and learning contexts (e.g., trade school and workplace). Apprentices are often treated as a homogenous group, when differences in retention rates across occupations suggest otherwise. Additionally, despite numerous empirical studies involving apprentices’ trade school and workplace factors, less is known about the interplay of these situated aspects of learning in determining STVs (Eccles & Wigfield, 2020). Trade apprenticeships provide a unique opportunity to explore differences in *concurrent* trade school and workplace learning environments in apprentices’ choice decisions.

### **2.3.1 Occupational Context**

Apprenticeship attrition rates show substantial variation across trade occupations in Australia (Ball & John, 2005; Callan, 2000; Cully & Curtain, 2001; Seymour et al., 2012; Snell & Hart, 2008; Stromback & Mahendran, 2010) and internationally, such as in New Zealand (Mahoney, 2009), the U.K. (Hogarth et al., 2009; West, 2005), Switzerland (Schmid & Stalder, 2012), and other German-speaking countries (Negrini et al., 2016). Recently reported completion rates for Australian apprentices who commenced in 2014 (NCVER, 2020b) revealed significant differences across occupational sectors – ranging from 66% for the electrotechnology and telecommunications trade sector, to 42% for the food trade sector. In a separate study which compared specific trade occupations within sectors, apprenticeship retention rates (Seymour et al., 2012) ranged from 79% to 44% (see Table 2.2). These individual completion rates were adjusted for recommencements which is rarely done at the specific trade level, although more common at the broader occupation level. Trade occupations with the highest completion rates tend to be regulated (i.e., licensed) within

Australia – electricians and plumbers. Licensed trades require the successful completion of trade school, or current enrolment in apprentice training, to work in these occupations.

**Table 2.2**

*Completion Rates for Apprentices in 2002 to 2004 Cohorts as of 2011 (Western Australia)*

Apprenticeship occupation	Individual completion rates %
Electricians	79.0
Plumbers	78.4
Bricklaying and carpentry and Joinery	61.3
Glaziers, Plasterers and Tilers	48.8
Food trade workers	43.9
Overall for 20 occupations	65.7

*Note.* N range of 1,743 to 4,887 across listed occupations. Adapted from “An econometric analysis of completion rates for probationary apprentices,” by Seymour, R., Dockery, M., and Harris, M., 2012, *The Centre for Labour Market Research*, p. 11, Curtin Business School, Curtin University, Perth.

### 2.3.1.1 Current Research into Occupational Context

Extant empirical studies on apprenticeship retention rates either compare rates exclusively between occupations (Ball & John, 2005) or as a direct effect, along with other apprenticeship factors (Seymour et al., 2012; Stromback & Mahendran, 2010). Both approaches reveal that occupations differ in retention rates, but not why. Few studies have conducted group comparisons across apprenticeship occupations to explore how apprenticeship factors may differentially predict retention for one occupation versus another (e.g., age, pre-apprenticeship, perceived quality of teaching, excessive work demands). For instance, might workplace physical demands be more strongly associated with dropout considerations for bricklayers, as compared to electrician apprentices? Generalising explanatory apprenticeship factors across all trade occupations has been questioned (Virtanen



et al., 2014). Variation in retention rates across trade occupations may imply the need to consider influential factors germane to each.

Many have reasoned that differences in apprenticeship retention stem from occupational-level features, such as industry culture (Harris & Simons, 2005), wages earned after completing an apprentice qualification (Karmel & Mlotkowski, 2010b; Nechvoglod et al., 2009), professional esteem of the qualification within the occupation (Harris, Simons, et al., 2001), and labour market mobility into other occupations (Ball & John, 2005). Researchers have argued that some industries are more learning intensive (Mahoney, 2009; Skule, 2004; Stromback & Mahendran, 2010), due to a high degree of change, high job demands, along with other conditions conducive to learning such as superiors' feedback, supervisors' support, and recognition for proficiency (Skule, 2004). "Such conditions tend to accumulate in some jobs and be sparse in others" (Mahoney, 2009, p. 13). Typical of many apprenticeship research reports is the acknowledgement that occupational variation "could be due to a range of latent factors which are associated with the occupations but which have not been included for analysis because they are (known or unknown) underlying characteristics, which may not be amenable to measurement" (Ray et al., 2000, p. 33) as an observed variable. Drawing from theoretical and empirical literature in the field of motivation however, offers insights as to how such apprenticeship factors could be fruitfully assessed and examined.

#### *2.3.1.2 Regulated Occupations*

Licensed and unlicensed occupations may represent two groups of trade occupations where apprenticeship characteristics may differentially predict retention. Industries with few licensed occupations, such as agriculture, have lower completion rates as compared with engineering and electrotechnology which encompass more licensing requirements (Mahoney, 2009). This may create an industry culture associated with higher apprenticeship retention,

due to higher valuing of formal qualifications (Alkema et al., 2016; Dickie et al., 2011), perceived workplace complexity, and higher skill level (Brooker & Butler, 1997). Licensed occupations are more prevalent in the technical trades (Meredith, 2011) which have been associated with higher retention rates. In a Canadian study of 40 separate apprenticeship trades over a 15 year period ( $N > 1,000$  commencements for each year between 1991 and 2007), there was evidence that industries which moved from a voluntary to mandatory qualification were associated with an increase in retention of approximately 11% (Coe, 2013). However, whether a mandatory qualification or industry characteristics raises retention rates is still contested. It has been suggested that where the completion of an apprenticeship greatly enhances employment chances (e.g., German apprenticeships) or is close to being a de-facto licence to practice (e.g., the gas industry in the U.K.), retention rates are higher even when not mandatory (Hogarth et al., 2009).

To summarise, much apprenticeship research concerning occupational differences in retention have not explored the reasons why they may differ. To date there has been little explicit comparative modelling across trade occupations or analysis of the contextual apprenticeship factors that determine such differences. This study seeks to address this issue through explicit comparative modelling across four trade occupations – two licensed, and two unlicensed.

### ***2.3.2 Learning Context***

Despite the espoused benefits of apprentices' dual learning environments to motivate disconnected youth to reengage with education (OECD, 2017), quantitative research that investigates the interplay between workplace and trade school learning context in determining overall STVs and hierarchies is a key area of needed research (Eccles & Wigfield, 2020). Qualitative research suggests apprentices often perceive their trade school and workplace learning contexts to hold differing aims, content, and social interactions

(Gurtner et al., 2012; Harris, Willis, et al., 2001). For example, trade school learning is regularly presented as *theoretical* learning, focused on the “why”, as compared to the *practical* nature of workplace learning which focuses on the “how” (Harris, Willis, et al., 2001; Hordern, 2016; Schwendimann et al., 2015). Despite the practical nature of workplace learning, the focus can devolve onto a narrow set of skills which emphasise a production aim (Butler & Brooker, 1998). In a recent Australian survey study, employers of apprentices reported main barriers to training as financial and time constraints (Smith et al., 2019). In this context, employers may consider the delivery of knowledge skills that extend beyond their workplace as the responsibility of trade school (Butler & Brooker, 1998).

Workplace and trade school learning may also differ in pedagogical approaches which may, in turn, influence motivational values. The use of workplace learning in apprenticeships is widely viewed as a means of engaging early school leavers and academically disadvantaged individuals (Dommers et al., 2017; OECD, 2017). Nearly 70% of early school leavers tend to enrol in VET, while just under 45% of grade 12 completers make such a choice (Lamb et al., 2015). For early school leavers, trade schools may place apprentices in a similar classroom environment that they chose to leave in high school.

Not all studies have viewed trade school and workplace learning to have divergent aims. In a comparison of Australian and Swiss apprentices (Sappa et al., 2016) involving semi-structured interviews of trade teachers, employers, and apprentices, findings suggested that Australians interpreted trade school as the starting point in learning, whose role was to support learning of workplace tasks. The Swiss system had a broader approach where learning focused on the formation of citizens as active members of an occupation. The Australian perspective reflected a strong industry focus on customised training aimed to meet specific needs of Australian firms (Sappa et al., 2016) and industries (OECD, 2010a). This may indicate that Australian apprentices view trade school and workplace learning contexts

as part of a singular training regime. Although apprentices' learning contexts have been the subject of much qualitative research, quantitative empirical studies directly comparing such contexts have been lacking in Australian apprenticeship research. The present study explores the differences in apprentices' motivations, across their trades school and workplace learning contexts.

### **2.3.3 Connecting Context to STVs**

Subjective task values (STVs) have predicted occupational aspirations (Watt et al., 2019) and future occupational choice (Guo, Eccles, et al., 2018). Apprenticeship training provides the unique opportunity to study STVs within concurrent trade school and workplace environments – a direct comparison of formal study and workplace learning valuation. This nexus sits apart from traditional EVT research where STVs for study-related domains (e.g., mathematics and language; STEM courses; teacher education) predict *future* work participation. For most occupations outside of apprenticeships, formal study precedes paid work. As such, research often focuses on study-related STVs in determining future work choices. For example, study-related STVs have predicted career aspirations (Guo, Wang, et al., 2018; Nagengast et al., 2011; Watt et al., 2019; Watt et al., 2012) and career choice (Guo, Eccles, et al., 2018; Watt et al., 2017). But how might study-related values relate to concurrent work-related values?

Central to extant EVT research designs is the paradigm that study-related STVs (i.e., courses of study) are similar to work-related STVs. That is, if studying a course is valued (e.g., studying engineering), then working in a related field (e.g. working as an engineer) may infer similar values. Since apprenticeship training takes place in both trade school and work *concurrently*, the comparison of STVs can be made directly between contexts. This enables addressing the question, do STVs differentiate for apprentices' trade school and workplace contexts?

### ***2.3.4 Context and Domain Specificity***

Motivation may be defined at various levels of specificity. Study-domain STVs at the level of school subjects have predominated (Wigfield et al., 2009) as compared to task-specific levels, where the level of specific activities within a course are the focus (e.g., content-specific element, Bong, 2001). Past studies have discriminated STVs between school subject domains such as history and mathematics (Buehl & Alexander, 2005); reading, instrumental music and sports (Wigfield et al., 1997); psychology (Hulleman et al., 2008); mathematics and science (Watt et al., 2019); and science and social sciences (Guo, Wang, et al., 2018) to name but a few. The use of distinct sets of STVs across subject domains has provided a useful means of examining their domain-specific predictions of future course selections, occupational aspirations and choices. Yet, further contextual domains beyond school subjects can be studied in terms of the role of STVs in motivated choice such as occupation-specific domains (i.e., licensed and unlicensed) and learning domains (i.e., trade school and workplace).

### ***2.3.5 Similar and Dissimilar Domains***

At the individual level, Eccles (2005) posited that it is the relative valuation of various tasks that forms the hierarchy of STVs which determines the choice process. As such, the interpretation of STVs can be expanded into across domain comparisons (Eccles & Wigfield, 2020). Recent research has demonstrated strong positive STV correlations across similar study domains (e.g., mathematics and physics), as compared to dissimilar domains (e.g., mathematics and English) where correlations are lower or even negative (Gaspard et al., 2018; Trautwein et al., 2012). Notably, the four STVs (i.e., intrinsic, attainment, utility, and cost) are more highly correlated *within* a domain than between domains even when domains are related (e.g., mathematics and science, Watt et al., 2019). This suggests apprentices' STVs would be more highly correlated within an occupational domain (e.g., bricklayers) as

compared to another occupation (e.g., plumbers). This may extend to within-person comparisons across learning environments – raising the question on whether apprentices distinguish STVs between trade school and workplace learning contexts.

### ***2.3.6 Dimensional Comparison Theory***

Values in one domain may affect values in another domain, according to dimensional comparison theory (Möller & Marsh, 2013) which suggests that individuals regularly compare their motivations across domains (Möller et al., 2016). Originally, dimensional comparison theory described comparisons across achievement and self-concept of ability domains. Achievement in one domain may have a positive effect on self-concept of a related domain that is perceived as similar (e.g., mathematics and physics). However, when domains are perceived to be dissimilar, a higher perceived ability in one domain can have a negative effect on self-concept in the other domain. Möller and Marsh (2013) refer to these as *assimilation* and *contrast effects* respectively.

Dimensional comparisons between domains are carried out spontaneously within a wide range of contexts, such as work, studies, social relationships, wellbeing, health, sports and financial situations (Möller & Husemann, 2006). The strength of the comparison effect depends upon individuals' perceived correlation between the domains (Möller & Marsh, 2013). Following negative achievement outcomes, contrast effects appear more common; this appears especially so where individuals are motivated to improve their mood or self-concept (Möller et al., 2016) by focusing on the more successful domain. This may serve individual compensatory needs: When I fail at the workplace, I prefer to concentrate on my trade school abilities. While this contrast may enhance self-concept in the preferred domain (e.g., trade school in this example), there may be a reduction in self-concept for the domain where failure has been experienced (Möller et al., 2016).

Möller and Marsh (2013) claim that spontaneous dimensional comparisons often belong to the same context where people find it easier to compare their abilities in order to identify their strengths and weaknesses. As such, it is easier to compare academic self-concepts (e.g., mathematics and language) than activities from non-related contexts (e.g., mathematics and cycling). However, between context comparisons may be situationally activated. For instance, Möller and Husemann (2006) demonstrated university students' comparisons of academic matters with overall well-being – choosing to study all night for a test (academic matter) or get some rest (well-being).

Dimensional comparison theory has been extended beyond achievement and self-concept to STVs (Gaspard et al., 2018; Guo, Wang, et al., 2018; Lauermann et al., 2015; Nagy et al., 2008). For example, in their longitudinal study of Finnish students, Guo et al. (2018) showed that differential STV trajectory profiles across three knowledge domains influenced each other through within-person dimensional comparisons. They found that increasing STVs in Finnish language studies across grades 9 to 11 led to a decline in mathematics and science STVs. This contrast effect also worked in the opposite direction. A recent study by Gaspard et al. (2018) examined STVs across five knowledge domains (German, English, biology, physics, and mathematics) to prior achievements in each domain. Using regression analyses, they showed how students' achievements predicted their STVs in a manner that indicated contrasting and assimilating dimensional comparisons. This study examined Gaspard et al.'s expanded set of STVs (2015), and certain of these added subfactors showed weak associations with students' achievement in the same domain (e.g., two utility value components: social utility, and utility for school). This is likely due to their perceived difference in context, that make domain comparison less likely.

A formal taxonomy of context proposed by Barnett and Ceci (2002) extends contextual considerations beyond study domains (see Table 2.3), to include location (physical

context), time, content focus (functional context), social, and modality of learning. Similar to dimensional comparison theory (Möller & Marsh, 2013), each category of context has a measure of contrast, which Barnett and Ceci describe as *near* and *far*. Considering various categories of context may provide better understanding and prediction in relation to apprenticeship retention. Factors influencing retention may vary across contexts. Relevant contexts may include:

- temporal - between different years of apprenticeship (Harris & Simons, 2005);
- knowledge domain – differing tasks within a specific trade occupation (Ball & John, 2005; Hordern, 2016);
- modality – on- and off-the-job experienced factors (Bednarz, 2014);
- social context – in the level of social interaction (Bednarz, 2014), type of employer (e.g., GTO, private, or government employer; Stromback & Mahendran, 2010); and
- physical location - geographical location (Stromback & Mahendran, 2010).

The effect of various categories of context may, in part, help untangle conflicting results in apprenticeship research discussed previously. Two contexts which have been widely discussed within the apprenticeship literature are learning environments (workplace and trade school), and acknowledgement of occupational (knowledge domain) differences in attrition rates. Barnett and Ceci (2002) refer to these as modality and knowledge domains within their taxonomy (see Table 2.3).

### **2.3.7 Summary of Context**

Given the numerous categories of context at higher and lower levels of specificity outlined in Table 2.3, it seems a poor methodological practice to model contextual factors as an explanatory effect at the same level as all other predictors. This study seeks to better understand contextual effects by comparing apprenticeship factors and motivational values between: (1) occupations (i.e., licensed vs. unlicensed), and (2) learning environments (i.e.,



**Table 2.3***Context Taxonomy for Near and Far Transfer of Knowledge*

Context	Near	←————→				Far
Knowledge domain	Mouse vs. rat	Biology vs. botany	Biology vs. economics	Science vs. history	Science vs. art	
Physical context	Same room at school	Different room at school	School vs. research lab	School vs. home	School vs. the beach	
Temporal context	Same session	Next day	Weeks later	Months later	Years later	
Functional context	Both clearly academic	Both academic but one nonevaluative	Academic vs. filling in tax forms	Academic vs. informal questionnaire	Academic vs. at play	
Social context	Both individual	Individual vs. pair	Individual vs. small group	Individual vs. large group	Individual vs. society	
Modality	Both written, same format	Both written, multiple choice vs. essay	Book learning vs. oral exam	Lecture vs. wine tasting	Lecture vs. wood carving	

*Note.* Adapted from “When and where do we apply what we learn? A taxonomy for far transfer,” by Barnett, S. M., Ceci, S. J., 2002. *Psychological Bulletin*, 128(4), p. 621.

trade school vs. workplace). It is proposed that contexts may influence factors and values in ways that differentially predict apprentices’ intentions to persist or dropout.

A framework for organising apprentice factors is the subject of the next section. While EVT includes task characteristics as predictors of achievement-related choices, through their influence on motivational values, it is not well understood how and why job determinants influence individuals’ values (Wielenga-Meijer et al., 2006; Wielenga-Meijer et al., 2010). The job demands-resources model is drawn upon as a useful heuristic to incorporate a range of job-related characteristics, complementary to the EVT framework.

## 2.4 The Job Demands-Resources (JD-R) Model

Employers, trade teachers, and apprentices describe a wide range of factors which may affect apprentices' decisions to drop out of their training (Harris & Simons, 2005; Hodgkinson & Bloomer, 2001; Karmel & Mlotkowski, 2010a). The job demands-resources model (JD-R; Demerouti et al., 2001) provides a framework for associating positive (resources) and negative (demands) job characteristics with outcomes including work absences (Schaufeli et al., 2009), turnover intentions (Schaufeli & Bakker, 2004; Skaalvik & Skaalvik, 2018), and actual turnover (de Lange et al., 2008). The JD-R model has been productively applied to predict turnover intentions for teachers (Rajendran et al., 2020), management consultants (Hallberg & Schaufeli, 2006), call centre employees (Bakker, Demerouti, & Schaufeli, 2003), family business workers (Hu et al., 2011), and turnover across diverse service sector workers (de Lange et al., 2008). The JD-R model proposes that job resources and demands affect outcomes via two psychological processes: the motivational (i.e., engagement) process, and the health impairment (i.e., stress) process (Bakker & Demerouti, 2017; Schaufeli & Bakker, 2004).

The JD-R model assumes that while every occupation exhibits its own specific working characteristics, these can be classified into the two overarching categories within each occupational setting: job demands and resources (Bakker & Demerouti, 2007). This provides a useful heuristic framework within which to study the role of positive and negative apprenticeship factors identified in previous research, in relation to the psychological process underpinning dropout considerations.

As a heuristic model, the JD-R model complements the psychological processes related to apprenticeship attrition through the influence of resources and demands on STVs. As Schaufeli and Taris (2014) claimed, resources and demands may explain the *how*, but do not explain the *why* of the motivational process. They argue, “additional explanatory

theoretical frameworks are usually needed to argue why particular demands interact with particular resources” and the underlying psychological processes (p. 55). Additional theoretical frameworks utilised in tandem with JD-R research variously specify psychological processes with constructs such as control and social support (the job demands-control model; Karasek, 1979), the dynamics of resources in relation to demands (conservation of resources theory; Hobfoll & Shirom, 2000; effort reward imbalance model; Siegrist, 1996), and even specific “core” job characteristics that are linked to critical psychological states (job characteristic theory; Hackman & Oldham, 1980). However, many of these theories predict job stress (rather than the motivational process), with a focus on burnout and health impairment (Demerouti et al., 2001).

#### ***2.4.1 Job Resources***

The JD-R model defines job resources as supportive factors which are functional toward achieving work-related goals, or in reducing job demands and their associated costs (Bakker & Demerouti, 2007; Demerouti et al., 2001). In the context of trade apprenticeships, such goals may be to complete the apprenticeship training. Resources refer to physical, psychological, social, and organisational aspects of the work environment, casting a wide net of factors which may support a positive motivational process. A number of job resources studied in the JD-R literature mirror identified factors in apprenticeship research, such as supervisory coaching and performance feedback (Bakker et al., 2008; Harris, Willis, et al., 2001), social support opportunities to learn and learning feedback (Schaufeli et al., 2009; Snell & Hart, 2008), instructional quality of trainers (Harris & Simons, 2005; Lüthi & Stalder, 2018; Snell & Hart, 2008), role clarity and job autonomy (Bakker & Demerouti, 2007; Dickie et al., 2011), and variability of required professional skills (Hakanen et al., 2005; Harris, Willis, et al., 2001).

### **2.4.2 Job Demands**

The earliest model of the JD-R evolved out of research into job burnout (Demerouti et al., 2001). As a result, job demands have been associated with research on the stress process and resultant work absenteeism (Bakker, Demerouti, de Boer, et al., 2003; Schaufeli et al., 2009). Within the JD-R model, job demands are defined as those physical, social, psychological, or organisational characteristics of the job that require sustained physical or emotional effort and are therefore associated with physiological and/or psychological costs (Bakker & Demerouti, 2017; Demerouti & Bakker, 2011). Demands within the JD-R literature also overlap with retention-related factors in apprenticeship literature. Examples of overlapping demands include excessive work (Dickie et al., 2011; Hallberg & Schaufeli, 2006), work-home conflict (Misko & Wibrow, 2020; NCVER, 2010; Rajendran et al., 2020), work pressure, work responsibility and role ambiguity (Cully & Curtain, 2001; Webster et al., 2011). Further factors common within apprenticeship literature align well with demands and the stress process, such as poor relations with employers (Callan, 2000; Snell & Hart, 2008) which may involve bullying, harassment, abuse, and unfair treatment (Harris & Simons, 2005).

#### **2.4.2.1 Challenge and Hindrance Demands**

Demands may associate differentially with the motivational process depending upon how they are appraised by the individual (Schaufeli & Taris, 2014; Searle & Auton, 2014). Although job demands are typically associated with the stress process, some job demands can play different roles in the stress and motivational processes, dependent on how they are appraised. LePine, Podsakoff, and LePine (2005) distinguished *hindrance* from *challenge* demands. Hindrance demands involve excessive or undesirable constraints that inhibit individuals from achieving valued goals (Cavanaugh et al., 2000), such as role overload and role conflict. Challenge demands can promote personal growth and achievement despite

effort cost (Crawford et al., 2010). For example, added responsibilities may be perceived as rewarding work experiences worthy of the extra effort.

Challenge and hindrance demands have been linked to retention-related outcomes within JD-R literature, such as work loyalty, job searching or intent to quit (Boswell et al., 2004). A study of 1,886 U.S. managers found that hindrance demands positively predicted voluntary turnover, whereas challenge demands were unrelated (Cavanaugh et al., 2000). More broadly, results from a meta-analysis of 183 samples reported in peer-reviewed management and psychology journals, showed that hindrance demands negatively predicted organisational commitment, and positively predicted turnover intentions and actual turnover whereas challenge demands demonstrated opposite results (Podsakoff et al., 2007).

Challenge demands may be experienced as hindrance demands in different contexts (Bakker & Demerouti, 2017). In a study of 479 nonteaching employees at a large university, workload was appraised as both a challenge and hindrance (Webster et al., 2011). This raises the question of how certain demands are associated with motivational subjective task values (STVs) for trade apprentices.

#### ***2.4.3 Complementary Theoretical Framework of Expectancy-Value Theory***

Expectancy value theory has rarely been explicitly used jointly with the JD-R model, perhaps because the original aim of JD-R was to address conceptualisations of burnout (Demerouti et al., 2003). As such, the JD-R literature has focused on mitigating unhealthy work conditions, and stress-related processes (Bakker et al., 2008). JD-R model has been productively used with self-determination theory (Deci & Ryan, 2000) in describing the intervening psychological process through satisfaction of basic psychological needs (i.e., autonomy, competence, and relatedness). Such studies have demonstrated that basic psychological needs play a mediating role (partially or in whole) in accounting for the

relationship between demands and resources on choices (Baard et al., 2004; Van den Broeck et al., 2008).

In this research, Study 3 integrates the JD-R model (apprentices' perceived job-related demands and resources) together with EVT (apprentices' STVs) to explore the processes underlying apprentices' dropout considerations. For example, the JD-R model may suggest that a supportive boss who provides a variety of learning experiences will increase apprentices' motivation. However, with the addition of STVs we can go further, to explore the differential effects of resources and demands on intrinsic, attainment, utility, and cost values, and the resultant effect on dropout considerations. This addresses a gap in the literature to link previously identified apprenticeship factors (as demands and resources) to apprentices' dropout considerations, through their effect on STVs. This can potentially help explain more precisely the psychological processes that underpins apprentices' decision development.

#### ***2.4.4 Job Versus Trade School Resources and Demands***

As outlined in section 2.1.1, the extant apprenticeship literature is often classified by three stakeholders: individual, training provider, and employer (see Table 2.1). The training provider and employer represent the learning context experienced by apprentices, within each of which factors can be easily categorised as resources or demands. Although one could develop separate JD-R models for each environment, the empirical apprenticeship research suggests both sets of work and study factors are interrelated (Mulder et al., 2015; Renta-Davids et al., 2017). This is especially explicit in qualitative research (i.e., situated learning theory; Billett, 1996; Fuller & Unwin, 2004) where researchers have focused on finding productive ways of relating school and work practices (i.e., boundary crossing; Akkerman & Bakker, 2012).

Although numerous quantitative studies on apprenticeship retention have been conducted without formally invoking the JD-R framework, such an approach may add cohesion and clarity to the factors across workplace and trade school learning contexts. As one of the rare apprenticeship studies to use the JD-R model ( $N = 715$ ), latent profiles were determined utilising workplace and trade school resources and demands (Lüthi & Stalder, 2018). Apprentices with differentiated profiles of resources and demands (i.e., autonomy at work/school, instructional quality at work/school, and demands at work/school; see Figure 2.2) demonstrated varying effects on *occupational commitment* and *apprenticeship satisfaction*. Independently, high levels of workplace resources (Profile 3) or trade school resources (Profile 4) were not significant predictors of occupational commitment and trade school satisfaction. However, the outcomes were positively predicted by profiles that exhibited a moderate level of resources across both trade school and the workplace (Profile 1 and 2). This “threshold” effect highlights the interrelatedness of both workplace and trade school characteristics in the apprenticeship setting.

#### ***2.4.5 Framing Apprenticeship Factors Through JD-R***

The JD-R model provides a framework for classifying commonly reported factors in the Australian apprenticeship literature as job resources versus demands. Using the JD-R framework in combination with EVT, this study sought to understand how factors commonly associated with apprenticeship retention may be linked via psychological motivational processes.

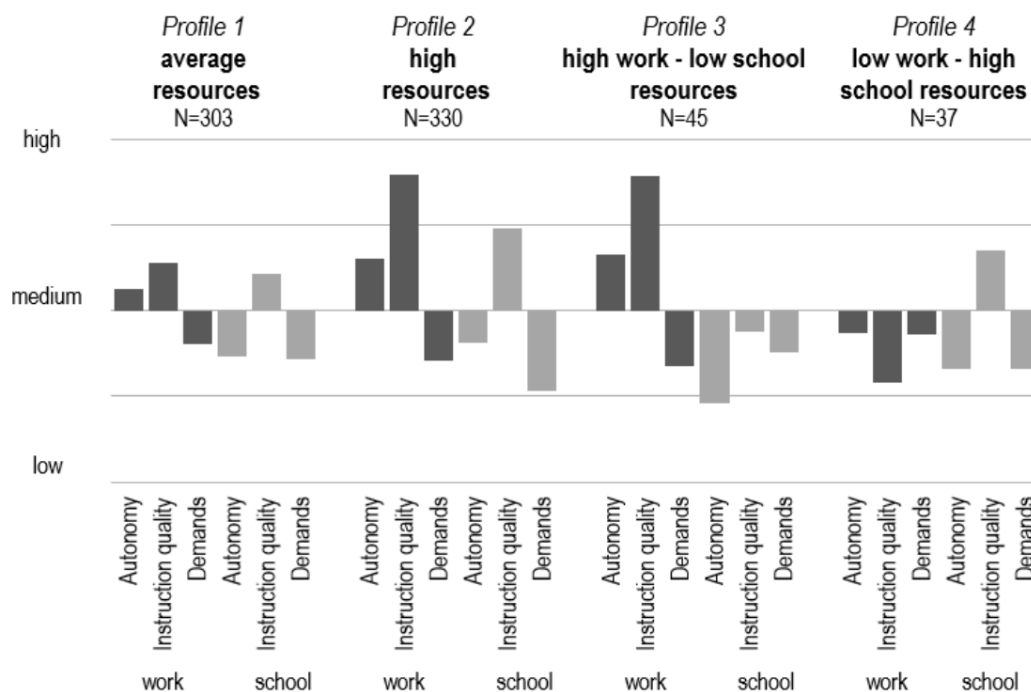
### **2.5 Chapter Summary**

Expectancy-value theory (Eccles-Parsons et al., 1983) outlines a psychological process of subjective value beliefs that most directly determine choice. Values are shaped over time by individual and contextual factors. This framework is applied to the exploration of apprentices’ dropout considerations, by locating commonly studied apprenticeship factors

(e.g., demographics, prior experiences, socialisers, trade school and workplace experiences) as predictors of motivational values, which in turn predict subsequent intentions. Many of these factors may be framed through job demands-resources model as supportive (resources) or undermining (demands) in relation to values that are important to apprentices' dropout considerations.

**Figure 2.2**

*Latent Profile of Learning Resources and Demands at Work and Trade School*



*Note.* From “Situational and individual resources predict learning opportunities and career outcomes in VET”, by Lüthi & Stalder, 2018, In C. Nagele & B. E. Stalder (Eds.), *Trends in vocational education and training research*. Proceedings of the European Conference on Educational Research (ECER), Vocational Education and Training Network (VETNET) (p. 231).



The current research into this motivational process required explicit modelling of important contexts, and further analyses which utilised and then extended beyond descriptive statistics and simple regression – often employed in apprentice retention-related studies. Additionally, multivariate processes over time require methods which elucidate the dynamic process espoused by motivational theory (Eccles, 2005), and how these are shaped by the context (Eccles & Wigfield, 2020). The following chapter provides an overview of methodologies utilised in the three studies that explored and quantified factors which motivated apprentices' intentions to persist or dropout.

### **Chapter 3 - Method**

Driven by the low apprenticeship retention rate, the present research sought to examine the role of motivational values to link apprenticeship factors with intentions to persist or drop out of apprenticeship training. Potential differences in this psychological process across two contexts were of interest – whether predictive factors and motivational values differed across: (a) occupations, and (b) learning environments (i.e., trade school vs. workplace).

This psychological process was explored through a stepped process. The initial step inquired which apprenticeship factors predicted dropout considerations and whether such factors differed between occupations. This was followed by asking, how were motivational values associated with intentions to persist across learning environments, and were they moderated by different occupations? The final question asked whether dropout considerations were predicted by growth in key motivation values over time and was growth explained by apprenticeship factors?

These enquiries were explored through three publications. The first (Study 1) compared apprenticeship factors for plumbing and bricklaying apprentices utilising secondary data from two federally funded projects collected during 2008 and 2009, which explored differences in predictive factors for plumbing and bricklaying apprentices. Studies 2 and 3 utilised primary data collected by the PhD candidate. Informed by EVT and the findings from Study 1, a two-year longitudinal study investigated apprentices' motivational values, apprenticeship factors (resources and demands), planned persistence and dropout considerations, across four measurement occasions. Structural equation models (SEMs) examined the proposed psychological processes.

This chapter begins with an overview of the secondary data used in Study 1, followed by in-depth coverage of the 2-year longitudinal primary data collected for Studies 2 and 3

including the sample plan, procedure, and approaches to manage missing data. A brief overview of the measures is provided, leaving the more detailed description to the publications. The analytical approaches for each of the three studies are outlined and their strengths and weaknesses evaluated.

### **3.1 Data Collection Strengths and Shortcomings**

Surveys are an effective method of collecting a large amount of data from many respondents. Although surveys do not offer the researcher the possibility to probe in depth the participants' answers to elaborate and extend on their responses, which other methods such as interviews do, they were suited to address the research questions that guided this thesis.

The analysis of secondary data for Study 1 restricts the researcher to only be able to analyse information that was already collected and available. This is why the primary data collection for Studies 2 and 3 was carefully designed to address the research questions that were not able to be addressed by the secondary data. The primary data collection utilised theoretically grounded sensitively designed and, in many cases, already externally validated measures.

### **3.2 Secondary Data (Study 1)**

Study 1 drew on secondary data from two separate large-scale surveys of plumbing ( $n = 1,016$ ) and bricklaying apprentices ( $n = 369$ ), collected by the author in 2008 and 2009, under funding from the Australian Governments' Industry Training Strategies Programme, administered by the Department of Education, Employment and Workplace Relations. Survey questions aimed to identify the drivers and barriers which hindered apprentices' take-up of and persistence in plumbing and bricklaying, and included 143 single items developed from preceding focus groups and interviews with apprentices, trade teachers, and employers canvassing the following topics:

- why apprentices took up an apprenticeship,

- who influenced their decision,
- where they found information on apprenticeships,
- experiences with training organisations, and
- experiences with employers.

The prior outputs for both projects included descriptive reports for survey items for each separate trade (see public reports: Walker & Powers, 2008, 2009). Study 1 involved secondary, entirely distinct analyses, to extend findings by exploring which factors were most important in predicting apprentices' considerations of dropping out, and whether predictive factors differed between plumbing and bricklaying apprentices. Stepwise binary logistic regression was employed to identify important factors which accurately classify individuals who had "*ever seriously considered dropping out*" of their apprenticeship, or not; a binary outcome.

Binary logistic regression is logit-based analyses producing probability of a case falling into a category (Dugard et al., 2010). Overall model fit is measured by log likelihood ratios, and individual predictors are typically analysed for significance using the Wald test (Menard, 2001; Tabachnick & Fidell, 2007). The stepwise modelling process utilised deletes non-significant predictors from the model using backward selection in an iterative process to locate significant predictors.

### **3.2.1 Measures**

Both plumbing and bricklaying apprentice surveys had near-identical questions. Unfortunately, some of the response scales differed precluding a combined analysis to directly compare the two trades. All items were single observed variables (i.e., no latent variables), with a mix of binary and Likert-type scale responses. A full listing of the 143 items can be found in Appendix B. Two example questions are:

1. What are the top three reasons you took up a plumbing apprenticeship?

*Response options:* tick top three.

*Answer set:* Working outdoors, plumbing is a highly respected trade, the opportunity to be my own boss, money, the variety of work, I like working with my hands, I like to see the results of my work, lots of work for plumbers (i.e., year round), a friend is also doing an apprenticeship, other reasons you would like to add (optional).

2. Who was influential in your choosing to become a plumbing apprentice?

*Response options:* very influential, somewhat influential, not influential.

*Answer set:* parent or guardian, family business opportunity, other family members, friends not working in a trade, friends in an apprenticeship/trade, secondary school teacher/career advisor, TAFE teacher, a plumber you know, a tradesperson other than a plumber, job network provider, other (please specify).

The two datasets enabled comparable analyses with each, to identify factors which associated with dropout considerations for each of plumbing and bricklaying apprentices. Study 1 informed the measures developed for the longitudinal study which is presented next.

### **3.3 Primary Data (Studies 2 and 3)**

Primary data were collected from trade apprentices at four measurement occasions using self-report surveys commencing February 2015, followed by August 2015, February 2016, and August 2016. The initial survey included 1<sup>st</sup> and 2<sup>nd</sup> year trade apprentices across Australia, who were enrolled in bricklaying, carpentry, plumbing, or electrical apprenticeship courses at 26 trade schools. These trade occupations were targeted to facilitate comparisons of apprentices in licensed and unlicensed occupations. Australian plumbing and electrical occupations are licensed, which require a qualification or enrolment in the specified apprenticeship to be able to work in that occupation. Unlicensed occupations (e.g., bricklaying and carpentry) have no such requirement. 1<sup>st</sup> and 2<sup>nd</sup> year apprentices were

targeted in the initial survey to yield data collectively spanning all four years of apprenticeship training (the accelerated longitudinal design described later in this chapter).

### ***3.3.1 Intended Sample Size***

There are various heuristic guidelines to determine the needed sample size for SEM analyses, often based on the ratio of number of observations to estimated parameters. Additional considerations include degrees of freedom, reliability of measures, quality of indicators, and model complexity (MacCallum et al., 1999). Taking these considerations into account for normally distributed longitudinal data, Little (2013) suggests a sample size of approximately 120 per group for trustworthy statistics. For this study, there were four trade groups (i.e., 4 x 120) and the possibility of non-normally distributed data. Therefore, doubling Little's suggested sample size to 1,000 seemed prudent.

A power analysis also informed the targeted sample size. An *a priori* estimate of sample size was calculated using Hancock and Freeman's interpolation method based on the RMSEA statistic (see Table 4.1 in Hancock & French, 2013, p. 128). Seeking a .80 level of power (i.e., a .80 probability of accepting or rejecting the null hypothesis), sample sizes were calculated for three sets of degrees of freedom providing an indication of sample size needed for a variety of model complexities. Sample sizes with degrees of freedom of 50, 100, and 150 were calculated to be 328, 213, and 168 respectively. This suggested that an intended sample size of 1,000 would be adequately powered.

### ***3.3.2 Sampling Frame***

The sampling frame included all 40 publicly funded trade schools across Australia, which offered apprenticeship training for any of the four targeted occupations, as not all trade schools offered all four trade apprenticeships. The sample did not include apprentices enrolled in private training organisations as no central listing existed for those; and, most apprentices in these four occupations attend publicly funded trade schools (i.e., 71%,  $N =$

37,767<sup>5</sup>). Lead teachers at trade schools were contacted by phone in the first instance, with a follow-up email and flyer (see Appendix C1 and C2 for email and accompanying flyer). Each trade school had a lead teacher acting as a direct manager or team coordinator of other trade teachers. Of all 40 trade schools contacted, 26 chose to participate spanning all Australian states.

### 3.4 Measures

Measures used across Studies 2 and 3 examined: (a) apprentice demographics, (b) job demands and resources, (c) subjective task values, and (d) intentions to persist or consider dropping out. Table 3.1 provides a list of the measures, and Appendix D provides a complete list of items for each latent construct. This section provides an overview of the measures, which are further detailed in the published studies.

The demographic measures were used primarily as control variables. Resource and demand measures were informed by Study 1. Pre-entry resource and demand measures related to career choice factors which were closely linked to the apprenticeship choice. These were retrospective items measured at measurement occasion 1. Resource and demand measures during the apprenticeship related to workplace environment of the apprenticeship experience – this environment was a focus for Study 3, given the results of Study 2.

Subjective task values (STVs) were assessed with previously validated items from large-scale studies, per each of apprentices' job and trade school learning environments. The measurement of STVs across the job and trade school environment was strictly parallel

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<sup>5</sup> This represents the number of Australian commencements between January – March 2015 for bricklayer, carpentry, plumbing and electrical apprentices, as sourced from NCVER VOCSTAT's online dataset, 27 Jan. 2019, <https://www.ncver.edu.au/research-and-statistics/vocstats>

except for the stem: “*My current job experience ...*” to preface job-related measures, and “*My trade-school training experience ...*” to preface trade-school-related measures.

Two outcomes were measured in Study 2, including apprentices’ intentions to: (a) persist with their apprenticeship, and (b) leave the occupation. While related, it should be noted that apprentices in non-licensed occupations (e.g., bricklaying and carpentry) are able to drop out of their apprenticeship and remain in the occupation. The outcome for Study 3 was dropout considerations.

### **3.5 Procedure**

The survey (and project) was granted approval by the Monash University Human Research Ethics Committee (see Appendix E for certificate of approval).

#### ***3.5.1 Piloting the Survey***

The survey instrument was piloted with eight trade apprentices (including carpentry, electrical and plumbing) in the state of Victoria across two TAFEs (i.e., metropolitan and regional). The time taken to complete the survey was approximately 20 minutes. After completing the survey, cognitive interviewing was conducted with these apprentices by the researcher by telephone or in person, to assess comprehension, flow, and any aspects found confusing (Presser et al., 2004). This resulted in two minor changes to the instructions, and the addition of one new question:

- “Print neatly” for name and contact details was added since one apprentice signed his name;
- the instructions for the parallel scoring of value items for each of workplace and trade school was confusing for one apprentice. This led to the additional instruction, “score the questions down one side, then down the other side” (see Appendix F for final version of parallel items); and



**Table 3.1***Measures of Study Constructs*

Measurement occasion 1 only				
Pre-entry measures	Sample item	Items	$\alpha$ in the present study	Source
<i>Controls</i>				
Education attainment	What is your highest level of education?	1	na	
SES	Parental education level + occupational status (AUSEI06).	3	na	
Age	Years.	1	na	
Employer type	Is your apprenticeship with: (1) a group training organisation (2) trade contractor/business?	1	na	
<i>Resources</i>				
Pre-apprenticeship	Have you ever done a pre-apprenticeship program or any pre-trade training before entering your apprenticeship?	1	na	
Time deciding	When did you decide that you wanted to go into this trade?	1	na	
Experience with role model	I've experienced good role-models in the trade.	3	.68	(Watt & Richardson, 2007)
<i>Demands</i>				
Lack of information	I wish I had more information on the variety of career choices in this trade.	3	.86	(Gati et al., 1996)
Indecisiveness	I found it difficult to make this decision.	3	.56	(Gati et al., 1996)
Apprentice experience measure	Measurement occasions 1 – 4		$\alpha$ range in the present study	
<i>Resources</i>				
Work security	This trade offers steady work.	3	.83 - .88	(Watt & Richardson, 2007)
Fair training wage	The apprenticeship wage is a fair deal.	3	.77 - .82	new measure
Employer teaching	My boss takes time to show me new skills.	3	.82 - .85	new measure
<i>Demands</i>				
Expertise	This trade involves highly specialised knowledge.	3	.82 - .86	(Watt & Richardson, 2007)
Excessive work	There is constant pressure for workers to keep working.	3	.69 - .75	(Hart et al., 2000)

Apprentice experience measure	Measurement occasions 1 – 4		$\alpha$ range in the present study	
<i>Job values</i>	My current job experience ...			
Intrinsic	... is something I like.	3	.87 - .91	(Watt & Richardson, 2006)
Attainment	... is important for me to be good at.	3	.86 - .91	(Gaspard, Dicke, Flunger, Schreier, et al., 2015)
Utility	... will be useful to me in the future.	3	.86 - .89	(OECD, 2009b)
Emotional cost	... is something I'd rather not do, because it only worries me.	3	.89 - .90	(Gaspard, Dicke, Flunger, Schreier, et al., 2015)
<i>Trade school values</i>	My trade school training experience ...			
Intrinsic	... is something I like.	3	.86 - .91	(Watt & Richardson, 2006)
Attainment	... is important for me to be good at.	3	.87 - .89	(Gaspard, Dicke, Flunger, Schreier, et al., 2015)
Utility	... will be useful to me in the future.	3	.86 - .89	(OECD, 2009b)
Emotional cost	... is something I'd rather not do, because it only worries me.	3	.88 - .90	(Gaspard, Dicke, Flunger, Schreier, et al., 2015)
<i>Outcomes</i>				
Training persistence (intentions)	How sure are you that you will stay in this apprenticeship?	3	.85 - .92	(Watt & Richardson, 2008)
Occupation turnover (intentions)	I often seriously think about leaving this occupation.	3	.80 - .95	(Bordia et al., 2004)
Dropout considerations	I have seriously considered dropping out of my apprenticeship within the last 6 months (Yes/No)	1	na	

*Note.* na for single-item measures and SES. SES was calculated as the average of highest parents' occupational status and attained level of education

- one apprentice discussed his differing experiences between current and prior employers. This led to adding a question in all surveys after the first timepoint:

“Are you working for the same employer you had 6 months ago?”

None of the survey items was identified to be problematic by the apprentices who piloted the survey.

### ***3.5.2 Distribution Procedure***

Prior to each of the four survey measurement occasions, lead teachers were contacted to collect information on apprentices' date of attendance, the class name/unit, and the number of apprentices who were in each class. A box of paper surveys, bundled by class/unit name, was mailed in one package to each lead teacher. Since most trade schools had multiple classes of apprentices involved in the study over a range of dates, reminder emails were sent to each lead teacher a week prior to the planned survey dates to remind them to coordinate with and distribute the class survey bundle to the relevant teacher conducting each class survey (see Appendix G for reminder email).

The first surveys were distributed in class by trade teachers to all 1<sup>st</sup> and 2<sup>nd</sup> year apprentices during February to May 2015. This initial survey included: (a) a participant explanatory statement (see Appendix H), and (b) an administrator form filled in by the class teacher to record class enrolment and attendance on the day to enable calculation of response rates (see Appendix I for administrator form) – 86% ( $n = 2,250$ ) of scheduled apprentices were in attendance on the survey day, and 75% ( $n = 1,695$ ) of those in attendance participated in the survey. Some participating apprentices attended *self-paced learning* ( $n = 704$ ) and therefore, did not have pre-scheduled classes. These apprentices were approached opportunistically by their trade teachers to complete the survey. Completed surveys were returned in a supplied envelope posted back to the researcher. Prior to disbursing the 2<sup>nd</sup> – 4<sup>th</sup>

surveys, lead teachers provided class names and a nominated attendance date for each participating apprentice. Surveys were then bundled by class/unit with a list of participating apprentices affixed to each bundle.

To encourage teacher engagement during the second survey collection, five informative 2-page flyers were developed reporting findings from the first survey (see Appendix J for an example promotional flyer). The flyers were emailed to participating lead teachers for distribution within their trade school. A new flyer was distributed every two weeks, over a 10-week period, during the second survey collection period.

Returned surveys were entered online using Qualtrics. Approximately 5% of the entered surveys were double-checked for data entry errors at each measurement occasion. Very few discrepancies were found.

### ***3.5.3 Achieved Samples***

There were 2,399 surveys returned during the first collection (i.e., inclusive of self-paced and classroom-allotted apprentices). Of these, 29 participants were excluded because they did not report their name, which meant that they could not be tracked for follow-up surveys. Additionally, 264 surveys were excluded because they revealed pattern responses (e.g., selecting the same response for all questions) which suggested unthoughtful answers (Dillman et al., 2014). Finally, as a longitudinal study, surveys that were mostly incomplete (i.e., 50% or more incomplete) were excluded ( $n = 62$ ). Thus, the initial Measurement 1 sample size for longitudinal analysis was 2,044, representing 3.1% of all Australian in-training apprentices across the four trades at the time of the first survey collection. The sample closely matched the target population in terms of gender, highest school level attained, employer type, and state/territory location (see Table 3.2).

**Table 3.2***Sample Comparison to In-training Apprentices for January-March 2015*

	Sample n (%)		Australia N (%) <sup>ab</sup>	
Apprentices	2,044	(100.0%)	66,543	(100.0%)
<i>Gender</i>				
female	16	(0.8%)	966	(1.5%)
male	2,011	(99.2%)	65,577	(98.5%)
<i>Highest school level</i>				
Year 9 or lower	69	(3.4%)	2,166	(3.3%)
Year 10	410	(20.3%)	14,624	(22.0%)
Year 11	382	(18.9%)	11,230	(16.9%)
Year 12 or higher	1,156	(57.3%)	38,361	(57.8%)
<i>Employer type</i>				
Private sector	1,533	(81.2%)	55,703	(83.8%)
Group training	356	(18.8%)	9,774	(14.7%)
Government	n/a		1,032	(1.6%)
<i>State</i>				
New South Wales	558	(27.3%)	20,091	(30.2%)
Victoria	685	(33.5%)	18,589	(27.9%)
Queensland	176	(8.6%)	13,084	(19.7%)
South Australia	174	(8.5%)	3,867	(5.8%)
Western Australia	297	(14.5%)	7,606	(11.4%)
Tasmania	49	(2.4%)	1,203	(1.8%)
Northern Territory	0	(0.0%)	740	(1.1%)
Australian Capital Territory	105	(5.1%)	1,331	(2.0%)
<i>Age</i>				
19 years and under	1,067	(52.8%)	24,756	(37.2%)
20 to 24 years	635	(31.4%)	28,086	(42.2%)
25 to 44 years	311	(15.4%)	12,785	(19.2%)
45 years and over	9	(0.4%)	916	(1.4%)

<sup>a</sup> Source: VOCSTATS <<http://www.ncver.edu.au/resources/vocstats.html>>, extracted on 20

March, 2018. <sup>b</sup> Includes bricklaying, carpentry, plumbing and electrical apprenticeships in-training during the period of January-March 2015.

The second and third surveys (i.e. Measurement 2 and Measurement 3) included additional participants (see Table 3.3). Although these were not actively sought out, additional apprentices who may have been absent in Measurement 1 chose to participate when given the opportunity. Of the 2,044 apprentices in the sample at Measurement 1 – who had the potential to fill out surveys at all four timepoints – 76% ( $n = 1,544$ ) filled in two or more surveys, 48% ( $n = 972$ ) three or more, and 22% ( $n = 440$ ) filled in all four surveys. It is worth noting that apprentices who missed a measurement occasion could still respond at a later timepoint (see section 3.5.1 regarding attrition).

**Table 3.3**

*Number of Apprentices Involved in Survey*

Measurement of participants' 1st survey	<i>N</i>	Cumulative
Measurement 1	2044	2044
Measurement 2	467	2511
Measurement 3	340	2851
Measurement 4	0	2851
Total participants	2851	

### 3.6 Missing Data

Understanding patterns of missing data are relevant to any study, but particularly so in longitudinal studies. Missing data patterns within samples raise concerns about making population inferences, and influence power, bias, and the effectiveness of modern missing treatments (Little et al., 2014). Three missing data mechanisms include: a truly random process (MCAR; missing completely at random), a predictably missing process (MAR; missing at random), or an unpredictable process (MNAR; missing not at random; Little, 2013; Rubin, 1976). MCAR and MAR are “both referred to as ignorable missing data mechanisms because bias is either non-existent (MCAR) or recoverable (MAR) and power is

restored when a modern treatment is used” (Little et al., 2014, p. 152). Missing not at random (MNAR) is more problematic as the missingness cannot be explained by other collected data. The following describes missingness across measurement occasions (i.e., attrition), within surveys, planned missingness, and the approaches used to manage missingness.

### ***3.6.1 Attrition***

Attrition, or survey non-response, is “nearly always” the most common pattern of missingness in longitudinal studies (Newsom, 2015, p. 348). This study proved no different. Although attrition rates vary considerably across studies (Alderman et al., 2001), they often depend upon the number of waves, length of time between waves, the targeted respondents, and the procedure to retain participation (Hunt & White, 1998; Sullivan et al., 1996). Procedural challenges within this study included tracking of apprentices who changed classes between measurement occasions, and instances where trade teachers inadvertently missed distributing surveys to classes due to miscommunication. Although such reasons could be argued to be MCAR for apprentices, there are bound to be other non-ignorable reasons for attrition. Survey non-response rates in this study ranged from 35% to 41% for the second through fourth measurement occasions (see Table 3.4). Similar non-response rates are reflected in international longitudinal apprenticeship survey studies; for instance, 30-38% across three studies in Germany and Switzerland (Forster-Heinzer et al., 2016; Nagele & Neuenschwander, 2014; Schmid & Stalder, 2012).

### ***3.6.2 Missing Items within Completed Surveys***

Apprentices who started the survey completed most questions. As presented in Table 3.5, less than 10% of apprentices who started a survey were missing more than 20% of the questions in the survey. While it is heuristically accepted that item missingness of 5% or less is ignorable using traditional listwise deletion (Kline, 2016), this approach is based on the

**Table 3.4***Survey Attrition Rate Across 4 Measurement Occasions*

	M 1	M 2	M 3	M 4
Participants <sup>a</sup>	2044	2511	2851	2851
Dropped out or completed apprenticeship <sup>b</sup>	0	153	428	749
Available for survey	2044	2358	2423	2102
Completed survey	2044	1486	1575	1242
% Attrition <sup>c</sup>	0%	37%	35%	41%

<sup>a</sup> Survey participants including new participants starting at measurement occasions 2 and 3.

<sup>b</sup> Participants unavailable for survey because they had dropped out or completed their course.

<sup>c</sup> Rate of survey attrition excluding apprentices who had dropped out or completed their study and were therefore unavailable to be surveyed.

**Table 3.5***Survey Item Missingness Across 4 Measurement Occasions*

% items missing	M 1	M 2	M 3	M 4
10% or more	11%	14%	12%	15%
20% or more	7%	8%	9%	9%
30% or more	4%	6%	8%	7%

assumption that “the discarded cases are like a random subsample” (Schafer, 1999, p. 7).

Others have shown that missingness up to 20% satisfies the assumptions underlying listwise deletion (see simulation studies by Muthén et al., 2016, p. 476). With higher rates, other modern approaches are required, as described later in this section.

**3.6.3 Planned Missingness**

Planned missingness occurs when participants are split into random subgroups which impose an unbiased data pattern across missing measurement occasions, or items (Little & Rhemtulla, 2013). Such missing data are considered MCAR since the participant is not



making a decision related to attrition or missing items. Planned missingness can be useful in longitudinal studies (Mistler & Enders, 2012) when studying developmental processes (Enders, 2010). A planned missing design often utilised in longitudinal studies is an accelerated longitudinal design, also known as a cohort-sequential design (Little, 2013). The main advantage of an accelerated longitudinal design is the ability to model a more complete timespan of the training experience within a shorter timespan (Enders, 2010) by combining several short-term longitudinal studies involving participants at different stages (e.g., year/semester of apprenticeship). This can greatly reduce the time (Galbraith et al., 2017), cost, and burden on respondents (Little & Rhemtulla, 2013). An accelerated longitudinal design was employed for Study 3. The initially sampled apprentices (1<sup>st</sup> and 2<sup>nd</sup> year apprentices) were considered across 4 cohorts:

- Cohort 1: those just starting their trade school training (< 4 weeks in training),
- Cohort 2: first semester,
- Cohort 3: second semester,
- Cohort 4: third semester.

By surveying the same apprentices every 6 months over 4 occasions, apprentices completed their final survey while in their 3<sup>rd</sup> to 6<sup>th</sup> semester of trade school (see Table 3.6). By transforming this dataset into an accelerated longitudinal design (see Table 3.7), the developmental process of apprenticeship training could be examined from the initial period of training until the 6<sup>th</sup> semester. This accelerated longitudinal design has planned missing measurement occasions for each cohort – three missing occasions for each cohort in this study (see Table 3.8). Since a planned missing design can be considered MCAR, the main issue of concern is power for analysis, which can be increased with more apprentices, increased measurements per apprentices, fewer cohorts (Galbraith et al., 2017), and greater

overlap of data between cohorts. Overlapping data is a key issue in the context of planned missing designs to ensure enough coverage to generate trustworthy covariance estimates that adequately reflect the population (Little, 2013).

**Table 3.6**

*Measurement Occasions by Cohort*

Cohort	Measurement occasions			
	M1	M2	M3	M4
1	Sem 0 <sup>a</sup>	Sem 1	Sem 2	Sem 3
2	Sem 1	Sem 2	Sem 3	Sem 4
3	Sem 2	Sem 3	Sem 4	Sem 5
4	Sem 3	Sem 4	Sem 5	Sem 6

*Note.* Colour coding represents measurement occasion of surveys; yellow = March 2015, blue = August 2015, pink = March 2016, green = August 2016. Sem = semester.

<sup>a</sup> Apprentices' initial attendance at trade school (less than 4 weeks).

**Table 3.7**

*Accelerated Longitudinal Design (Semester x Cohort)*

Cohort	Semester of attendance in trade school						
	Sem 0 <sup>a</sup>	Sem 1	Sem 2	Sem 3	Sem 4	Sem 5	Sem 6
1	M1	M2	M3	M4			
2		M1	M2	M3	M4		
3			M1	M2	M3	M4	
4				M1	M2	M3	M4

*Note.* Colour coding represents measurement occasion of surveys; yellow = March 2015, blue = August 2015, pink = March 2016, green = August 2016. Sem = semester.

<sup>a</sup> Apprentices' initial attendance at trade school (less than 4 weeks).

**Table 3.8***Number of Surveyed Apprentices (Semester x Cohort)*

Cohort	Time in trade school (semester)						
	Sem 0	Sem 1	Sem 2	Sem 3	Sem 4	Sem 5	Sem 6
1	507	247	248	223			
2		530	274	233	266		
3			637	343	381	316	
4				323	136	125	123
<i>N</i>	507	777	1,159	1,122	783	441	123

*Note.* Colour coding represents time of surveys; yellow = March 2015, blue = August 2015, pink = March 2016, green = August 2016. Sem = semester.

The accelerated longitudinal design is well suited for identifying semester differences, while controlling for cohort differences – issues which are confounded in cross-sectional designs. Notwithstanding, there is an underlying assumption that the time-of-measurement effects are small, since such effects are confounded with the interaction of semester and cohort (Little, 2013). Examples of time-of-measurement effects in the context of this study might include possible national changes (e.g., pay rates, curriculum, economic downturn), or possibly seasonal effects such as surveys conducted during the summer versus winter period.

### **3.6.4 Managing Missing Data**

The strategies for handling missing data depend on the amount and pattern of missing data. When item missingness exceeds 20%, traditional methods of handling missing data become indefensible. These traditional methods include listwise deletion and data substitution (i.e., means-, and regressions-substitution). Such methods assume MCAR, which is rarely the case in uncontrolled environments (Little & Rhemtulla, 2013), and can produce considerable loss of power (Schlomer et al., 2010), biased means, and variances or

covariances. In the presence of substantial missing data, experts strongly advise against these methods (Allison, 2001; Enders, 2010; Graham et al., 2003; Schlomer et al., 2010).

Modern methods for treating missing data include full-information maximum likelihood (FIML) and multiple imputation. Compared to traditional methods, these modern methods perform better under a range of missing data mechanisms:

- MCAR – greater efficiency (i.e., smaller standard errors; Enders, 2001);
- MAR – greater efficiency and less bias (Enders, 2001); and
- MNAR – less bias (Collins et al., 2001).

FIML is commonly used as a means of estimating parameters in the presence of missing data in structural equation models (Enders, 2013), and was utilised within this research. While FIML and multiple imputation generally produce similar results (Graham, 2009), the fit indices for multiple imputations are “pooled” from multiple imputed samples “and methodologists have yet to develop formal pooling rules for fit indices such as the CFI and RMSEA” (Enders, 2013, p. 514). FIML is a model-based estimation method that utilises what is known about the observed variables in the model to *imply* probable values for the missing data – without imputing missing values (Enders, 2013). As the name suggests, “full information” maximum likelihood uses the all case-specific log likelihood values to estimate the analogous covariance matrix based on all the *available* data for each case (Enders, 2013; Newsom, 2015). FIML appears to perform well even with small sample sizes (e.g., 50 cases) and with missingness as high as 50% (Graham & Schafer, 1999). The use of FIML has therefore been encouraged (Newsom, 2015) and was utilised in Studies 2 and 3.

### 3.7 Analyses

As was discussed in chapter 2, a great deal of Australian retention-related apprenticeship research has utilised single-item measures sourced from focus groups and

interviews. Such items, along with the results of Study 1 informed the development of multi-item measures of apprenticeship factors developed for this research and utilised in Study 3. Such latent measures provide stronger and more defensible constructs whereby measurement error can be accounted for in analyses, thus providing for contemporary methodological approaches encouraged within apprenticeship research (Shah, 2017). This section discusses the overarching statistical approaches utilised in Studies 2 and 3 which are only briefly described in the publications. They are: (a) SEM, (b) bi-factor analysis, and (c) latent growth curve modelling, respectively.

### ***3.7.1 Structural Equation Modelling***

Structural equation modelling (SEM) is distinguished by simultaneous estimation of measurement of latent variables and structural paths between them. Latent (or unobserved) variables are inferred by a set of observed indicators which share a common cause – the latent construct (Borsboom et al., 2003; Edwards & Bagozzi, 2000). Motivations are examples of latent (unobserved) variables, common among research in the social sciences (Kaplan, 2009) and educational psychology (Nagengast & Trautwein, 2015). Their observed indicators are imperfect manifestations of the latent variables and contain measurement error (Lord & Novick, 1968). An important advantage of SEM is the ability to separate this measurement error from the *true score* of the latent construct, providing more precise estimates of the structural paths between them (Cole & Preacher, 2014; McArdle & Kadlec, 2013).

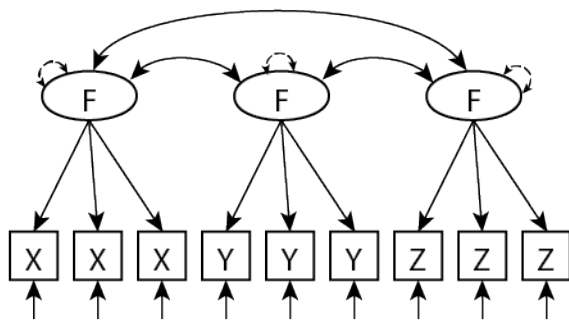
There are further advantages to SEM which can posit complex multivariate relationships among independent and dependent variables (Hershberger & Marcoulides, 2013; Nagengast & Trautwein, 2015), enabling tests for direct and indirect effects (Wang & Wang, 2012). SEM can accommodate longitudinal data with autocorrelated errors, FIML missing data treatment, along with categorical outcomes and the ability to handle

nonnormally distributed data (Browne, 1984; Kaplan, 2009). Finally, SEM provides a suite of indices for model fit, which extend beyond individual regression parameters.

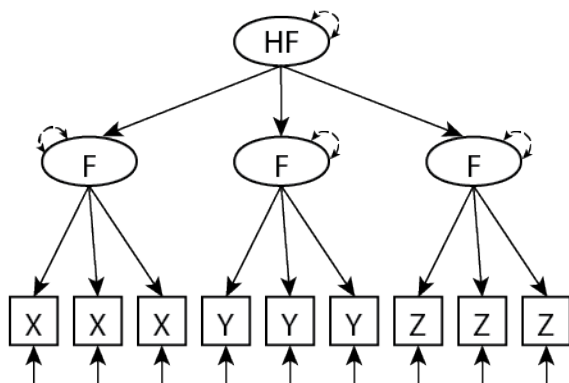
SEM provides a unifying framework with tremendous flexibility to explore relationships among multidimensional STVs and their developmental changes over time, which are described in the following sections. Study 2 used bifactor analysis to explore multidimensionality of STVs within trade school and workplace as predictors of intentions to persist with training, to directly compare trade school and workplace learning environments. Study 3 utilised latent growth modelling (LGM) to assess the shape of STVs' change over time as predictors of dropout considerations, and the job-related resources and demands that influence these STV growth patterns. These two approaches are explained in greater detail in the following sections.

### **3.7.2 Bifactor Analysis**

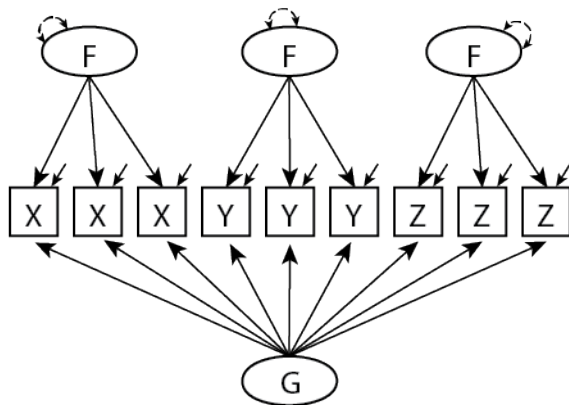
Bifactor analysis is common within behavioural and social science research to ascertain whether a measurement instrument that is not homogeneous may be operating in a unidimensional way that can serve as a convenient summary “for several subsidiary tendencies that contribute to it” (Carver, 1989, p. 583). Bifactor models partition item measurement variance between one general factor, and two or more orthogonal specific factors (Holzinger & Swineford, 1937; Simms et al., 2008), as presented in Figure 3.1c. Given the moderate-to-high covariance typical between the four STVs (i.e., intrinsic, attainment, utility, and cost values), Study 2 explored a *general value* construct operating across the observed items of these four constructs. Bifactor analysis was used in Study 2 to examine the role of apprentices' general value for trade school versus the workplace in predicting apprentices' planned persistence. This provided empirical evidence for the relative importance of the two learning contexts, and how they were interrelated.

**Figure 3.1***Lower and Higher Dimensional Measurement Models*

a. first-order CFA



b. higher-order CFA



c. bifactor CFA

*Note.* F = factor; HF = higher-order factor; G = general factor.

A key advantage of the bifactor model comes from its orthogonality, providing a way to simultaneously consider all specific factors without encountering potentially severe

problems of multicollinearity (Howard et al., 2018) which has been a key challenge for EVT research. Other advantages of bifactor versus higher-order models (see Figure 3.1b) include the ability to independently model the effects of general *and/or* specific factors on external variables (Chen et al., 2006). Such advantages have given rise to the use of bifactor structures in modelling multidimensional data (Eid et al., 2017) in education and psychology fields (Koch et al., 2018; Wang et al., 2018).

In interpreting bifactor models (Bonifay et al., 2017), the general factor represents the common underlying variance to all indicators, while the specific factors are “residualised factors” (Reise, 2012, p. 691) and represent substantively unique constructs to the general factor (Bonifay et al., 2017). They are not *caused* by the general factor as in higher-order CFA models (see Figure 3.1b). Thus, there is substantive, distinct meaning in the general construct in a bifactor model (Kline, 2016), rather than higher order factor that is derived from *prediction errors* (unaccounted variance) in a second-order model framework (Chen et al., 2006). This is important when one is interested in the predictions of the general factor on substantive outcomes (Chen et al., 2006).

### **3.7.3 Latent Growth Modelling**

Study 3 explored the trajectories for STVs for apprentices in relation to their dropout considerations through latent growth modelling (LGM), and how various job-related covariates (i.e., demands and resources) influence these trajectories. Longitudinal SEM can flexibly account for both within-participant and between-participant heterogeneity over time (Wang & Wang, 2012). Traditional non-SEM approaches to longitudinal data (e.g., repeated-measures analysis of variance) operate at the group mean level. While this may be informative, it fails “to address hypotheses regarding the nature and determinants of change



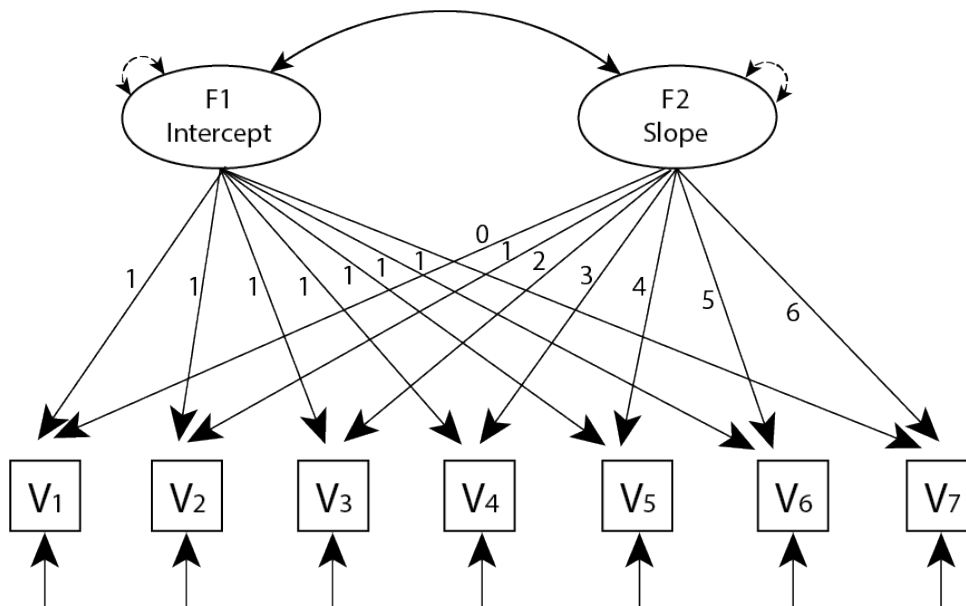
at the level of the individual which are often the most important aspects of the data”  
(Hancock et al., 2013, p. 310).

Latent growth modelling (LGM) can be estimated within the flexible framework of SEM, to examine the rate and shape of change over time (Little, 2013). LGMs characterise the initial group mean (i.e., when intercept is modelled at first timepoint) and trajectory over time (i.e., shape of growth) for a repeatedly measured variable (see Figure 3.2).

LGMs can facilitate and model linear, nonlinear, or a combination of trajectories within a repeated measure. Additionally, LGM can measure the variability across individuals for latent intercept, slopes, or other growth functions. The presence of significant variance on these latent trajectories suggests explanatory variables may be missing from the model. LGMs can estimate the influences of other variables to explain the variance in growth

**Figure 3.2**

*Latent Growth Curve Model (Linear Example)*



*Note.* F = factor; V1-7 = observed variables over 7 timepoints.

trajectories (Duncan & Duncan, 1995; Rogosa & Willet, 1985). Such explanatory variables may include time-invariant predictors of trajectories which explain differences between individuals, and time-varying predictors that are measured at each timepoint which explore within-person effects over time (Hancock et al., 2001).

### **3.8 Chapter Summary**

This chapter has provided an overview of the secondary data sources for Study 1 and the 2-year longitudinal survey plan and methodological approaches for data used in Studies 2 and 3. The first study provided an exploration of apprenticeship factors predicting apprentices' dropout considerations specific to a licensed trade occupation, which were compared to predictive factors for an unlicensed occupation. The second study examined multidimensional motivational values predicting planned apprenticeship persistence across learning environments (i.e., trade school and workplace) and whether predictive values differed across licensed and unlicensed occupations. The third study examined predictions of dropout considerations by growth trajectories of important motivational values derived from Study 2. Further, the third study examined whether such trajectories could be influenced by retention-related apprenticeship factors experienced by apprentices prior to entry (i.e., experience with role models, timing of choice, career information, and career indecision) and during their apprenticeship (employer teaching, job security, training wages, expertise perception, and excessive work).

Chapters 4 to 6 present the three publications, summarised in Table 3.9. The three publications are followed by Chapter 7 providing critical analysis, theoretical and practical implications, limitations and future research implications, and the conclusion.

**Table 3.9***Studies in Chapters 4 to 6*

Study	Title	Data source	Methodology
1	Predicting apprenticeship retention: Not all trades are the same	Secondary data	Logistic regression
2	Motivated apprentices: The value of workplace and trade school	Cross-sectional (M1)	Bifactor SEM
3	Understanding why apprentices consider dropping out - Longitudinal prediction of apprentices' workplace interest and anxiety	Longitudinal (Semester 0-6)	Latent growth model

*Note.* M1 = data collected at measurement occasion 1 (March 2015).

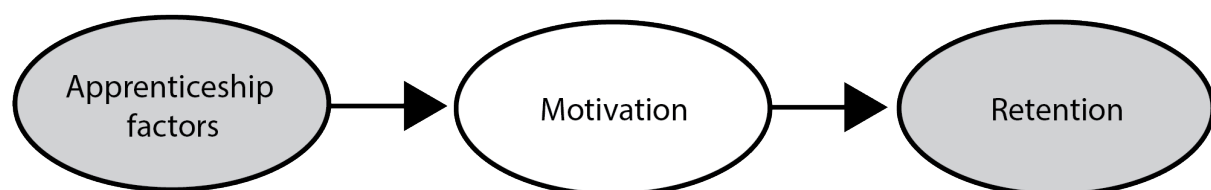
## Chapter 4 - Study 1

### 4.1 Preface

The overarching aim of this research was to explore apprenticeship factors that inform the underlying psychological process that predicts apprentices' dropout considerations. In pursuing this overarching aim, Study 1 began with the research question, do apprenticeship factors which predict dropout considerations differ between occupations? Although dropout rates have been shown to differ across apprenticeship occupations in Australia (Ball & John, 2005; Callan, 2000; Cully & Curtain, 2001; Seymour et al., 2012; Snell & Hart, 2008; Stromback & Mahendran, 2010), whether factors that predict dropout considerations differ between trade occupations has not been sufficiently explored. Study 1 is one of the first empirical studies to examine whether different factors predict dropout intentions across two apprenticeship occupations. Such findings will inform interventions and policy directions which may differ across apprenticeships.

**Figure 4.1**

*Focus of Study 1*



*Note.* Shaded ovals represent focus of Study 1, within the three components of the psychological process examined in this PhD.

Study 1 analysed 143 items from secondary data under two separate analyses – plumbing ( $n = 1,016$ ) and bricklaying apprentices ( $n = 369$ ). These items were analysed using

stepwise logistic regression, where the outcome variable was whether apprentices “had seriously considered dropping out”.

# Predicting apprenticeship retention: not all trades are the same

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## Abstract

In Australia non-completion rates in trade apprenticeship training have remained stubbornly high over the last decade and currently hover between 44% and 46%. Most studies of retention or attrition focus on apprentices as a single group. However, the challenge of identifying the reasons why some people persist in an apprenticeship, while others drop out is complex and multifaceted. This study explores the factors which predict planned persistence and the risk of dropping out for two construction trade apprenticeships — plumbing and bricklaying. These two trades share some common industry characteristics, but also differ in specialist diversity, status, licensing and work gang numbers.

Findings from this study indicate that the reasons individual apprentices plan to persist or drop out is best understood at the occupational level. Some factors were the same between these two trades, while over half differed. *Plumbing and bricklaying apprentices* were more likely to persist if they decided to take up the trade because they liked working with their hands, looked forward to being their own boss, had discussed their career choice with tradespeople, and found good career information at the training institute. Apprentices from both trades were more likely to persist if they found the teaching easy to understand at an institute and enjoyed having a variety of topics covered. Their planned persistence also increased when apprentices had an employer who was flexible in their teaching skills and forthcoming in answering questions.

*Plumbing apprentices* were more likely to persist if they linked their on-the-job experience to career aspirations, viewed plumbing as a respected trade and had close friends who were supportive of their decision to take up an apprenticeship. Persistence was enhanced for plumbing apprentices when they had a school career advisor who directed them generally into TAFE and they were able to easily access career information. Plumbing apprentices were much more likely to persist if they experienced easy-to-understand teaching at the training institute. This perception was enhanced when they had good access to teachers, got help with subjects, believed the tools and materials were adequate and enjoyed the way they were taught.

*Bricklaying apprentices* were more likely to persist if they were supported in their decision to take up an apprenticeship by their parents, perceived their school career advisor to be encouraging and knowledgeable about bricklaying as a suitable pathway, and found career information in the newspaper. Persistence was more likely for bricklaying apprentices who enjoyed learning from their boss and were satisfied with the people they worked with.

By using factors appropriate to the trade, this study was able to identify which apprentices planned to persist or those who had seriously considered dropping out, for 74% of plumbing and 79% of bricklaying apprentices. This has important implications for recruitment and training practices. This occupational approach fills an important gap in research on apprenticeship retention by detailing how to attract

and retain trade apprentices in different occupations. This study shows that people plan to persist in different trade apprenticeships for some core, but many trade-specific, reasons.

## Introduction

Non-completion rates for construction trade apprentices have remained stubbornly high over the last 20 years and continue to be a topic of concern. While many studies have analysed apprentices as a single group, others have argued that the issue of retention can only be understood at the occupational level (Harris et al. 2001a; Harris & Simons 2005; Wigfield & Eccles 2000). The aim of this study is to identify the factors that accurately distinguish, for two trades, those apprentices who are at risk of dropping out from those who are likely to persist with their trade training.

There are two aspects which differentiate this study from many other reports on apprenticeship retention and attrition. First, this study looks at factors which help to explain the individual decision process, including: interests, expectations, personal goals, influential people, career advice/information, and perceptions of trade training. These factors address both the period of time before (retrospectively) and after signing up to an apprenticeship. These two perspectives have important implications for recruitment approaches and ongoing support during apprenticeship training. Secondly, this empirical analysis reviews apprenticeship persistence in relation to two specific occupations with the aim of exploring whether trade apprentices choose to remain or drop out of their training for the same reasons across trades. Consequently, this study seeks to answer the following questions:

- Can we identify apprentices who are at risk of dropping out as well as those who are more likely to persist in their trade training?
- If so, are the factors the same across two compared trades?

The two trade occupations that were compared are bricklaying and plumbing apprentices, chosen because of their similarities and differences. The similarities are that they are both generally three-year apprenticeships in the construction industry, include domestic and commercial worksites, are considered part of the suite of 'traditional trades', and have similar time committed to on- and off-the-job training. The differences are that plumbing offers a number of specialist areas, provides the capacity to work independently or in larger gangs and tends to have a higher status amongst tradespeople — often attributed to the licensing requirement. In contrast, bricklaying is unlicensed, less diverse, and bricklayers tend to work in gangs of two to four.

There are many views on what encourages people into a trade and how best to support their apprenticeship training, but not all have been examined in terms of their association with retention. In this study, over 100 factors will be tested from those suggested by tradespeople, trade-specific industry associations, state education departments, group training organisations, registered training organisations, unions and apprentices. If it is shown that bricklaying and plumbing apprentices persist for reasons that differ, then this suggests that career information should be relevant to specific trade apprenticeships to attract individuals who are more likely to persist in that trade.

The following section provides background on the challenge of non-completion rates for trade apprenticeships and an overview of previous studies. The third section reviews the research process and some of the important measures used in this report. This is followed by an in-depth section presenting results for the plumbing apprentices (Study 1). In Study 2, the results from plumbing apprentices are compared with those for the bricklaying apprentices, to explore whether the same

factors predict persistence for the two trades. The final two sections offer further interpretations and final comments.

## Background

Trade apprenticeships have a long history of low completion rates. Various interventions have been trialled including: financial incentives, field officers, mentoring programs, contestable funding and pedagogical changes such as 'fast-tracking' and on-site training. However, despite initiatives implemented independently and in combination, little has changed when it comes to retention rates for apprentices in the construction industry.

### Non-completion rates

Non-completion rates in trade apprenticeship training have long attracted the attention of industry stakeholders and government funding bodies. Despite this attention, non-completion rates have remained stubbornly high over the last decade (Dickie, McDonald & Pedic 2011) and currently hover in the range of 44–46% in Australia (NCVER 2010).

In fact, studies highlight significant declines in completion rates over the last 20 years. A study by Ball and John (2005) found that contract completion rates<sup>1</sup> fell from 65% in 1995 to only 45% in 2005. Karmel and Virk (2006) produced estimations for individual completion rates<sup>2</sup> over a similar time period and found that they fell from 64% during the period of 1998–2002 to 57% during 2002–05. More recently, a study by NCVER (2010) revealed that the cohort of trade apprentices who finished in 2010 had a 56% completion rate.

There are substantial differences in individual completion rates between states and territories; for example, Tasmania and Victoria differ by 14% (see table 1). This variation is more than an artefact of reporting practices (Knight 2008) and suggests that high attrition rates are not intractable.

**Table 1 Individual completion rates<sup>a</sup> for trade occupations commencing 2009 (%)**

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT
Individual completion rate for construction trade workers	54.9	52.7	61.8	55.7	64.5	66.7	55.3	57.3

Note: a = based on a recommencement adjustment factor.

Source: NCVER (2014).

### Which occupation?

Establishing which factors influence completion rates is complex, because the combination of factors is multifaceted and idiosyncratic (GTA 2005; Harris & Simons 2005). Notwithstanding, there is a strong view that the factors of persistence are better understood within the context of a particular occupation (Harris et al. 2001a; Harris & Simons 2005). In 2001, Harris et al. conducted interviews with 437 apprentices and trainees across occupations in Australia to uncover the factors which contributed to improved retention rates. The report states emphatically that the 'phenomena of retention and completion can only be fully understood within the context of a particular occupation's culture. Any overall discussion of factors or analysis of aggregated national statistics affecting

<sup>1</sup> Contract completion rate refers to the proportion of contracts of training which were completed.

<sup>2</sup> Individual completion rate is an estimate of the proportion of apprentices who eventually completed their training in the same occupation, but not necessarily with the same employer.



retention and completion can only be general, as the nature of the particular occupation is critically important' (2001a, p.34).

Empirical studies of occupational choices, performance and persistence outside the apprenticeship field also emphasise that influential factors are distinguishable only at the occupational level (Wigfield & Eccles 2000).

### Person-based factors

The decision to drop out of an apprenticeship is a very personal choice, influenced by personal interests, expectations and individual goals (Lent, Brown & Hackett 1994). These factors change over time as individuals interact with their changing environment (Sharf 2010; Vondracek, Lerner & Schulenberg 1986) in dynamic interactions which impact on individual vocational behaviour (Lent, Brown & Hackett 1994).

#### *Ability beliefs and interests*

Interests in particular types of activities tend to develop in youth through experiences that are challenging, intrinsically satisfying and, in the main, successfully completed. Career counsellors often explore these interests to help individuals find appropriate job matches.

A person's belief in her/his ability to achieve particular activities is strongly related to career interest (Lent, Brown, Schmidt et al. 2003). Such ability beliefs are more cognitive than objectively measured abilities. Bandura (1989) first described this as self-efficacy, which has been shown to determine level of motivation (Bandura 1989), effort in mastering challenges (Bandura & Cervone 1983; Cervone & Peake 1986; Jacobs, Prentice-Dunn & Rogers 1984), and level of persistence and efforts (Bandura 1986). Apprentices' belief in their ability is important to the decision to persist in their apprenticeship. Bandura presents these ability beliefs as 'the most central and pervasive mechanism of personal agency' (1989, p.1175).

#### *Outcome expectations*

Career interests flourish where there are highly anticipated positive outcomes and often founder where negative outcomes are foreseen (Lent, Brown & Hackett 1994). These anticipated outcome expectations include intrinsic valued outcomes (for example, satisfaction, fulfilment), as well as valued work reinforcers (Dawis & Lofquist 1984) such as money, status, and independence. Outcome expectations appear to have a strong influence in educational decisions where decisions are considered costly or important and where the level of ability is not linked to entry (Lent, Brown & Hackett 1994).

#### *Personal goals*

Personal goal setting is important in regulating self-behaviour through its capacity for self-motivation (Bandura 1989). Expressed career choices, career planning, course selection, and seeking related job experience are all examples of personal career goal mechanisms. These goals help to maintain behaviour over sustained periods and thereby increase the likelihood of expected outcomes.

### Context-oriented factors

The literature on retention factors is generally divided between person-oriented and context-oriented factors (Harris & Simons 2005). Context-oriented factors have been shown to influence vocational choice and persistence (Lent, Brown, Schmidt et al.; Phillips, Christopher-Sisk & Gravino 2001; Shih &

Chuang 2008; Rogers & Creed 2011; Rogers, Creed & Glendon 2008). Studies specific to apprenticeship retention and attrition have tended to focus on the themes below, which are reviewed in sequence:

- the influence of important people (for example, family, friends)
- career information and advisors
- training provider (that is, off-the-job training)
- employment experience (that is, the on-the-job experience of apprentices).

### *Influential people*

Support from family, friends and partners have been repeating factors in many industry-led qualitative studies conducted on apprenticeship persistence (Dickie, McDonald & Pedic 2011; GTA 2005; Harris et al. 2001a). More specifically, Kenney and Bledsoe (2005) pointed to family support as impacting on career outcome expectations and perceptions of barriers, whereas teachers were most influential for school engagement. Peer support was the most influential factor for perceptions of barriers.

Even after making a vocational choice, the approval of family, friends and teachers has been shown to impact on career development (Millward et al. 2006), whereby disapproval can have a negative impact on vocational development, although some research suggests this effect is due to negative or poor relationships (Rogers, Creed & Glendon 2008). In addition to receiving social support, apprentices may be less persistent in their training due to the time associated with their social commitments, which may be perceived as important social interactions (Harris et al. 2001a).

### *Career information and advisors*

There are many individuals who support school leavers in their career decision, often due to their relationship or professional role. Not surprisingly, a lack of awareness of and information on apprenticeships have been linked to reduced apprenticeship training persistence (Canadian Apprenticeship Forum 2003; Gunderson 2009).

### *Training institute environment*

The career theory literature highlights the impact of the training institute on training persistence. In one of the few studies that distinguished technical (that is, US equivalent to vocational education in Australia) from university training, Lent, Brown, Talleyrand et al. (2002) highlighted that technical college students were much more inclined to mention the school environment as influential in their career pursuits. The aspects mentioned by the students included instructors, staff members, curriculum structure, and job placement assistance. Other studies have shown that positive attitudes towards the educational institution were related to higher educational aspirations and participation (Stephen & Fullarton 2002; Khoo & Ainley 2005).

Industry reports have also placed a great deal of attention on training institute factors. In an analysis conducted by the NSW Board of Vocational Education and Training in 2011 (Dickie, McDonald & Pedic), the perceived value of the qualification and participation in structured training were associated with the likelihood of completion, as was the perceived higher quality of training, a finding also noted by Mitchell, Dobbs and Ward (2009). The quality of teachers is specifically emphasised in industry reports: teachers who are supportive, efficient and experienced in the occupation are associated with higher completion rates (Dickie, McDonald & Pedic 2011; Harris et al. 2001a).

### *Employer environment*

A variety of tertiary education programs has noted the positive impact of supportive on-the-job work experience on career choices (Shih & Chuang 2008; Millward et al. 2006). These studies suggest that on-the-job work experience increases confidence and occupational competence, which in turn helps to confirm for the individual whether or not s/he should persist and pursue training further.

Many industry reports claim that the employment experience is the most important and distinguishing factor in apprenticeship retention and completion (Bednarz 2014; Cully & Curtain 2001; GTA 2005; Dickie, McDonald & Pedic 2011; Snell & Hart 2008). Even for those apprentices who were less committed, or more ambivalent about their apprenticeship, the employment experience often 'tips them towards or away from completion' (Dickie, McDonald & Pedic 2011).

Other employment factors important to persistence have included supervisor support (Harris et al. 2001a), the respect shown by employers towards the apprentice (Dickie, McDonald & Pedic 2011), the quality of on-the-job training (Mitchell, Dobbs & Ward 2009), and the variety of work experience (Dickie, McDonald & Pedic 2011; Harris et al. 2001a). Workplace cultures that value training show higher levels of retention (Mitchell, Dobbs & Ward 2009).

## The research process

This section provides a brief background on the surveys utilised and the statistical modelling approach. An overview of the inferential tests and interpretive statistics is presented to provide background to their use in the subsequent results. A more detailed explanation of the statistical approach can be found in appendix A.

### Apprentice surveys

The factors explored in this study cover both the period of time before and after signing up to an apprenticeship. Those factors that deal with the period before sign-up are most helpful in guiding hiring and the promotion of specific occupations. Those which deal with the period of the apprenticeship highlight potential interventions to increase the likelihood of persistence for those already commenced.

This analysis was conducted using secondary data from two separate surveys. Study 1 targeted plumbing apprentices (n = 1016) and was conducted in 2008 (Walker & Powers). Study 2 was a year later with bricklaying apprentices (n = 369) (Walker & Powers 2009). Both were funded by the Commonwealth Department of Education, Employment and Workplace Relations.

The development of both surveys followed a similar process. Both projects ran forums in at least five states with representation from tradespeople, trade-specific industry associations, state education departments, group training organisations, registered training organisations and unions. Focus groups were also conducted with apprentices: four groups for plumbing and five for bricklaying.

This process informed the content of the apprentice survey, which contained questions organised under the following themes:

- the main reasons individuals choose a trade apprenticeship
- the most significant worries when choosing a trade apprenticeship
- the most influential individuals and whether they supported the apprentice in their career choice
- school career advisors' perceived career knowledge and training pathways encouraged

- career information sources
- training institution flexibility and training performance criteria
- employer training approach.

Many question responses were yes/no to ease response complexity and completion time. The remainder were 3 to 5-point Likert scales. Factors were then grouped within person- and context-oriented dimensions, as suggested by the literature review (see table 2).

**Table 2 Number of factors explored within dimensions**

	<b>Dimensions</b>	<b>Factors explored</b>
Person-oriented dimensions	Ability beliefs/interests	9
	Outcome expectations	10
	Personal goals	1
Context-oriented dimensions	Influential people	17
	Career advisors	8
	Career Information	32
	Training institute	39
	Employer	27
<b>Total</b>		<b>143</b>

These dimensions and factors were used to predict whether respondents answered yes or no to the question: 'Have you ever seriously considered dropping out of your apprenticeship training?' Those who answered yes are considered to be at risk of dropping out and are referred to as potential drop-outs. Respondents who did not consider dropping out are considered to be more likely to persist with their apprenticeship and are referred to as 'persistors'. This is not a direct measure of attrition, but is viewed as an indicator of risk. Even if they continue, a better understanding of why individuals who seriously consider dropping out or came close to dropping out is informative.

Intention to drop out is associated with actual drop-outs (Bean 1982) and has been used in a number of studies on educational persistence (Lent, Brown, Talleyrand et al. 2002; Lent, Sheu et al. 2010; Dickie, McDonald & Pedic 2011; Betz & Hackett 1981). A study conducted by GTA (2005, p.9) noted: 'the decision to leave is generally not taken lightly and/or hastily with trainees taking at least a week to a month or more to make the decision'.

### Finding the important factors

The intent of this analysis is to identify the factors which accurately classify individuals as persistors versus potential drop-outs. Stepwise binary logistic regression was utilised to produce a probability for each apprentice, measuring likelihood of persistence versus the risk of dropping out.

It was hypothesised that not all of the 143 factors would be useful in classifying respondents as persistors or potential drop-outs. Therefore, the process of building a successful prediction model involved decisions on which factors to keep and which to discard. An iterative process was utilised, whereby all the factors within a dimension were analysed in the first process. If any of the factors did not accurately classify individuals as potential drop-outs or persistors, then the worst-performing factor was discarded from the model. This process continued until a final set of statistically significant factors remained.

An overall predictive model for each occupation was then developed by utilising the results of the dimension models (that is, probabilities) in a binary logistic regression. A further detailed explanation of the statistical approach is described in appendix A.

The results are presented as two separate studies: Study 1 is conducted with plumbing apprentices, while Study 2 is a confirmatory analysis conducted with bricklaying apprentices.

### *Interpretation of important factors*

Identifying significant factors was the first step. Each factor is interpreted through the odds ratio: the probability of being a persistor divided by the probability of being at risk of dropping out. An odds ratio greater than one represents an increase in the odds of being a persistor, while an odds ratio less than one represents a decrease in those odds. Those predictors that change the odds of an outcome variable the most are typically interpreted as the most important (Tabachnik & Fidell 2007).

A set of examples from Study 1 is illustrative:

- Individuals who took up their apprenticeship because they liked working with their hands were 93% more likely to persist (that is, odds ratio of 1.93) when compared with individuals who did not take up their apprenticeship for this reason.
- Individuals who worried whether plumbing was really the right choice were 37% less likely to persist (that is, odds ratio of .63).
- Individuals who found their studies difficult were no more or less likely to be persistent (that is, the odds ratio was not significantly different from 1.0).

The results section presents odds ratios in terms of predicting persistors, which can be readily converted to predicting potential drop-outs by inverting the odds ratios. The second example above could instead have been presented as a factor which increases the odds of dropping out by 58% (that is,  $1/.63$ ).

### *Accuracy of classification*

A practical question is how well do the factors, in combination, predict whether an apprentice is likely to persist, or seriously consider dropping out? Can we accurately predict better than chance (that is, 50%)? Are we more able to predict persistors or potential drop-outs?

Interpreting the overall classification accuracy required a slightly different approach from simply interpreting odds ratios. When the answers from each apprentice are regressed on persistence, the result is a probability of persistence for each apprentice within a range between 0 and 1. Classifying apprentices as persistors or potential drop-outs is accomplished by choosing an appropriate cut-off point between 0 and 1, a point that separates persistors from potential drop-outs. Comparing this classification to apprentices' actual answers on whether they had seriously considered dropping out or not provides the basis of judging how accurate the modelling is.

Choosing an appropriate cut-off point is very much dependent upon the context in which the prediction model will be used (Pepe et al. 2004). One method which has been used to measure performance classification is to fix one side of the classification to a set level of accuracy (Hand 2001). In this context, it was judged that a model that accurately predicted 80% of the persistors would adequately control the cost of false negatives (that is, incorrectly identifying persistors as individuals at risk of dropping out).

With the methodology in place, the next sections present the results for the two studies. These studies highlight the factors that accurately predict persistors and potential drop-outs for plumbing and bricklaying apprentices.

## Study 1 – Plumbing apprentices

The first study explores whether we can predict which apprentices are at risk of dropping out and those who are not. Of the 1016 surveyed plumbing apprentices, 32% were at risk of dropping out; these apprentices indicated they had ‘seriously considered dropping out’. The following section presents the accuracy of predicting apprentices at risk or not, and which factors predict this outcome.

In the survey sample the plumbing apprentices were relatively evenly spread across the four-year apprenticeship, with 23% in first year, 33% in second, 26% in third, and 18% in their fourth year. Two-thirds of respondents were under 21 years of age and only 10% were older than 26 years of age. Responses were analysed for response bias: to test whether there was any systematic difference in the outcome variable across a number of demographics contained in the survey. There were no significant differences detected (see appendix B for more information), suggesting that taking part was more or less random and the results were unbiased.

### Predicting persistence for plumbing apprentices

Of the 143 factors analysed in this study, 24 factors were found to significantly classify plumbing apprentices as persistors or at risk of dropping out. In combination, these factors produced a model with adequate goodness-of-fit, suggesting a sound representation of the data set (see appendix C for model statistics). Overall, these factors were able to predict 74% of apprentices as persistors or potential drop-outs. More specifically, the combined use of all dimensions was able to accurately predict 80% of persistors and 60% of apprentices at risk of dropping out, as presented in the last row of table 3.

**Table 3** Classification accuracy for plumbing apprentices

Dimension models	n <sup>1</sup>	Significant factors	Correctly classified persistors <sup>2</sup>	Correctly classified potential drop-out
Person-oriented				
Ability beliefs /interest	1016	3	80%	35%
Outcome expectations	1016	1	80%	22%
Personal goals	1016	1	80%	24%
Context-oriented				
Influential people	1016	3	80%	32%
Career advisors	967	2	80%	27%
Career information	962	4	80%	35%
Training institute	982	4	80%	37%
Employer	1007	6	80%	45%
<b>All dimensions combined</b>	<b>893</b>	<b>24</b>	<b>80%</b>	<b>60%</b>

<sup>1</sup> n differs by dimension because responses with missing data were excluded from analysis (listwise deletion).

<sup>2</sup> Classification thresholds were chosen to correctly classify 80% of persistors.

Independently, each dimension was a poor predictor of apprentices at risk of dropping out. The increased accuracy with all dimensions combined underlines the multifaceted forces at play when dealing with retention and attrition, a finding supported by previous studies (Snell & Hart 2008, p.65; Harris et al. 2001a; Gow et al. 2008). However, since only a select few factors appear to distinguish

between persistors and those considering dropping out, a closer look at the factors at play is warranted. The next section highlights these factors for plumbing apprentices.

### Person-oriented dimensions

The person-oriented dimensions include ability beliefs/interests, outcome expectations and personal goals, as reviewed in the background section. The suggested factors identified by focus groups that fall within these dimensions are listed in table 4.

**Table 4 Factors for person-oriented dimensions (significant predictors italicised)**

<b>Ability beliefs/interest</b>	
▪ <i>Like working with my hands</i> (take-up reason)*	▪ School-based apprenticeship (take-up reason)
▪ <i>Like to see the results of my work</i> (take-up reason)*	▪ Variety of work (take-up reason)
▪ <i>Is plumbing really for me</i> (worry)*	▪ Physical work (worry)
▪ Working outdoors (take-up reason)	▪ Making time for training (worry)
	▪ Difficult schoolwork (worry)
<b>Outcome expectation</b>	
▪ <i>Respected trade</i> (take-up reason)*	▪ Time off work for training (worry)
▪ Money (take-up reason)	▪ No earnings while at school (worry)
▪ Lots of work for plumbers (take-up reason)	▪ Will I enjoy training (worry)
▪ Good working hours/lifestyle (take-up reason)	▪ Finding host employer (worry)
▪ Training while still working (worry)	▪ Finding work after apprenticeship (worry)
<b>Personal goal</b>	
▪ <i>Own boss opportunity</i> <sup>†</sup>	

Note: \*  $p < .05$  in separate dimension models,  $t p < .06$ .

Most of the person-oriented factors were framed around reasons why an individual took up an apprenticeship and their biggest worries when they first considered taking up an apprenticeship. Focus groups identified a number of factors on ability beliefs/interests and outcome expectations. However, there were few personal goals identified in focus groups, despite discussions that specifically targeted this area. Most apprentices identified training as simply 'something that has to be done', with few individualised interim goals, milestones or aspirational goals. The opportunity to be their own boss was the only personal goal identified in focus groups.

Furthermore, many factors are notable in their absence as significant predictors. Challenges often cited by trade teachers in focus groups were notably missing. These included difficulty with trade schoolwork, making time for training and training while still working. Those who previously attended school-based apprenticeships were no more (or less) likely to be persistors.

Current and future earnings were also conspicuously missing, despite focus groups' strongly held beliefs that earning while learning either helped attract people to the trade, or were set too low and aggravated current attrition rates.

It is surprising that only five significant factors emerged under the person-oriented dimensions (see table 5). These dimensions focus on the entry period and highlight the factors which inform typical interview questions. This raises the issue of whether there is clarity on what employers should look for in an apprenticeship applicant, as it pertains to persistence. Studies have highlighted the employer's frustration in finding the 'right' person and the need for more structured approaches (Walker & Powers 2008; Bednarz 2014).

**Table 5** Factors in person-oriented dimensions

	Odds ratio	95% C.I. for odds ratio	
		Lower	Upper
Ability beliefs/interest			
Like to see results of my work	1.932*	1.240	3.008
Like working with my hands	1.545*	1.157	2.064
Is plumbing really for me	.630*	.481	.824
Constant	2.100*		
Outcome expectations			
Respected trade	1.390*	1.001	1.930
Constant	1.981*		
Personal goals			
Own boss opportunity	1.311 <sup>t</sup>	.990	1.735
Constant	1.937*		

Note: \*  $p < .05$ , <sup>†</sup>  $p < .06$ .

The most important factors associated with persistence were in the ability beliefs/interest dimension. An odds ratio greater than one represents an increase in the odds of being a persistor, while an odds ratio less than one represents a decrease in odds of being a persistor (that is, more likely to be a potential drop-out).

Plumbing apprentices who took up their apprenticeship because they like to see the results of their work were 93% more likely to be a persistor when compared with apprentices who did not select this reason. Apprentices who like working with their hands were 55% more likely to be persistors. However, when apprentices worried 'Is plumbing really for me?', they were on average 37% less likely to be a persistor (that is,  $1 - .63$  odds ratio).

Although a number of outcome expectations were put forward by focus groups, most factors were not associated with persistence or the risk of dropping out. This suggests that more work is needed in identifying the important outcomes with which persistors identify. Tuning the message, for example, by focusing on the respected trade aspect, to attract more individuals who will persist in their plumbing apprenticeship may increase completion rates.

There was only one suggested factor under the personal goal dimension. Setting milestones and making plans is helpful in maintaining training persistence over sustained periods and may suggest an area for exploration or intervention. However, this may be largely overlooked by apprentices who view their apprenticeship from a job perspective (Smith, Walker & Brennan Kemmis 2011). This may indicate that personal goals are more appropriate in the on-the-job setting.

## Context-oriented dimensions

The actions and behaviours of those around apprentices are associated with their decision to persist. Five context-oriented dimensions were analysed for factors. They included: influential people, career advisors, career information, training institute and employers.

A number of factors in the context-oriented dimensions were measured on a Likert scale; the questions had three to five levels to choose from. Therefore, instead of the odds ratio representing the odds of answering 'yes' versus 'no', each Likert scale required a reference level to be clearly identified. This created an odds ratio for each level versus the reference level within a factor. In other words, for each level in the factor scale, the odds ratio describes how much the odds of being a



persistor increase or decrease when compared with the reference level of the factor scale. For example, respondents were asked to rate the training facilities as poor, average or good. Using poor as the reference level, those who rated the facilities as average were 1.5 times more likely to be persistors than those who responded with poor. Separately, those who responded with good were 1.8 times more likely to persist when compared with those who rated the facilities poor.

## Influential individuals

Making a career choice is an important decision at any point in one's working life. However, the decision is somewhat more challenging for school leavers navigating this decision for the first time. The dimension of influential people attempts to find out whether particular people are more (or less) likely to influence persistence. The career advisor dimension explores whether the perceived knowledge and education pathway suggested by career advisors had any bearing on whether apprentices were more (or less) likely to be persistors. The list of explored factors is presented in the following table.

**Table 6 Factors for influential people and career advisor dimensions (significant predictors italicised)**

<b>Influential people</b>	
<ul style="list-style-type: none"> <li>Parent or guardian</li> <li>Family business opportunity</li> <li>Other family members</li> <li>Friends not in a trade</li> <li>Friends in a trade/apprenticeship</li> <li><i>School advisor*</i></li> <li>TAFE teacher</li> <li><i>Plumber*</i></li> <li>Tradesperson other than plumber</li> <li>Job network provider</li> </ul>	<ul style="list-style-type: none"> <li>Response of school advisors<sup>3</sup></li> <li>Response of parent/guardian<sup>2</sup></li> <li>Response of partner/spouse<sup>2</sup></li> <li><i>Response of close friend<sup>2</sup>*</i></li> <li>Response of other family members</li> <li>Friend in apprenticeship (take-up reason)</li> <li>Are friends doing an apprenticeship (worry)</li> <li>Family commitments (worry)</li> </ul>
<b>Career advisors</b>	
<ul style="list-style-type: none"> <li>Trade career knowledge</li> <li><i>Plumbing career knowledge*</i></li> <li>Knowledge on how to get an apprenticeship</li> <li>Knowledge on where to get more information on apprenticeships</li> </ul>	<ul style="list-style-type: none"> <li>Trade pathway suggested</li> <li>University pathway suggested</li> <li>Plumbing pathway suggested</li> <li><i>TAFE pathway suggested*</i></li> </ul>

Note: \*  $p < .05$  in separate dimension models.

## Those who know you best

Individuals who took up the trade due to the influence of a plumber were 49% more likely to be persistors (see table 7). However, this study was unable to show that individuals who took up the trade because of family business opportunities were any more likely to persist; 192 apprentices responded that they were influenced to take up an apprenticeship because of a family business opportunity.

Quite surprisingly, those who were encouraged into a plumbing apprenticeship by family members were no more or less likely to persist. While family members may be influential in the vocational choice, the influence does not appear to be significantly different between persistors and those who seriously consider dropping out of their plumbing apprenticeship. This was contrary to expectations, and an interpretation is offered in the section entitled, 'Career information — the good, the bad and the indifferent'.

<sup>3</sup> Apprentices were asked how particular individuals responded *after* they decided to enter an apprenticeship.

**Table 7 Factors for influential people and career advisor dimensions**

	Odds ratio	95% C.I. for odds ratio	
		Lower	Upper
<b>Influential people</b>			
Influenced by school advisor	.573*	.393	.835
Influenced by plumber	1.488*	1.119	1.979
Response of close friends (discouraged)	reference		
Response of close friends (not discussed)	2.312	.819	6.524
Response of close friends (encouraged)	3.145*	1.245	7.944
Response of close friends (no opinion)	2.227	.801	6.190
Constant	.679		
<b>Career advisors</b>			
Plumber knowledge (poor)	reference		
Plumber knowledge (no contact)	1.522	.514	4.503
Plumber knowledge (good)	.470*	.271	.815
Plumber knowledge (average)	1.107	.627	1.954
TAFE pathway (discouraged)	reference		
TAFE pathway (no CA contact)	1.905	.646	5.621
TAFE pathway (encouraged)	3.164*	1.112	9.003
TAFE pathway (no opinion)	1.769	.597	5.236
Constant	1.346		

Note: \* p < .05.

More broadly, studies have found that close relationships have a positive influence on career development (Phillips, Christopher-Sisk & Gravino 2001; Blustein 2001), and this was partially reflected in this study. Plumbing apprentices who had close friends who were encouraging of the decision they had made were 3.1 times higher in their odds of persistence on average, when compared with apprentices with friends who were discouraging. Although the response of close friends after they had decided to take up an apprenticeship positively influenced persistence, the perceived influence of friends before they made their choice did not.

### *School career advisors*

The career advisor dimension factors looked at how respondents rated school career advisor, with particular emphasis on apprenticeship knowledge and the career pathways suggested. This dimension explored eight factors, with a 4 or 5-level Likert scale response. A category of 'no contact' was added for those respondents who did not have a career advisor at their school or did not make contact with a career advisor even if one was available. This added category was a point of interest in its own right.

Advice offered by school career advisors was a significant predictor of plumbing apprenticeship persistence. However, their influence was mixed. Where career advisors more broadly suggested a TAFE pathway, these future plumbing apprentices were 3.2 times more likely to be persistors — a very strong and positive indicator. Apprentices who were influenced in their decision to specifically take up a plumbing apprenticeship by their school advisor were more likely to be at risk of dropping out. This was also the case where apprentices perceived their career advisor to possess good plumbing career knowledge. An important distinction here is to emphasise that the level of knowledge is a perceived measure on the part of the student, not a direct measure of actual knowledge.

These findings on the influence of career advisors are somewhat concerning and counterintuitive. This topic will be taken up after reviewing bricklaying apprentices.

## Finding the right information

Finding information on career pathways is particularly important for young people. Many apprentices are embarking on their first career journey and tend to have less work–life experience than mature-aged individuals; 67% of the surveyed plumbing apprentices were under the age of 21 years.

The career information dimension included factors that explored the ease of finding information on plumbing apprenticeships, along with ten sources of information identified by focus groups. The survey explored these ten sources of information under three separate lines of enquiry: which was the first source of information; which was the best source; and which sources were most frustrating.

**Table 8 Factors for career information dimension (significant predictors italicised)**

- *Ease in finding info\**
- First source of info rating

The following were used as choices for three separate enquiries: what was your first info source, the best info source, and the most frustrating info source

- |  |  |
|--|--|
| ▪ School career advisor                            | ▪ Newspapers                             |
| ▪ Other plumbers                                   | ▪ Internet                               |
| ▪ <i>TAFE/training institute (frustrating)*</i>    | ▪ Recruitment agency                     |
| ▪ <i>Australian Apprenticeship Centres (best)*</i> | ▪ <i>Plumbing supply company (best)*</i> |
| ▪ Friends  | ▪ Parents                                |

Note: \*  $p < .05$ .

### *Make it easy to find*

The relative ease or difficulty in finding information about a plumbing apprenticeship is an important predictor of persistence. It did not matter which source of information was first sought or how ‘good’ that information was perceived. Those who found it very easy to source information on plumbing apprenticeships were 3.2 times more likely to persist when compared with apprentices who found it difficult (see table 9).

Similar to previous research, persistence was related to barriers to information (Gunderson 2009; Canadian Apprenticeship Forum 2003). In this study, those who found it frustrating accessing information from TAFE were more at risk of dropping out of their apprenticeship.

### *Is some information better than others?*

Not all sources of information were a positive influence on persistence (see table 9). Those who found their best information on plumbing apprenticeships at an Australian Apprenticeship Centre (AAC) were 95% more likely to be persistors. This stands in contrast to those who found their best information at a plumbing supply store. These individuals were 72% less likely to be persistors (1 - .28 odds ratio). Stated inversely, these individuals were 3.6 times more likely to be at risk of dropping out (1 / .28 odds ratio).

**Table 9 Factors for career information dimension**

	Odds ratio	95% C.I. for odds ratio	
		Lower	Upper
Finding info (very difficult)	Reference		
Finding info (very easy)	3.214*	1.519	6.800
Finding info (fairly easy)	2.069*	1.019	4.198
Finding info (fairly difficult)	1.793	.829	3.881
Best info AAC	1.945*	1.036	3.651
Best info Supply Co.	.282	.079	1.004
Frustrating info TAFE	.540*	.365	.799
Constant	1.051		

Note: \* p < .05.

### The training institute environment

Vocational training institutes are naturally perceived as a focal point for training. Therefore, it is not surprising that focus groups suggested many factors relating to the training institute. In all, there were 39 factors in this dimension, which are presented below. They were grouped into questions on the perceived flexibility and performance of the training institute, as well as the factors most or least enjoyed by plumbing apprentices.

**Table 10 Factors for training institute dimension (significant predictors italicised)**

▪ Ease in finding institute	▪ Enjoy meeting new people
▪ Flexibility in training dates	▪ <i>Enjoy variety of work*</i>
▪ Flexibility in scheduling	▪ Enjoy hands-on work
▪ Flexibility in help with subjects	▪ Least enjoy being taught things I already know
▪ Flexible access to teachers	▪ Least enjoy digging holes
▪ <i>Easy to understand teaching*</i>	▪ Least enjoy too much reading
▪ Teaching in a way that you enjoy	▪ Least enjoy supplies available
▪ Teaching current techniques	▪ Least enjoy waiting for teachers to check work
▪ Communication	▪ Least enjoy variety of work
▪ <i>Facilities*</i>	▪ Least enjoy inappropriate direction
▪ Tools & materials	▪ Least enjoy slack time
▪ Enjoy learning new skills	▪ Least enjoy by-laws
▪ Enjoy working outside	▪ Least enjoy working outside
▪ Enjoy group projects	▪ Least enjoy long days
▪ <i>Enjoy fellow apprentices*</i>	▪ Least enjoy costs of training
▪ Enjoy professional standard	▪ Least enjoy technical requirements
▪ Enjoy new experiences	▪ Least enjoy group projects
▪ Enjoy training facilities	▪ Least enjoy lack of info on training schedule
▪ Enjoy class discussion	▪ Least enjoy travel time
▪ Enjoy knowledgeable teachers	

Note: \* p < .05.

### *Complaints do not always point to drop-outs*

Industry focus groups were vocal and specific about the predictors of attrition within the institute training environment. For example, many stakeholders (including apprentices) complained of being trained in aspects they had already picked up on the job; waiting around for teachers to check their work; and a lack of communication on the scheduling of training topics. However, none of the 16 suggested factors that concerned aspects they least enjoyed were indicative of persistence or likelihood of dropping out.

**Table 11 Factors for training institute dimension**

	Odds ratio	95% C.I. for odds ratio	
		Lower	Upper
Easy to understand teaching (very poor)	Reference*		
Easy to understand teaching (excellent)	5.566*	1.915	16.178
Easy to understand teaching (good)	3.314*	1.180	9.305
Easy to understand teaching (average)	2.346	.836	6.584
Easy to understand teaching (poor)	1.408	.380	5.215
Enjoy variety (no opinion)	Reference*		
Enjoy variety of work (No)	1.281	.862	1.903
Enjoy variety of work (Yes)	1.826*	1.141	2.921
Enjoy fellow apprentices (No)	Reference		
Enjoy fellow apprentices (Yes)	.455*	.307	.674
Facilities (very poor)	Reference*		
Facilities (excellent)	1.157	.441	3.037
Facilities (good)	1.758	.686	4.510
Facilities (average)	1.475	.573	3.796
Facilities (poor)	.762	.259	2.245
Constant	.587		

Note: \*  $p < .05$ .

### *The full breadth of the trade*

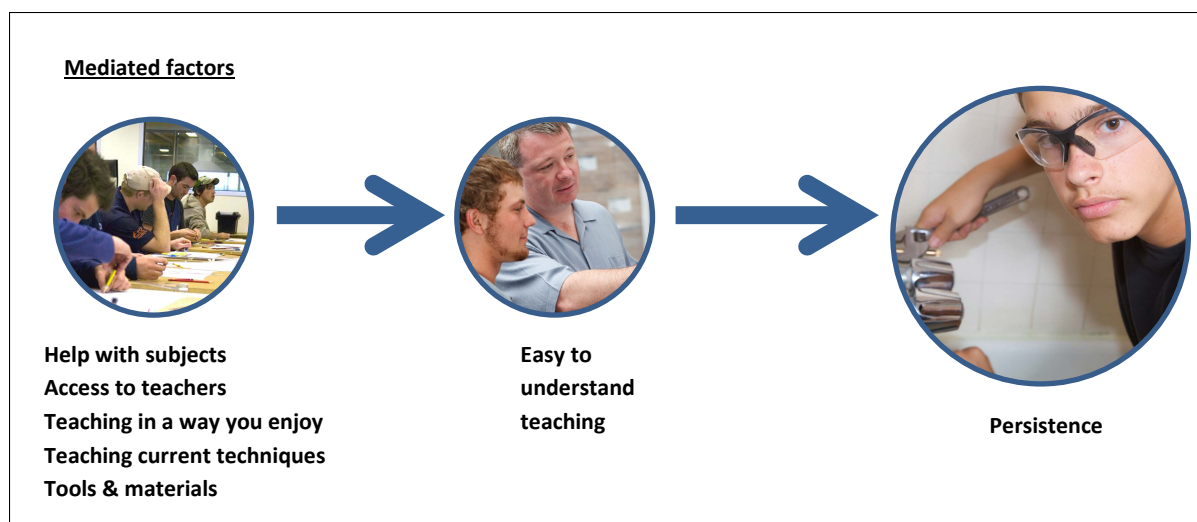
Providing apprentices with experience in all facets of the trade can be a challenging function for employers of apprentices. Many plumbers and industry group representatives suggested that the institute training helps to fill this gap. Apprentices who most enjoy the variety of work they do within the institute were 83% more likely to be persistors when compared with apprentices who held no opinion on this matter (see table 11).

The training institute factors that more directly relate to learning trade skills have a positive relationship with persistence. Where this strays, there is some indication that apprentices are more likely to consider dropping out. Individuals who most enjoy training in the institute because of their fellow apprentices were 2.2 times more likely of seriously dropping out (that is,  $1 / .455$  odds ratio).

### *Teaching that makes a difference*

Teaching in a way that apprentices find easy to understand is a significant and dominating factor. Apprentices who rated their training institute's ability to provide 'easy to understand teaching' as good or excellent had much higher odds of being a persistor. Those who rated this factor as excellent were 5.6 more likely to persist, on average, when compared with those who rated their teaching as very poor. Apprentices who rated this factor as good were 3.3 times more likely to persist.

Although teaching in a way that apprentices find easy to understand was a significant factor, it would be misleading to suggest that the focus groups were wholly off the mark in their other suggested factors. A number of factors excluded from the stepwise selection model were significant predictors of persistors when analysed in isolation (that is, univariate regression analysis).

**Figure 1** Direct and indirect training factors associated with apprenticeship persistence

However, each of these excluded factors was completely mediated by the variable, 'easy to understand teaching' (see appendix D for further statistical information on mediation). The mediated factors listed on the left of figure 1 do not directly influence persistence: they influence persistence indirectly through their influence on 'easy to understand teaching'. Therefore, an increase in these mediated predictors increases the perception of 'easy to understand teaching', which in turn increases persistence.

On a practical level, these mediated factors provide strong guidance on how to make trade teaching easier to understand for apprentices in a way that increases the likelihood of being a persister. These findings elaborate the more general findings that associated higher completion rates with quality teaching (Dickie, McDonald & Pedic 2011), where teachers are supportive, efficient and experienced (Harris et al. 2001a).

### Employer environment

Supportive on-the-job work experience has been shown to increase confidence, occupational competence and persistence across a variety of industries (Millward et al. 2006; Shih & Chuang 2008). Apprentices with employers who support and value the learning process have been associated with higher completion rates (Harris et al. 2001a; Dickie, McDonald & Pedic 2011). Unfortunately, not all apprentices experience such support. The most commonly cited reasons for apprenticeship non-completion are employment-related (Bednarz 2014).

Focus groups offered strong opinions on the supportive and non-supportive factors experienced by apprentices in this context. Factors in the employer dimension focused on employer support and the aspects most enjoyed or least enjoyed by apprentices in their on-the-job training environment. The factors are presented in table 12.

**Table 12 Potential predictors for employer dimension (significant predictors italicised)**

<i>Flexibility in teaching skills*</i>	Enjoy large projects
Flexibility in your attending trade school	Enjoy working outdoors
<i>Flexibility in answering questions*</i>	Least enjoy being left alone to do jobs I don't understand
Flexibility in job variety	<i>Least enjoy being treated without respect*</i>
Flexibility in annual leave	Least enjoy long hours
Enjoy financial freedom	Least enjoy my boss
<i>Enjoy hands-on experience*</i>	Least enjoy not getting experience in all areas
<i>Enjoy learning a career*</i>	Least enjoy physical labour
Enjoy learning from my boss	Least enjoy people I work with
Enjoy learning how to do things professionally	Least enjoy variety of work
Enjoy learning new skills every day	<i>Least enjoy weather*</i>
Enjoy seeing the results of my work	Least enjoy working outdoors
Enjoy people I work with	
Enjoy variety of work	
Enjoy working on different sites	

Note: \*  $p < .05$ .

Of the 27 suggested factors, only six were significant predictors of persistors or potential drop-outs. Many of the non-supportive factors were not significant. What appears to be more important to persistence are the factors that apprentices most enjoy about working on the job, how they learn and being treated well.

### *Respect for a career in the trade*

Plumbing apprentices who link their on-the-job experience to developing a career are more likely to be persistors (70% more likely, as presented in table 13). Previous studies have highlighted higher completion rates where apprentices perceive the workplace to value the qualification and training (Dickie, McDonald & Pedic 2011; Mitchell, Dobbs & Ward 2009).

The individual respect shown by employers towards apprentices have been associated with improved persistence (Dickie, McDonald & Pedic 2011), while abuse, harassment or treating an apprentice unfairly have resulted in higher dropouts (Harris & Simons 2005). This study adds to these findings. Apprentices were 35% less likely to be persistors when they perceived they were being treated without respect.

### *The importance of teaching on the job*

There are positive impacts on persistence when employers actively support the learning process (Harris et al. 2001a). Working on the job does not automatically mean that learning takes place, especially where repetitive work is done and learning is subordinated to the needs of the business (Harris, Willis et al. 2001b). The findings from this analysis indicate that employers who were actively involved in teaching plumbing apprentices improved persistence.

Apprentices who perceived their employer to have flexible teaching skills were much more likely to be persistors. As this rating declined, so too did the likelihood of persistence. For example, apprentices who perceived their employer to be somewhat inflexible in their teaching skills were 47% lower in their odds of persistence, compared with those who rated their employer as very flexible. Those who rated their employers as very inflexible in teaching skills were even less likely to be persistent — 94% less likely; or 18 times more likely to be at risk of dropping out (that is,  $1 / .056$ ).

**Table 13 Predictors for employer dimension**

	Odds ratio	95% C.I. for odds ratio	
		Lower	Upper
Teaching skills (very flexible)	Reference*		
Teaching skills (somewhat flexible)	.887	.612	1.285
Teaching skills (somewhat inflexible)	.529*	.291	.961
Teaching skills (very inflexible)	.056*	.011	.284
Teaching skills (no opinion)	1.014	.317	3.244
Answering questions (very inflexible)	Reference*		
Answering questions (no opinion)	.443	.105	1.870
Answering questions (very flexible)	.679	.197	2.341
Answering questions (somewhat flexible)	.357	.106	1.202
Answering questions (somewhat inflexible)	.231*	.064	.834
Enjoy hands-on experience (No)	Reference*		
Enjoy hands-on experience (Yes)	1.761*	1.264	2.452
Enjoy hands-on experience (no opinion)	.874	.444	1.717
Enjoy learning a career (No)	Reference*		
Enjoy learning a career (Yes)	1.702*	1.239	2.339
Least enjoy weather (No)	Reference*		
Least enjoy weather (Yes)	1.652*	1.145	2.383
Least enjoy weather (no opinion)	1.764	.953	3.264
Least enjoy being treated without respect (No)	Reference*		
Least enjoy being treated without respect (Yes)	.649*	.468	.900
Constant	3.263		

Note: \*  $p < .05$ .

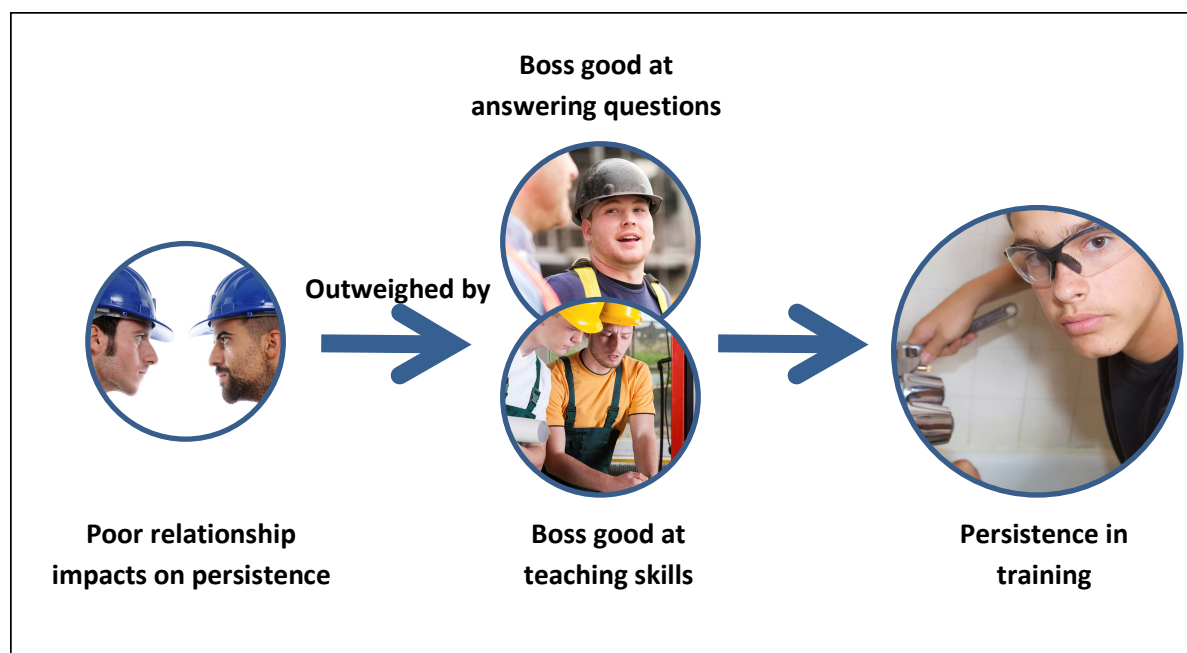
Employers who answered questions posed by apprentices increased the likelihood of persistence. However, 'answering questions' was partially mediated, or overshadowed by 'teaching skills'. An analysis of the factor 'answering questions' on persistence without the other factors provides a clearer picture. Univariate regression revealed that apprentices who perceived employers to be very flexible in answering questions increased their odds of persistence by 3.4 times, when compared with those who rated employers very inflexible.

### *The employer–apprentice relationship*

The literature review highlighted that many apprentices drop out of their apprenticeship because of a deteriorating or poor relationship with their employer (Cully & Curtain 2001; Harris & Simons 2005; Snell & Hart 2008). Although the factor 'least enjoy my boss' was not found to be significant in the stepwise modelling with all factors, it significantly predicted the risk of dropping out when analysed independently (see appendix D for statistical details).

When analysed independently of other factors, those apprentices who least enjoyed their boss were 1.9 times more likely to be at risk of dropping out (that is, 53% less likely to be persistors). However, this factor was fully overshadowed (that is, mediated) by two factors in combination – 'flexibility in teaching skills' and 'flexibility in answering questions'. This relationship is presented in figure 2.



**Figure 2 Indirect association of employer–employee relationship with persistence**

Since apprentices often state that they drop out of their apprenticeship due to their relationship with their boss, this finding is important. It suggests that, while the employer–apprentice relationship may well be related to lower persistence, the perceived ability to teach skills and answer questions is much more important when it comes to making an impact on persistence. Stated another way, a poor relationship will lower the apprentices’ perception of the employers’ teaching skills and ability to answer questions. While the poor relationship is detrimental, it is the employers’ ability to teach and answer questions that has a direct impact on persistence. So, can a poor relationship between an apprentice and employer be overcome by employers with strong teaching skills and the ability to answer questions? These results suggest this is possible and likely.

### *Summary*

This concludes the study of plumbing apprentices. Of 143 potential factors, 24 were significant in their ability to accurately classify 74% of the apprentices as persistors or at risk of dropping out.

We now turn our attention to explore how well these same predictors work for bricklaying apprentices. Are these two trades so similar that the same factors will predict persistence equally well?

## **Study 2 – Comparing with bricklaying apprentices**

The purpose of study 2 is to cross-validate the findings for plumbing apprentices in study 1. This second study assessed whether the factors that classified plumbing apprenticeship as persistors or at risk of dropping out were similar for a different trade occupation. Do bricklaying apprentices persist or risk dropping out for the same reasons as plumbing apprentices?

To that end, the overall set of factors utilised in this study was limited to those similar to those in study 1 for plumbing apprentices. Factors that were specific to only the bricklaying context were not included in this study. Of the 143 factors utilised in the plumbing survey, the bricklaying survey included 116 factors that were identical or near identical. Notably, all of the 24 significant plumbing factors were available within the bricklaying survey. However, there were limitations. Some of the

bricklaying questions used slightly different Likert scales, making it difficult to combine both datasets. Therefore, the analysis of bricklaying persistence was conducted and interpreted separately.

The bricklaying survey consisted of 369 valid responses from bricklaying apprentices across Australia during 2009. All states were represented, with one response from the Northern Territories and none from the ACT. Responses were evenly spread amongst the typical three-year apprenticeship (that is, only one state has a four-year bricklaying apprenticeship). Of those who responded, 32% were in first year, 31% in second year and 34% in their third year of training. Only 3% of respondents identified as fourth-year apprentices.

Within this sample, 34% of respondents were at risk of dropping out (that is, had 'seriously considered leaving' their apprenticeship training) – a very similar proportion to the plumbing sample (32%). The bricklayer dataset was analysed for response bias to ensure that the surveyed apprentices were representative of bricklaying apprentices. There was no outcome bias detected amongst the available apprenticeship characteristics, which included the following: state, age, apprentice year of training, type of host employer, pre-apprenticeship and previous paid work as a bricklayer.

### Predicting persistence for bricklaying apprentices

The identification of factors that were significant predictors of persistors and potential drop-outs for bricklaying apprentices followed the same process as in study 1 (that is, stepwise regression with backward selection). For bricklaying apprentices, there were 23 factors which were statistically significant in classifying persistors and those at risk of dropping out. Together, these factors produced a model with adequate goodness-of-fit measures (see appendix C for model statistics). In combination, these factors accurately classified 79% of the bricklaying apprentices. More specifically, the factors correctly classified 80% of persistors and 77% of those at risk of dropping out, as presented in table 14.

The accuracy of classifying bricklaying apprentices was higher than that found for plumbing apprentices (74%). This was somewhat surprising on a couple of fronts. First, the bricklaying model utilised only those factors that were originally devised by and for the plumbing industry (that is, 116 factors). Secondly, the factors in the bricklaying dataset that were specific to bricklaying were not included in the analysis. In other words, it is quite possible, and likely, that the bricklaying model's accuracy in classification can be improved. However, this must be left for future research since this analysis would in turn require cross-validation.

**Table 14 Comparing classification accuracy by occupational model**

	n	Factors	Overall classification (weighted) <sup>1</sup>	Correctly classified persistors	Correctly classified potential drop-outs
Plumbing apprentices	893	24	74%	80%	60%
Bricklaying apprentices	365	23	79%	80%	77%

Note: 1 Classification is weighted by proportion of persistors and potential drop-outs.

## Comparing persistence factors across both trades

This comparison of two trades suggests that plumbing and bricklaying apprentices persist (or drop out) for reasons that differ somewhat. Of the 23 significant factors for bricklaying apprentices, only eight were identical to those found in the plumbing study. Details of the factors can be viewed in table 15.

**Table 15 Comparison of factors for bricklaying and plumbing apprentices**

Plumbing apprentice factors	Bricklaying apprentice factors
<b>Ability interests</b>	
<ul style="list-style-type: none"> <li>Like working with my hands (take-up reason)</li> <li>Like to see the results of my work (take-up reason)</li> <li>Is plumbing/bricklaying really for me (worry)</li> </ul>	<ul style="list-style-type: none"> <li>Like working with my hands (take-up reason)</li> <li>Is bricklaying really for me (worry)</li> <li>Physical work (worry)</li> </ul>
<b>Outcome expectations</b>	
<ul style="list-style-type: none"> <li>Respected trade (take-up reason)</li> </ul>	<ul style="list-style-type: none"> <li>Training while still working (worry)</li> <li>Time off work for training (worry)</li> </ul>
<b>Personal goals</b>	
<ul style="list-style-type: none"> <li>Own boss opportunity</li> </ul>	<ul style="list-style-type: none"> <li>Own boss opportunity</li> </ul>
<b>Influencers</b>	
<ul style="list-style-type: none"> <li>School teacher or career advisor</li> <li>Plumber/bricklayer</li> <li>Response of close friend</li> </ul>	<ul style="list-style-type: none"> <li>Response of parent/guardian</li> <li>Family commitments (worry)</li> <li>Influenced by tradesperson</li> </ul>
<b>Career advisors</b>	
<ul style="list-style-type: none"> <li>Plumbing/bricklaying career knowledge</li> <li>TAFE pathway suggested</li> </ul>	<ul style="list-style-type: none"> <li>Trade career knowledge</li> <li>Bricklaying pathway suggested</li> </ul>
<b>Career information</b>	
<ul style="list-style-type: none"> <li>Ease in finding info</li> <li>TAFE/training institute</li> <li>Australian apprenticeship centres</li> <li>Plumbing/brick supply company</li> </ul>	<ul style="list-style-type: none"> <li>TAFE/training institute</li> <li>Brick supply company</li> <li>Newspapers</li> </ul>
<b>Training institute</b>	
<ul style="list-style-type: none"> <li>Easy to understand teaching</li> <li>Facilities</li> <li>Enjoy fellow apprentices</li> <li>Enjoy variety of work</li> </ul>	<ul style="list-style-type: none"> <li>Flexibility in help with subjects</li> <li>Enjoy learning a career</li> <li>Enjoy class discussion</li> <li>Least enjoy variety of work</li> </ul>
<b>Employer</b>	
<ul style="list-style-type: none"> <li>Flexibility in teaching skills</li> <li>Flexibility in answering questions</li> <li>Enjoy hands-on experience</li> <li>Enjoy learning a career</li> <li>Least enjoy being treated without respect</li> <li>Least enjoy weather</li> </ul>	<ul style="list-style-type: none"> <li>Flexibility in answering questions</li> <li>Enjoy learning from my boss</li> <li>Enjoy learning a career</li> <li>Least enjoy people I work with</li> <li>Least enjoy weather</li> </ul>

The following points present some of the similarities and differences between bricklaying and plumbing apprentices. This review does not provide the same level of detail as presented in the plumbing apprentices since the factors do not include all possible bricklaying-specific factors. The purpose here was to cross-validate the factors used for plumbing apprentices with another trade (bricklaying). However, with 79% accuracy, these points will be informative to bricklaying apprenticeship stakeholders.

- Importantly, for the eight factors common to both trades, seven impacted on persistence in the same manner. That is to say, where a factor increased the likelihood of being a persistor for one trade (on average), it did the same for the other trade (although to varying levels).
- In the person-oriented dimensions, bricklayer apprentices were similar to plumber apprentices in that they were more likely to persist if they had taken up an apprenticeships because they like

working with their hands and less likely to persist if they worried whether the trade was really for them. However, bricklayers were more at risk of dropping out when worried about the physical work and whether they could make time for training — this includes both personal study time and getting time off work for training.

- Influential people were significantly different for bricklaying apprentices. Family took on a much more important role in predicting persistors for bricklayer apprentices. Bricklayer apprentices were much more likely to be persistors if the initial response from their parents was encouraging, but were much more at risk of dropping out if they were worried about family commitments. In comparison, plumber persistence was more associated with the response of close friends and the influence of school career advisors. While plumber persistors were very strongly associated with the influence of plumbers, surprisingly, bricklaying apprentices were not significantly influenced by bricklayers. Relatedly, however, bricklaying apprentices were positively influenced by tradespersons.
- Career advisors seemed to have a much more direct, informed and positive impact on bricklaying persistence. Bricklaying apprentices were more likely to be persistors where they perceived a school career advisor to have good general trade knowledge and encouraged a bricklaying pathway. For plumbing apprentices this association was less direct and informed. Plumbing apprentices were less likely to be persistors when their career advisor encouraged a plumbing apprenticeship and were perceived to be knowledgeable about plumbing careers. Career advisors were positively associated with plumbing persistence where they suggested a general TAFE pathway.
- Information from TAFE played a significant role for both trades — bricklayer apprentices who perceived TAFE information as good were more likely, on average, to be persistors, while plumbers who were frustrated by TAFE information were more likely to be at risk of dropping out. This appears relatively consistent. Also consistent between the trades was the predictive nature of information from supply companies. Those individuals who perceived supply companies as one of their best sources of information were more likely, on average, to be at risk of dropping out.
- The training institute factors were conceptually similar between bricklaying and plumbing apprentices. Apprenticeship persistence was on average increased when bricklayers perceived that the institute was good at providing help with difficult subjects. Similarly, plumber persistence was more likely when the institute was perceived to provide easy-to-understand teaching. Bricklayers were more at risk of dropping out when they least enjoyed the variety of work, while plumbers who enjoyed the variety of work were on average more likely to be persistors. Broadly speaking, this is conceptually consistent. And finally, bricklaying apprentices who most enjoyed class discussion and plumbers who most enjoyed their fellow apprentices were more likely, on average, to consider leaving. These two predictors appear to share underlying constructs.
- The employer environment had some similar factors for bricklaying and plumbing apprentices. Both were more likely to persist when they had an employer who was flexible in answering questions. However, there were contradictory indications between the trades for those who most enjoyed learning a career when on the job. This factor, on average, decreased the odds of being a persistor for bricklaying apprentices while it increased the odds for plumbing apprentices. (Similar findings were present in univariate regression analysis.) This was the only contradictory finding on factors common to both trades.

### *Summary*

In summary, the cross-validation provided by study 2 suggests the following observations. First, not all of the 24 factors used to identify persistors and potential drop-outs for plumbing apprentices were the same for bricklaying apprentices. Secondly, the bricklaying prediction model was enhanced when more accurate factors were selected from the complete set of plumbing factors (that is, from the 116 factors that were common to both). The factors used to identify persistors and potential drop-outs for bricklaying apprentices were both parsimonious and operationally promising (for example, 79% accuracy). Thirdly, roughly half of the factors pertinent to bricklaying apprentices were conceptually different from the plumbing apprentice factors, suggesting that these two trades differ in their reasons for persisting and dropping out. And finally, many of the factors in this study were context-oriented predictors, which suggests that intentions to drop out can be modified with the right interventions.

## Further interpretations

### Why would two trades differ?

Over half of the factors which identified apprentice persistors and potential leavers were different between the two trades. Somewhat surprisingly, the bricklaying factors were more accurate in their predictive ability when compared with plumbing factors (79% vs 74% respectively).

The differences in how apprentices perceived their trade apprenticeship revealed new insights into the factors which related to persistence and the risk of dropping out. Harris and Simons hold the view that retention 'can really only be fully understood within the context of a particular occupation's culture. Any overall discussion of factors or analysis of aggregated national statistics affecting retention can only be general, as the nature of the particular occupation is critically important' (2005, p.360). This study strongly supported this perspective. For instance, plumbing apprentices who viewed their apprenticeship as a career and a respected trade were more likely to be persistors. In contrast, persistent bricklaying apprentices appeared to view their apprenticeship as a job and did not take a career perspective.

The working environment and social influences also impacted on persistence in the two trades in different ways. The technical and varied work of plumbers appeared to attract persistent individuals who prided themselves on the work they did, and they made their career choice by seeking out the opinion of a plumber. For bricklayers, who work primarily in gangs of two to four, their persistence was much more influenced by the people they worked with (that is, boss and co-workers) and the encouragement of family members. Additionally, but unsurprisingly, the physical nature of bricklaying was a predictive factor for persistence in this trade, but not for plumbing apprentices.

### Career information – the good, the bad and the indifferent

Career information that was authentic and well informed on the nature of the trade appeared to support apprenticeship persistence through informed choices. Career information from tradespeople and TAFE institutes were significant predictors of persistence across both trades. However, not all career information was good information when it came to increasing the likelihood of persistence in apprenticeships. For instance, apprentices from both trades were more at risk of dropping out if they perceived their best source of information was from a trade supply store.

The career information and advice from influential people that predicted persistence were significantly different between plumbing and bricklaying apprentices. Perhaps most confounding were the results revealing that family members had no impact on plumbing persistence and that school

career advisors had a negative impact. These results were quite different for bricklayers. Bricklaying apprentices with family and school career advisors who supported their choice in taking up a bricklaying apprenticeship were more likely to be persistors.

Previous research suggests that awareness of a trade by the general public may influence the authenticity or accuracy of career information supplied by those most influential to the apprentice. In a study conducted on behalf of the Plumbing Industry Commission of Victoria, 63% of all plumbers in Victoria felt that the general public was unaware of the various roles and careers available within the plumbing industry (Walker & Powers 2010, p.15). Only 20% felt the general public was aware of the various roles and career paths. The findings revealed a lack of awareness of the diverse nature of the industry, the knowledge required and the earning potential for a plumbing career. This lack of awareness appeared less evident with bricklaying – a trade which is less diverse and generally more transparent in worksite activities. Public awareness of specific trades may partially explain why certain information sources were more or less related to apprenticeship persistence.

### Distinguishing between hiring and training support

Separating the factors explored into the time period before and after signing up to an apprenticeship allows the provision of important guidance. Those factors related to the time period before sign-up are most helpful in guiding the hiring and promotion of specific occupations; those after highlight potential interventions designed to increase the likelihood of persistence for those already in their apprenticeship.

The classification analysis for before sign-up utilised the factors in the following dimensions: ability beliefs/interests, outcome expectations, personal goals, influential people, career advisors, and career information. The after sign-up classification analysis used the predictive factors found in the training institute and employer dimensions.

**Table 16** Classified apprentices using factors before and after sign-up

Factors:	Correctly classified apprentices	
	Plumbing	Bricklaying
<b>Before sign-up</b>		
Ability beliefs/interests, outcome expectations, personal goals, influential people, career advisors, and career information dimensions	71%	76%
<b>After sign-up</b>		
Training institute and employer dimensions.	70%	72%
<b>Combined</b>	74%	79%

The factors grouped in this manner performed reasonably well (70% or greater) in identifying persistors and potential drop-outs for each trade. This is particularly encouraging for the hiring process, since there were few person-oriented factors identified. The inference is that influential people, career advisors, and the manner in which career information is sourced impact on the likelihood of being a persistor or potential drop-out.

### A targeted selection process

Since two occupations in the building industry were shown to have different reasons for apprenticeship persistence, it is possible to provide occupation-specific guidance and support for individuals considering different occupations. If further developed, we may in the future be able to

suggest in which trade(s) individuals are most likely to persist and how best to support their apprenticeship.

Asking pertinent questions in relation to persistence should enhance the ability of employers to make effective hiring choices. A more successful hiring experience for employers may increase the number of apprentices hired in the future. For example, bricklaying employers tend to hire more apprentices soon after they take on their first apprentice. Within seven years of hiring their first apprentice, bricklaying employers take on 50% fewer apprentices (Powers 2013). Their biggest concerns in regards to hiring an apprentice are 'what if he's no good' and 'will he stay?'.

### Leveraging the right influencers for the right trade

As noted earlier, some trade occupations are more readily understood in the public domain than others. This can have a secondary effect on prospective apprentices through influential people important to apprentices. Past research has clearly shown that many people who have close relationships with apprentices influence their decision to take up the chosen trade. The influential people who impact on persistence differed between the two trade occupations. For example, parents were positive influencers for bricklaying apprentices but were not related to plumbing persistence. Career advisors positively influenced bricklaying persistence while negatively influencing plumbing persistence. Although influential people are likely to be well intentioned, not all fully understand the trade they are recommending. A more nuanced understanding suggests that different occupations will need to leverage the impact of specific individuals and attempt to overcome the negative influence of others. This may inform both the content and target of future occupational career information campaigns.

### Helping individual learning

Teaching in ways that make it easier for the apprentice to understand is paramount. This does not imply that apprentices expect an easy ride. Planned persistence was not influenced by the difficulty of training, challenging topics such as technical requirements, regulations or the amount of reading involved.

Quality training has been highlighted as a key factor by many past studies: teachers who are supportive, efficient and experienced are associated with increases in trade apprenticeship retention (Dickie, McDonald & Pedic 2011; Mitchell, Dobbs & Ward 2009). However, this study additionally suggests that apprentices are more likely to persist where they have access to teachers, get individualised help with their subjects, are well informed by the training institute on upcoming learning topics, and are taught in ways that they enjoy.

These results suggest that the focus on training dates, scheduling, group activities, project-based learning, and time at the institute have less to do with persistence than would be surmised from the amount of attention devoted to them. Although other studies indicate that the structure and format of training impacts on persistence (Lent, Brown, Talleyrand et al. 2002), this study suggests other factors to be more important.

### Supporting the training capability of employers

Increasing the training capabilities of employers would have a positive impact on retention rates and help to overcome many on-the-job challenges. While many studies highlight the importance of the apprentice–employer relationship, apprenticeship persistence intentions appear to be more dependent on the teaching capacity of the employer than on this relationship.

The overriding drivers of persistence for apprentices were having an employer who supported them by teaching the skills of the trade, answering their questions, and perceiving a variety of work. Employment guidance on apprenticeship wages, time release for institute training, and annual leave may be important requirements, but seem to miss the mark when it comes to impacting persistence intentions.

While there has been a large focus on mentoring of apprentices of late, one wonders if this effort would be more effective if directed towards mentoring employers to support their training ability.

## Final comments

These results indicate that it is possible to predict who is at risk of leaving their apprenticeship as well as those who are most likely to persist. However, this study highlights that apprentices from two different trades persist, or drop out, for different reasons. As suggested by previous qualitative research, retention is best understood in the context and culture of the occupation (Harris et al. 2001a; Harris & Simons 2005). This study was able to correctly identify 74% of plumbing apprentices and 79% of bricklaying apprentices who had seriously considered leaving their apprenticeship, or not (that is, persistors).

Although focus groups had suggested 143 potential factors, it was only a select few that were significant predictive factors — 24 for plumbers and 23 for bricklayers. This sheds some light on employers' frustration in finding the 'right person' when hiring a new apprentice (Walker & Powers 2008). There are many opinions on what encourages people into a trade and how best to support their apprenticeship training, but not all are associated with the intention to persist.

It is important to point out that many of these non-significant factors may encourage individuals into the trade (for example, pay or costs of training), or have other impacts on their engagement with the apprenticeship system. However, this study did not reveal an association with persistence for numerous suggested factors.

In order to improve non-completion rates, a focus on asking the important recruitment questions and providing critical training support is required. This is best understood at the occupational level. The factors associated with attrition and retention are fewer than many industry stakeholders have suggested or perceive. Notwithstanding, apprenticeship retention is still a complex and multifaceted problem, one which requires a range of factors to accurately identify suitable candidates and appropriate training support.

## Key messages and implications

There are a number of key messages and implications that suggest approaches to improving completion rates for trade apprenticeships. Apprenticeship retention is affected by a number of factors and is best understood in the specific context of the trade. Identifying individual levels of drop-out risk is operationally feasible when factors are tailored to a specific trade. The implications are discussed in relation to each of recruitment, training and employer practices below.

### *Recruitment practices*

- To attract individuals who are more likely to persist in a trade, the career information should be relevant to the specific trade apprenticeship. Due to individuals' varying interests and their perception of what the apprenticeship means for their career path, some trades are a better fit.
- Individuals offering career advice require a clear understanding of the nuance of different trades. This may be influenced by the varying degree to which different trade roles are understood (or



misunderstood) by the general public. While some trades simply need to be promoted, others need more role/career details to overcome misunderstandings, which has major implications for their promotion.

- Ensuring that authentic career information is easy to access for prospective apprentices is much more important than any particular source of information on apprenticeships.
- Ensuring that employers are aware of the hiring factors that relate to retention in their specific trade is key. Employers are the main gatekeeper for the apprenticeship scheme and the arbiter for who comes into the trade. The trade associations, Australian Apprenticeship Centres and training institutes have a key role in distributing this information to employers.
- Prospective apprentices need career information that allows them to compare trade options. Taking the opportunistic option, even when well informed, did not increase retention. For instance, taking up the trade because of a family business opportunity did not equate to a good fit or higher persistence, nor did completing a school-based apprenticeship.
- Further research is encouraged to explore the individual motivations, interests and expectations that contribute to satisfied apprenticeship training experiences.

### *Training institute practices*

- Teaching in a way that apprentices find easy to understand was a significant and dominating predictor of planned persistence.
- Apprentices found their studies easier to understand when they had help with their subjects, access to teachers, enjoyed the way they were taught, learned current techniques, and had adequate materials. Making studies easier to understand does not equate to 'dumbing down the trade'. Apprentices were no more at risk of dropping out if they worried about the school work or found the technical requirements and reading demands unenjoyable.

### *Employer practices*

- Employers need to be actively involved in teaching apprentices on the job. Increasing the training capabilities of employers, with a particular focus on their ability to teach the skills of the trade, answer questions, and provide apprentices with a variety of work, increased the likelihood of apprentices' persistence. Even when apprentices have a poor relationship with their employers, it is the employers' ability to answer questions and teach the skills of the trade that matter most.
- Group training organisations are particularly well positioned to use this trade-specific information in guiding apprenticeship selection and support services. Their capacity to provide tailored support across different trade occupations would add value to their service. Their ongoing site visits have the capacity to support and educate employers in their training role with apprentices.
- Setting milestones and personal goals for apprentice training on the job that go beyond annual pay increases to include more frequent task-specific activities and/or responsibilities is likely to increase persistence. This appears to be an important activity, one that is not part of current practice or explicit to the apprentice.

In closing, a better understanding of retention and attrition could be gained by drilling down to the occupational level. By using factors appropriate to each trade, greater accuracy could be achieved in highlighting who was more or less likely to persist with apprenticeship training. This approach fills an important gap in research on apprenticeship retention by detailing how to attract and retain trade apprentices in different occupations. This study shows that people plan to persist in different trade apprenticeships for some core, but many trade-specific, reasons.

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## Appendix A: Technical details

This study was conducted using binary logistic regression. Logistic regression allows the production of discrete outcomes such as group membership. In this case, the outcome variable included two groups: those who seriously considered dropping out of their apprenticeship and those who did not.

Logistic regression is relatively free of restrictions. It was particularly useful in this study because of its flexibility in the use of predictors which are continuous, discrete and dichotomous. Furthermore, the predictors do not have the same restriction as other statistical approaches (for example, linear regression, discriminant analysis and the logit form of frequency analysis). As necessary in many other statistical approaches, the predictors are not required to be normally distributed, linearly related, or of equal variance (Tabachnick & Fidell 2007).

Logistic regression is part of the generalised regression family and produces a model which is nonlinear. The binary logistic equation predicts the natural log of the odds.

$$\ln\left(\frac{p}{1-p}\right)$$

For the purposes of this study, this is the natural log of the probability of being a *persistor* divided by the probability of being a *potential drop-out*.

### Model testing

Model testing in this analysis utilised two specific statistics. The first is a broad measure of model significance derived from the log likelihood ratio ( $G^2$ ). A significant result indicates that a sound model is tenable (that is,  $\alpha < .05$ ). Providing a slightly more nuanced measure for goodness-of-fit is the Hosmer-Lemeshow statistic. Goodness-of-fit measures are used to ensure models fit the data, to produce a significant model with the fewest predictors (Tabachnick & Fidell 2007). The Hosmer-Lemeshow statistic compares by decile the observed outcome variable with the predicted outcome probabilities to assess for significant differences. The Hosmer-Lemeshow statistic provides a non-significant chi-square result for a good fitting model (that is,  $\alpha > 0.05$ ). The Hosmer-Lemeshow statistic and log likelihood ratio were used throughout this analysis to judge whether a predictive logistic regression model was appropriate.

### Making sense of the estimated coefficients

Testing individual predictors was critical in the model development, since the removal of non-significant predictors was at the heart of this analysis. Within acceptable models, individual predictors were analysed for significance using the Wald test, which is the squared coefficient divided by its squared standard error (Tabachnick & Fidell 2007). The Wald statistic has a chi-square distribution and is considered a fairly conservative statistic, but with a strong history of use in binary logistic regression (Menard 2001). Non-significant predictors were deleted from the model in a stepwise modelling process (that is, using backward selection) to locate significant predictors of persistence. This approach was used to produce a model for each dimension.

The estimated coefficients are the natural log of the odds. Therefore, they are more easily understood when they are transformed by calculating the exponential of the parameter. This produces the odds ratio.

The odds ratio is the change in the odds of being a *persistor* when the value of a predictor is compared with a reference level of the same predictor. For instance, do the odds of persistence

change when a respondent answers yes to a question, as compared with respondents who answered no to the same question?

### Developing an occupational model

A particularly useful outcome of logistic regression is producing predicted outcomes that are probabilities between 0 and 1. In this study, the significant dimension models produced a probability outcome for each apprentice. These probability outcomes for each dimension were in turn used as predictors for the overall occupational model.

### Classification

Since the outcome of all binary logistic regression is a probability between 0 and 1, the classification of the two groups (that is, persistors and potential drop-outs) was analysed by choosing a cut-off point between 0 and 1. Those above the cut-off point were estimated to be persistors, while those below the cut-off point were estimated to be potential drop-outs. This classification was then compared with actual responses in the surveys to estimate the accuracy of classification.

While most often programs use 0.5 as a default cut-off point, others support a cut-off point that calibrates to the proportion of the two groups in the sample (Hosmer & Lemeshow 2000). However, choosing appropriate cut-off points is very much dependent upon the context in which the prediction model will be used (Pepe et al. 2004). One method which has been used to measure performance classification is to fix one degree of freedom (Hand 2001). This approach was adopted in this analysis, where a level of sensitivity was held constant in order to judge the performance of specificity. In this context, it was judged that a model with 80–90% sensitivity (that is, identifying 80–90% of ‘Persistors’ correctly) would adequately control the cost of false negatives (that is, providing career advice to ‘Persistors’ who were identified incorrectly as ‘Potential Leavers’).

## Appendix B: Representative sampling frame

### Plumbing apprentices

The proportion of plumbing apprentices who seriously considered dropping out (32%) and those who did not (68%) were reviewed against available demographic variables to ensure that the sample was representative of all plumbing apprentices in Australia. A chi-square test was conducted using the likelihood ratio ( $G^2$ ) to test for a significant association between the outcome variable (that is, persistors and potential drop-outs) and categories of demographic variables. These variables included:

- state or territory where institute training was taking place
- level of remoteness for home origin
- gender
- age
- starting year of apprenticeship (surrogate for apprenticeship year of training).

There was no association by state or territory ( $G^2 = 14.31$ ,  $df = 8$ ,  $p = ns$ ,  $n = 1016$ ), or on whether apprentices lived in remote areas ( $G^2 = 3.78$ ,  $df = 3$ ,  $p = ns$ ,  $n = 1009$ ). Remoteness was measured across four categories of population density, which included remote country (>100 km from a town of 20 000+ people), regional country (<100 km from a town of 20 000+), town, and city.

Gender showed no significant association between persistors and potential drop-outs (Fisher Exact Test = .440). However, with only seven females in the sample, there were insufficient data to provide any power to the analysis. This is characteristic of the industry where low female representation is prevalent across the construction industry. In 2008, only 1.1% of those in any construction training were female and a mere 0.5% were in plumbing apprenticeships (VOCSTATS 2008).

Persistors and potential drop-outs in this sample had a similar make-up of age when measured over eight categories of age ( $G^2 = 7.46$ ,  $df = 7$ ,  $p = ns$ ,  $n = 1013$ ). However, there was a significant difference in the proportions of persistors and potential drop-outs with respect to the year they started their apprenticeship ( $G^2 = 26.28$ ,  $df = 3$ ,  $p < .001$ ,  $n = 1016$ ). This association largely points to the natural observation that the longer an apprentice is in training, the more opportunity they have to consider leaving. Following from this perspective, the results show 20.3% of those in their first year of apprenticeship training had considered leaving, with an increase to 30.5% for second year plumbing apprentices. Those who had seriously considered leaving had stabilised at 39.8% and 38.2% respectively for third and fourth year apprentices.

**Table B1 Crosstab of demographics by DV for plumbing apprentices (%)**

Personal characteristics	Potential drop-outs	Persistors	Total
	Row %	Row %	Col %
<b>Age</b>			
17 years or younger	29.1	70.9	19.3
18 to 20 years	34.4	65.6	47.9
21 to 23 years	34.5	65.5	16.6
24 to 26 years	26.7	73.3	5.9
27 to 29 years	17.9	82.1	2.8
30 years or older	28.9	71.1	7.5
<b>Sex</b>			
Male	32.2	67.8	99.3
Female	14.3 <sup>a</sup>	85.7 <sup>a</sup>	.7
<b>Year apprenticeship started</b>			
2008	20.3	79.7	22.7
2007	30.5	69.5	33.3
2006	39.8	60.2	25.7
2005 or earlier	38.2	61.8	18.3
<b>Remoteness of home address</b>			
Remote country (>100 km from town of 20 000)	25.0	75.0	2.8
Regional country (<100 km from town of 20 000)	35.7	64.3	12.8
Town	34.6	65.4	36.7
City	29.7	70.3	47.8
<b>State or territory (&amp; New Zealand)</b>			
ACT	19.5	80.5	8.6
NSW	35.2	64.8	53.7
NT	b	b	.2
Qld	28.8	71.2	5.8
SA	15.8*	84.2*	1.9
Tas.	41.7*	58.3*	1.2
Vic.	33.1	66.9	15.2
WA	26.6	73.4	9.3
New Zealand	19.5	80.5	4.2
<b>All respondents (%)</b>	<b>32.0</b>	<b>68.0</b>	
<b>All respondents (n)</b>	<b>325</b>	<b>691</b>	<b>1016</b>

Notes: a: fewer than 20 cases in total (Potential Leavers + Persistors).

b: categories with fewer than 5 cases are not reported for anonymity.

## Bricklaying apprentices

In the bricklaying sample, 34% of respondents had seriously considered leaving their apprenticeship training and 66% had not. The bricklayers' dataset was analysed for response bias, to test whether the demographics of individuals were related to persistence. These demographic variables included:

- state or territory where institute training was taking place
- age
- apprentice year of training
- type of host employer
- pre-apprenticeship
- previous paid work as a bricklayer

Persistors and potential drop-outs had no significant association with the state in which bricklaying apprentices were training ( $G^2 = 6.58$ ,  $df = 5$ ,  $p = ns$ ,  $n = 365$ ). Nor was there any association between persistence and the age of apprentices ( $G^2 = .151$ ,  $df = 1$ ,  $p = ns$ ,  $n = 363$ ; using binary logistic regression) or their year of training ( $G^2 = 5.44$ ,  $df = 3$ ,  $p = ns$ ,  $n = 352$ ).

The bricklaying survey also collected information on the type of employer. This demographic variable contained four categories, including: bricklayer, group training organisation, not employed and other. There was no association between these categories and persistence ( $G^2 = 1.73$ ,  $df = 3$ ,  $p = ns$ ,  $n = 349$ ).

Bricklaying apprentices who had completed pre-apprenticeship training before entering their current apprenticeship were not associated with persistence (Fisher's Exact Test = .555,  $n = 327$ ). This was also the case for apprentices who had previously worked as a bricklayer ( $G^2 = 6.32$ ,  $df = 3$ ,  $p = ns$ ,  $n = 219$ ).

**Table B2 Crosstab of demographics by DV for bricklaying apprentices (%)**

Personal characteristics	Potential drop-outs Row %	Persistors Row %	Total Col %
<b>State or territory</b>			
NSW	40.0	60.0	49.3
Qld	25.0	75.0	7.7
SA	26.7	73.3	12.3
Tas.	b	a	1.6
Vic.	32.5	67.5	21.9
WA	26.9	73.1	7.1
<b>Year apprenticeship started</b>			
1st year	31.3	68.8	31.8
2nd year	29.1	70.9	31.3
3rd year	42.0	58.0	33.8
4th year	45.5	54.5	3.1
<b>Type of host employer</b>			
Bricklayer	35.1	64.9	68.5
Group training group	32.0	68.0	28.7
Not employed	a	a	b
Other	a	a	b
<b>Pre-apprenticeship</b>			
Yes	29.7	70.0	19.6
No	34.6	65.4	80.4
<b>Previous paid work as a bricklayer</b>			
None	36.9	63.1	73.1
< 1 year	41.5	58.5	18.7
1–2 years	a	b	b
> 2 years	b	a	b
<b>All respondents (%)</b>	<b>34.2</b>	<b>65.8</b>	
<b>All respondents (n)</b>	<b>125</b>	<b>240</b>	<b>365</b>

Notes: a: fewer than 20 cases in total (Potential Leavers + Persistors).

b: categories with fewer than 5 cases are not reported for anonymity.



## Appendix C: Dimension models

The following tables present the statistics for each independent dimension model and the overall occupational model for plumbing and bricklaying apprentices. The chi-square likelihood ratio ( $G^2$ ) is presented as the statistic for model significance, while the Hosmer and Lemeshow Test is used for model fit with the data. A non-significant Hosmer and Lemeshow Test signifies that the model adequately duplicates the actual responses.

### Plumbing model

The plumbing model utilised stepwise binary logistic regression with backward selection, using the Wald statistic for each dimension. The overall plumbing occupational model utilised the probabilities from each dimension's model output as predictors. A full explanation of the methodology is provided in appendix A.

**Table C1 Model statistics for plumbing modelling**

Dimension	Model statistics			Goodness-of-fit test		
	$G^2$	df	N	Hosmer $\chi^2$	df	p-value
Ability beliefs/interests	31.707**	3	1016	.249	4	.993
Outcome expectations	3.984*	1	1016	na	1	
Personal goals	3.625*	1	1016	na	1	
Influential people	21.499*	5	1016	1.923	3	.589
Career advisors	23.934*	6	967	1.176	4	.882
Career information	33.913**	6	962	3.725	6	.714
Training institute	67.764* *	11	982	6.241	8	.620
Employer	116.646**	14	1007	8.190	8	.415
<b>Occupational model (all dimensions included)</b>	<b>204.999**</b>	<b>8</b>	<b>893</b>	<b>7.037</b>	<b>8</b>	<b>.553</b>

Note: \*\*  $p < .001$ , \*  $p < .05$ .

### Bricklaying model

The bricklaying model utilised stepwise binary logistic regression with backward selection, using the Wald statistic. Only those exploratory factors that were similar to the plumbing set were used in this analysis. Of the 143 exploratory factors within the plumbing dataset, 116 were similar or identical within the bricklaying dataset.

The occupational model utilised the probabilities from each dimension's model output as predictors in the overall model.

**Table C3 Model statistics for bricklaying modelling**

Dimension	Model statistics			Goodness-of-fit test		
	G <sup>2</sup>	df	N	Hosmer X <sup>2</sup>	df	p-value
Ability beliefs/interests	19.098**	3	369	.254	5	.998
Outcome expectations	12.116*	2	369	na	0	
Personal goals	3.990*	1	369	na	0	
Influential people	11.189*	5	369	.799	3	.850
Career advisors	15.324*	6	369	1.783	5	.878
Career information	51.554**	8	369	1.384	6	.967
Training institute	21.834*	6	369	1.570	4	.814
Employer	49.997**	8	369	2.596	8	.184
<b>Occupational model (all dimensions included)</b>	<b>165.79**</b>	<b>10</b>	<b>365</b>	<b>6.42</b>	<b>8</b>	<b>.600</b>

Note: \*\* p<.001, \*p<.05.

## Appendix D: Mediated predictors

Mediated predictors must show a significant bivariate association with the outcome variable (DV), as well as a significant bivariate association with the mediating variable. A predictor is fully mediated when it no longer is significantly associated with the DV when the mediator variable is controlled for (that is, included in the model). A partial mediation exists when this relation is still significant, but reduced (Baron & Kenny 1986).

The following tables present the statistics for the mediated predictors. Each table presents the likelihood ratio statistic ( $G^2$ ) measure for association. In order to control for the mediating variable, a binary logistic regression was conducted, with the mediating variable entered as block one, followed by the mediated predictor in block two. This provided a likelihood ratio statistic for the mediated predictor after controlling for the mediator.

The tables show that the mediated variables are no longer significant predictors of the DV after controlling for the mediating variable.

### Easy-to-understand teaching (institute dimension)

**Table D1 Predictors mediated by 'easy to understand teaching' in the institute**

Mediated predictors	Mediating variable (easy-to-understand teaching)	DV (persistence)	DV after controlling for easy to understand teaching
	$G^2$	$G^2$	$G^2$
Flexibility in help with subjects	477.11**	21.71*	3.70
Flexibility in access to teachers	477.96**	24.07**	10.35
Teaching in a way that you enjoy	907.93**	23.83**	4.55
Teaching current techniques	531.50**	9.66*	2.71
Communication	816.60**	25.82**	6.34
Tools & materials	411.49**	13.83*	2.76
Facilities	535.70**	21.18**	9.44

Note: \*\*  $p < .001$ , \*  $p < .05$ .

### Flexibility in teaching and answering questions (employer dimension)

**Table D2 Predictors mediated by 'flexibility in teaching' and 'answering questions' by employer**

Mediated predictors	DV (persistence)	Mediating variable (flexibility in teaching)	Mediating variable (flexibility in answering questions)	DV after controlling for flexibility in teaching & answering questions
	$G^2$	$G^2$	$G^2$	$G^2$
Flexibility in your attending trade school	477.11**	418.53**	579.13**	1.92
Flexibility in job variety	477.96**	537.07**	561.70**	6.55
Flexibility in annual leave	907.93**	421.24**	560.44**	7.62
Least enjoyed physical labour	531.50**	27.56**	34.36**	2.17
Least enjoy my boss	816.60**	81.13**	81.10**	4.66

Note: \*\*  $p < .001$ , \*  $p < .05$ .

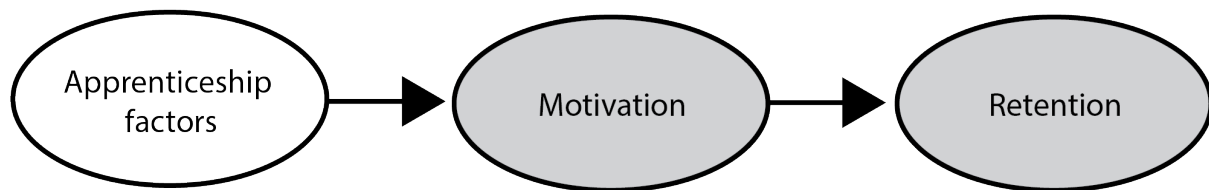
## Chapter 5 - Study 2

### 5.1 Preface

The prior study (Study 1) highlighted how apprenticeship factors associated with dropout considerations differed across a licensed (plumbers) and unlicensed occupation (bricklayers). Study 2 extended the exploration of context to apprentices' motivations, in the form of their subjective task values (STVs). The current study queried whether STVs discriminated across learning environments (trade school and workplace) and occupations (licensed and unlicensed) and STVs resultant capacity to predict apprentices' planned persistence?

**Figure 5.1**

*Focus of Study 2*



*Note.* Shaded ovals represent focus of Study 2, within the three components of the psychological process examined in this PhD.

While STVs have been distinguished between different education-subject domains in the past (Eccles & Wigfield, 1995; Luttrell et al., 2010), this study was the first to empirically distinguish four STVs (i.e., intrinsic, importance, utility, and emotional cost) across learning environment within a single education domain (i.e., trade apprenticeship). This study explored the impact of context on motivational values and their interplay, as encouraged within EVT literature (Eccles & Wigfield, 2020). Such results may inform levers for change

to lift apprenticeship retention, through motivational values. That is, which values are most important in predicting apprentices' planned persistence across different occupations, within their trade school, versus workplace learning environment?

This publication utilised the first measurement occasion (Measurement 1), of the longitudinal dataset collected for this PhD. Participating apprentices included two licensed trades (plumbers and electricians) and two unlicensed trades (carpenters and bricklayers), in their first and second year of study ( $N = 2,069^6$ ). Structural equational models utilised latent constructs in regression, bifactor, and multi-group analyses.

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<sup>6</sup> Note. This sample size is slightly larger than the Measurement 1 longitudinal sample ( $N = 2,044$ ) described in section 3.4.3 (Achieved Sample) because surveys without names were included in this analysis, whereas they were excluded from the longitudinal sample.



# Motivated apprentices: the value of workplace and trade school

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## ABSTRACT

Motivated students have been shown to persist longer in post-secondary education. As a multidimensional psychological construct, motivation is shaped by within- and between-person perceptions of context. Empirical measures of distinct workplace and trade school subjective task values (STVs) were examined, and their predictions of apprentices' planned apprenticeship persistence and intentions to leave the occupation. Further, these STVs (i.e., workplace/trade school intrinsic, importance, utility and emotional cost) were explored for predictive differences across licenced and unlicensed trade apprentices. Among a representative Australian sample of 2,069 trade apprentices, STVs discriminated across learning contexts (trade school vs workplace) and between occupations (licenced vs unlicensed apprenticeships). Workplace STVs had a greater impact on both planned study persistence and occupational departure intentions, while also diminishing the effect of trade school STVs on the same outcomes due to apprentices' internal comparison of STVs across learning contexts. Findings highlight the need for employer training and regulating who should employ an apprentice to ensure apprentices are afforded workplace training in a manner that maintains interest and reduces anxiety. Other findings present the roles and practical implications of within- and between-person contextualised motivation in explaining study and occupational planned persistence.

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## Introduction

Motivating students to stay in education and progress to the labour market has long been the hallmark of the apprenticeship scheme (Dumont et al. 2017). Apprenticeships that involve workplace and trade school learning support smoother transition from school to work (OECD 2010) and provide an important pathway to re-engage early school leavers with education (Lamb et al. 2015). This is particularly important in countries such as Australia, where apprenticeships are tertiary-level programs and represent a key pathway into work for school dropouts who comprise 65% of apprentices (Knight 2012). Yet, only 54% of construction trade apprentices complete their apprenticeship in Australia (NCVER 2018). An analysis of Programme for International Student Assessment (PISA) scores across 72 countries demonstrated motivation had a greater impact on student performance than either student background or school-related factors (Innovation and Science Australia 2017). Not only do motivated students perform better but studies found they persist longer in post-school education even after controlling for prior performance (Robbins et al. 2004).

Motivation refers to a person's desire to act or behave in a particular manner (Weiner 1992), and as such, has some element of cognitive or conscious process (Bandura 1977). Drawing on Eccles et al.'s expectancy-value theory of achievement-related choice (EVT, Eccles-Parsons et al. 1983, Eccles 2009),

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 Supplemental data for this article can be accessed [here](#).

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there is strong empirical evidence that interest, utility, and importance subjective task values (STVs) influence choices more directly than educational and employment characteristics. While substantial evidence supports STVs as the most proximal predictors of intentions to persist in a given task (Eccles 2009), in turn, motivations are shaped by features of their context (Kaplan and Patrick 2016). Two contexts to receive significant attention in apprenticeship retention research include workplace and trade school learning contexts.

Apprentices' STVs can vary considerably depending on methods and quality of learning afforded within workplaces and trade school environments (Fuller and Unwin 2011). 'Work is more first-person, active, practical, experiential, while [trade school] is more third-person, passive, conceptual and reflective' (Harris et al. 2001b, 273). Different learning contexts enable certain learning developments and exclude others (Butler and Brooker 1998) based on differing aims, contextual constraints, and training quality. It follows that what is deemed interesting, useful, and important should also differ across learning environments (Harris et al. 2001b).

Apprenticeship completions vary substantially across occupations (Cully and Curtain 2001; Negrini et al. 2016; Bednarz 2014). In particular, licenced trades, where apprenticeship qualification is mandatory, are associated with higher completion rates (Coe 2013). These trades are sometimes described as more technical (Meredith 2011), higher status (Dickie, McDonald, and Pedic 2011) and holding an implicit future earning premium, relative to unlicensed trades. Apprentices of licenced trades may hold higher STVs, or STVs may differentially predict planned apprenticeship and occupational retention, compared with unlicensed trades.

Apprenticeships offer a rare opportunity to compare STVs within contemporaneous trade school and workplace learning contexts and their interrelated effect on intentions to persist with study and work. Dimensional comparison theory (Möller and Marsh 2013) outlines how individuals regularly compare their ability across knowledge domains, and such comparisons affect self-concept. In this study, we extend this application to comparing STVs across learning contexts *within* the same knowledge domain (i.e. trade school and workplace learning for trade apprentices). The theory describes *assimilation effects* between domains that are perceived as highly correlated when achievement in one domain has a positive self-concept effect on a second domain (e.g., mathematics and physics). However, when the domains are perceived to be dissimilar (e.g., mathematics and English), a higher perceived ability in one domain can have a negative effect on self-concept in the other domain. Möller and Marsh (2013) call this a *contrast effect*. This is consistent with the EVT notion that it is the individual hierarchy of values which is most important across academic and occupational choice (Eccles 2009; Chow, Eccles, and Salmela-Aro 2012) and dimensional comparison theory has been replicated for STVs across knowledge domains (Guo et al. 2018; Gaspard et al. 2018), and related to course selection (Nagy et al. 2008).

## Australian trade apprenticeships

Australian trade apprenticeships are based on the dual system, which involves both on- and off-the-job training. Australian trade apprenticeships primarily take place post-school and are characterised by 3–4 year paid employment-based training contracts in a specified occupation, leading to a nationally recognised qualification. Since Australian apprenticeship entry occurs post-school, it is unsurprising that most apprentices view their apprenticeship as a job (Smith, Walker, and Kemmis 2011) focused on preparation for a specific occupation (Sappa, Choy, and Aprea 2016).

Other countries with dual apprenticeships (e.g., Germany, Austria, Switzerland, The Netherlands, and Denmark) offer trade apprenticeship training in upper secondary school. Such vocational qualifications integrate general academic curriculum with objectives that extend beyond training in a particular vocation (Sappa, Choy, and Aprea 2016). In such settings, apprentices may value educational certification more highly for general labour market access (Dumont et al. 2017) than for a specific occupation.

Differences in motivations may extend beyond trade school into the workplace environment. Whereas countries such as Switzerland and Germany require employers to have trainer qualifications before taking on apprentices, other countries like Australia and England have no such requirement. There is evidence that such unregulated employers are, at times, unsure how to implement workplace training (Smith 2000), resulting in a passive rather than a proactive approach to workplace teaching (Esmond 2018). Employers who offer little workplace support, or unstructured and informal learning opportunities, have been associated with poor apprenticeship retention (Bednarz 2014).

Much of the extant retention-related research in Australia has focused on reported demographics such as age, social economic status (SES), prior educational attainment, and pre-apprenticeship courses of apprentices (Stromback and Mahendran 2010; Ball and John 2005; Ray et al. 2000). Results have been mixed. For instance, studies have found older apprentices to be more likely to persist with their apprenticeship (Ball and John 2005), while other studies have found the age effect to be minor, or unrelated when controlling for other factors (Stromback and Mahendran 2010). Higher levels of schooling completed prior to an apprenticeship have been positively associated with retention rates (Ball and John 2005; Stromback and Mahendran 2010), while other researchers have indicated *perceived* academic performance relative to peers is more important (Gore et al. 2017). Such perceived and actual academic differences appear to be amplified by SES (Caro, Cortina, and Eccles 2014) – a concern for Australian apprentices who are typified by lower SES background compared with university students (Gore et al. 2017; Karmel, Roberts, and Lim 2014). Although apprentices' SES has been positively related to retention (Karmel and Roberts 2012), some consider SES important (Harris et al. 2001a), while others have found the impact to be modest (Misko, Nguyen, and Saunders 2007). Such varied results may suggest that reported demographics are better understood while also considering differences in apprentices' occupational groups. For instance, might the higher levels of retention for licenced trade apprentices be explained by higher levels of education and SES?

### Subjective task values

Expectancy-value theory (EVT; Eccles-Parsons et al. 1983) is a major comprehensive theoretical framework for explaining individual choice and persistence in carrying out achievement-related tasks (e.g., educational and occupational). Subjective task values (STVs) constitute psychological determinants posited to directly determine outcomes. STVs consist of four constructs, including how much individuals are interested or enjoy the task (intrinsic value), whether it is useful to their future (utility value), important to their identity (importance value), and the perceived costs of the activity (e.g., emotional cost). Although apprentices' demographic background, and experience on- and off-the-job, may influence intentions to persist with their apprenticeship, such intentions are filtered via their psychological determinants including STVs.

STVs have been used to predict study persistence across a range of academic courses (Perez, Cromley, and Kaplan 2014) and career choice (e.g., STEM careers; Guo et al. 2018, and the choice of teaching career; Watt and Richardson 2007). Notably, STVs related to knowledge domains (i.e., courses and subjects) have further predicted related career intentions. For instance, STVs for first-year engineering students predicted their engineering career plans (Jones et al. 2010), and high school students' STVs in mathematics predicted intentions to pursue mathematics-related careers (Watt et al. 2012).

Studies in those contexts do not distinguish study from workplace STVs, since study precedes work. Distinguishing STVs across concurrent learning contexts allows examination, for example, whether enjoying electrical studies equates to enjoying work as an electrician. Apprenticeships provide a rare opportunity for valid assessment of both co-occurring study and workplace STVs. There has been no such study that has examined all four STV constructs across learning contexts in the same knowledge domain. Examining only course-specific STVs prohibits identifying links with



the real-world complexity of apprenticeship motivation where learning takes place in two separate learning contexts – trade school and workplace.

**Hypothesis 1:** Trade school versus workplace subjective task values (STVs) can be distinguished among trade apprentices.

The study of STVs as framed by EVT has traditionally focused on discriminating intrinsic, importance, and utility values (Eccles and Wigfield 1995). More recent studies have incorporated cost values (Guo et al. 2016; Watt, Bucich, and Dacosta 2019; Flake et al. 2015) which were found to be salient to student outcomes. Some studies have combined various STV constructs, either from necessity due to their high level of covariance (e.g., Simpkins, Davis-Kean, and Eccles 2006; Musu-Gillette et al. 2015), or purposefully in order to predict outcomes. Guo and colleagues (2016) intentionally explored a general value for mathematics (i.e., all STV items loading on one general factor) using a bifactor analysis that produced strong fit and was defined with moderate loadings (standardised  $|\lambda| = .19$  to  $.85$ ,  $M = .51$ ). Their study demonstrated the general mathematics value was a stronger predictor of mathematics achievement, than individual STV factors. Combining STVs into a general value may provide a pathway to overall comparisons of valuation across trade school and workplace contexts.

**Hypothesis 2:** STVs can be combined meaningfully as a general value factor for each learning context – trade school and workplace – allowing a comparison of overall contribution to predicting planned apprenticeship persistence and intentions to leave the occupation.

There have been growing calls for better understanding of the role of context within motivational research (Volet and Kimmel 2012). While both general workplace and study values may prove important predictors of retention-related outcomes in each learning domain, workplace and trade school learning interrelate in ways that are complex, multifaceted, and multilayered (Gurtner et al. 2012). Dimensional comparison theory (Möller and Marsh 2013) suggests within-person comparisons occur regularly (e.g., ‘How much do I value my workplace learning compared with trade school?’). In the context of STVs (e.g., Gaspard et al. 2018), general trade school and workplace values may strengthen their effects on planned retention (‘assimilation’ effects) if apprentices perceive the two learning contexts as similar; for example, having similar content, modality of learning, or social context (Barnett and Ceci 2002). Alternatively, there may be a ‘contrast’ effect, reflected in dissimilar general values, whereby heightened general value of one learning context diminishes the effect of the other on planned retention.

## Occupation differences

National statistics for all Australian apprentices (NCVER 2018) reveal significant differences in completion rates across trades – ranging from 68% for electrotechnology and telecommunications, to 46% for food. Yet few empirical studies on vocational education training (VET) learning contexts differentiate occupations (Mikkonen et al. 2017). Therefore, identified factors *explaining* apprentices’ decision to attrit in general, may confound differences between occupations (Virtanen, Tynjälä, and Anneli 2014), which involve distinct skills, organisation of work, and learning environment (Mikkonen et al. 2017).

Licensed trades require a qualification (e.g., plumbing, electrical), unlike unlicensed trades (e.g., carpentry, bricklaying), and are characterised by higher completion rates (Seymour, Dockery, and Harris 2012; Coe 2013). This presumably suggests that for licensed trades, the non-optional apprenticeship study is perceived as instrumental (utility value), resembling findings from high school students (Watt et al. 2012). Further, the high stakes testing commonly involved as final hurdles for licensed trades may elevate strain and anxiety (Banks and Smyth 2015), boosting emotional cost. In

contrast, unlicensed trades have no qualification requirement; apprentices may discontinue their formal trade training and still work in these trades. EVT research among school students suggests that intrinsic value is more predictive of optional tasks, such as academic course selection (Watt et al. 2012) and leisure activities (Durik, Vida, and Eccles 2006). Inferring from this, general and specific STVs should differentially predict across licenced and unlicensed trade occupations.

**Hypothesis 3:** STVs differentially predict planned apprenticeship persistence and intentions to leave the occupation across licenced and unlicensed trade apprentices.

The present study seeks to understand how motivational values (STVs) *within* learning contexts (i.e., workplace and trade school) relate to broader *between* context variables (i.e., licenced and unlicensed trade occupations) in predicting apprentices’ intentions to persist with their apprenticeship and occupation. This study extends expectancy-value theory by exploring distinct STVs, and general values, across concurrent learning contexts within a single knowledge domain (trade apprenticeship), for trade occupations where the qualification is required versus optional.

Statistical analysis

Analyses were conducted in Mplus 8.2 (Muthén and Muthén 1998–201750) and utilised a design-based approach to accommodate the collection of data in trade school classes (Type = Complex) to reflect non-independence. The measurement model for within-person STVs across learning contexts was tested first using confirmatory factor analysis (CFA) (Hypothesis 1). Next, two structural equation models (SEM) were tested. The first modelled eight separate STVs (i.e., four each within each of workplace and trade school learning contexts; see Figure 1) as predictors of

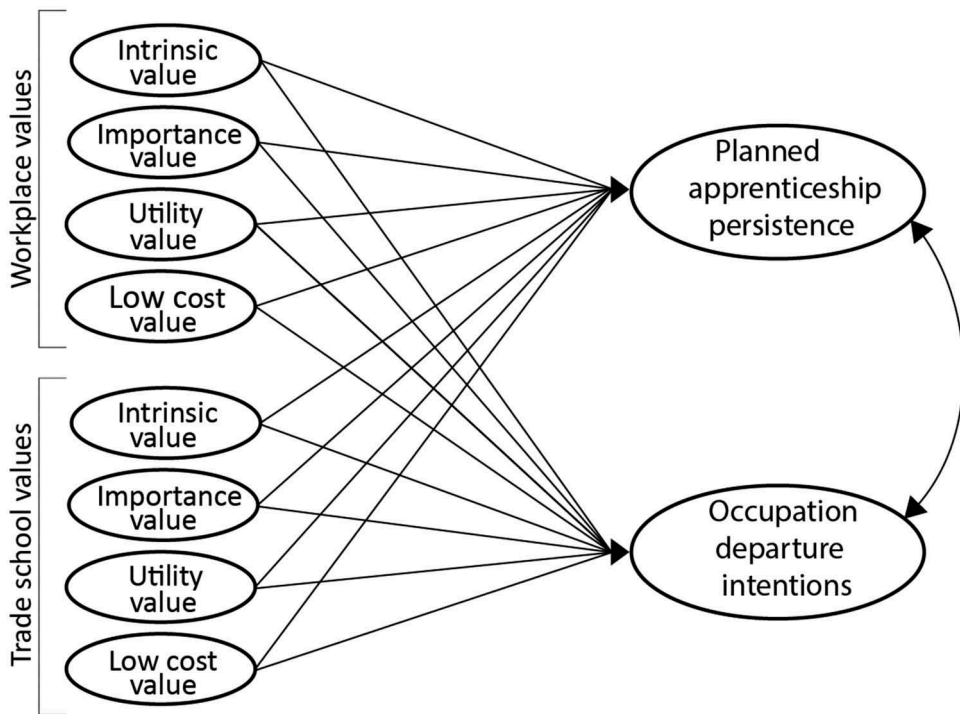


Figure 1. Hypothesised model presenting four value components within each of workplace and trade school learning contexts, as predictors of planned apprenticeship persistence and occupation departure intentions.

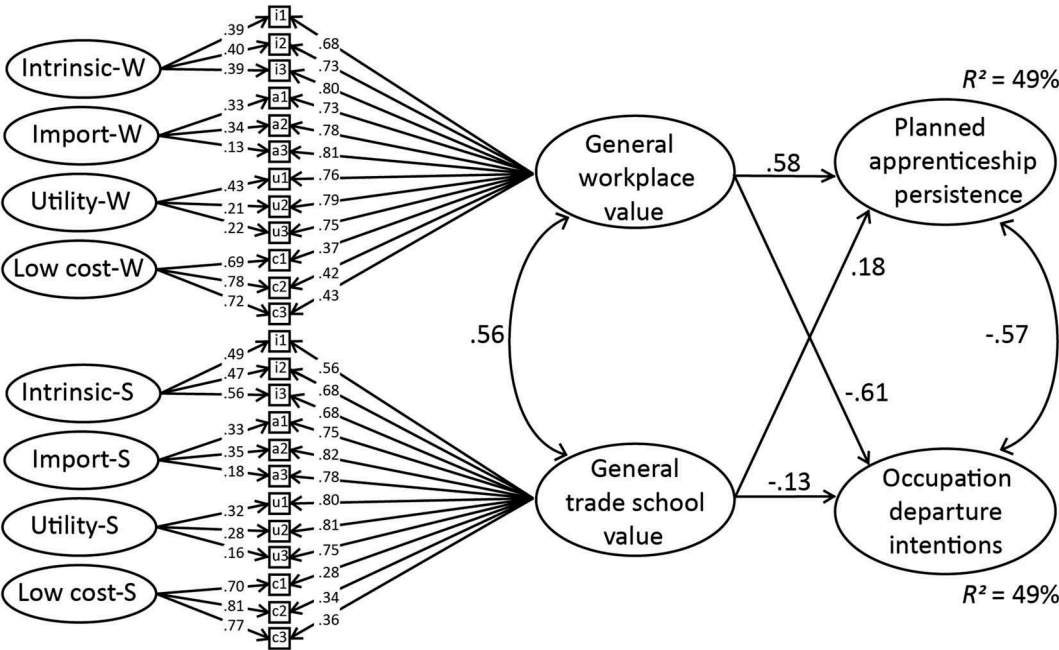


Figure 2. Standardised bifactor modelling of workplace (W) and trade school (S) values predicting planned apprenticeship persistence and occupation departure intentions.

apprentices' intentions to persist with their apprenticeship and occupation. The second utilised bifactor analysis (Morin, Katrin Arens, and Marsh 2016) to explore the overall impact of general trade school and workplace values (see Figure 2), in line with Hypotheses 2. Both structural models explored group differences between licenced and unlicensed trade apprentices using multigroup modelling (Hypothesis 3).

Goodness of fit for the measurement and structural models was assessed using four fit indices: the comparative fit index (CFI); root mean square error of approximation (RMSEA); standard root-mean square residual (SRMR); and the Tucker–Lewis Index (TLI). The scaled  $\chi^2$  index developed by Satorra and Bentler (1994) was included for completeness, although recognised as sensitive to sample size. CFI and TLI values  $> 0.95$ , RMSEA  $< 0.60$  and SRMSR  $< .08$  describe good model fit (Hu and Bentler 1999). Internal reliability of factors was measured using coefficient Omega ( $\omega$ ) to incorporate higher- and lower-order measures of reliability in bifactor models (Revelle and Zinbarg 2009).

## Material and method

### Participants and procedure

Questionnaires were collected from trade apprentices ( $N = 2,069$ ), for the FLARe Project (Factors Lifting Apprenticeship Retention expectations). Participating apprentices were in their 1<sup>st</sup> (58%) or 2<sup>nd</sup> year of study (42%). Thirty of the 54 public VET providers across Australia participated, with representation from all states and the capital territory. Four specific construction trades were targeted; two were licenced: plumbing ( $n = 866$ ) and electrical ( $n = 347$ ); two unlicensed: carpentry ( $n = 617$ ) and bricklaying ( $n = 239$ ). Paper surveys were administered by trade teachers during trade school attendance and took approximately 18 min to complete.

Closely matching the typical makeup of trade apprentices, the mean age for participants was 20.94 years ( $SD = 5.01$ ), who were predominantly male (99.10%). Almost a quarter (23.46%) entered their

Table 1. Example items for latent constructs.

Construct	Reliability ( $\omega$ ) <sup>a</sup>	
	Trade school/Work	Example item
<i>Values</i>		<i>My trade school/job experience ...</i>
Intrinsic	.87/.86	... is something I like.
Importance	.86/.87	... is important to me to perform well at.
Utility	.86/.87	... will be useful to me in the future.
Emotional cost	.88/.87	... is something I'd rather not do, because it only worries me.
<i>Outcome plans</i>		
Apprenticeship persistence	.81	How certain are you that you will remain in your apprenticeship?
Occupational departure	.82	I often seriously think about making a real effort to enter a new and different occupation.

<sup>a</sup>Internal reliability is represented by coefficient Omega ( $\omega$ ).

apprenticeship with no higher than a grade 10 level of education; 18.67% had attained grade 11, while the remainder (57.87%) had attained grade 12 or higher before entering their apprenticeship.

## Measures

### Values

Measured STVs included intrinsic, importance, utility, and emotional cost. Each was assessed with three items derived from validated large-scale studies. Measures of intrinsic value (Watt and Richardson 2006), future utility value for work (OECD 2009), importance value and emotional cost (both from Gaspard et al. 2015) included minor changes to reflect apprenticeships. The wording for these items across trade school and workplace context was strictly parallel, except for the reference to the learning context (e.g., *My trade school [job experience] is something I like*). All responses were on a 7-point scale from 1 (*not at all*) to 7 (*extremely*). Internal consistency and example items are presented in Table 1.

### Outcome measures

Planned apprenticeship persistence was assessed using 3 items by Watt and Richardson (2008). Intentions to leave the occupation (3 items) were measured by Bordia et al.'s items on turnover intention (2004), with one item modified ('asking for a transfer', to 'moving to another occupation').

### Background measures

Highest prior level of educational attainment was reported by apprentices from one of 7 levels: less than grade 10, grade 10, grade 11, grade 12, certificate (post-secondary), diploma (post-secondary), or university degree. *Socioeconomic status* (SES) was operationalised as the mean of two items: (a) the highest parent education level, and (b) highest parent occupational status score (i.e., AUSEI06 score, McMillan, Beavis, and Jones 2009) derived from parents' occupations as reported by apprentices. Parents' education level used the same 7 levels as for apprentices, and AUSEI06 which assigns occupations a score ranging from 0 to 100, was rescaled from 1 to 7 for equal weighting. Age, along with completion of pre-apprenticeship program (yes/no), and employment with group training organisations (yes/no) were included as background measures.

## Results

### Measurement model

The CFA supported the hypothesised 10-factor measurement model including intrinsic, importance, utility, and low cost values (cost measurement was reversed so scores reflected positive values) for each of trade school and workplace contexts, plus the two outcome factors – planned

apprenticeship persistence and intentions to leave the occupation. Because measurement items for the four value constructs used parallel wording across trade school and workplace contexts, common-item residuals were covaried a priori. A particularly high modification index led to correlating uniquenesses ( $\zeta$ ) between two items for intentions to leave the occupation; an artefact from the survey sequence and common introduction for these two items. Alternative models were compared to this hypothesised 10-factor model which combined like values across contexts (e.g., trade school intrinsic value and workplace intrinsic value were combined as a single factor), and another model that combined all value measures within each learning context (i.e., workplace motivation and study motivation were represented as two separate factors with 12 items each).

The hypothesised 10-factor measurement model presented good fit ( $\chi^2 = 1061.456$  (347), CFI = .97, TLI = .97, RMSEA = .03, SRMR = .03) whereas the alternative models did not (Table 2). Factor loadings for the 10-factor model were acceptable, ranging from 0.60 to 0.89. The internal reliability ranged from  $\omega = 0.81$  to 0.88 (Table 1).

The next step tested whether like values differed across learning contexts (e.g., intrinsic value for school versus work). Scaled  $\chi^2$  difference tests ( $\Delta \chi^2$ ; Satorra and Bentler 2001) were conducted separately between each parallel values (See Supplementary material). First, a one-factor model nested under a two-model factor (Brown 2015) was compared using  $\Delta \chi^2$ . In each set, the two-factor solution that discriminated values between learning contexts revealed a significant improvement in fit over the one-factor solution, with all  $\Delta \chi^2$  (1) > 349.27,  $p < .001$ , thus confirming Hypothesis 1 that value constructs could be distinguished between workplace and trade school contexts. Considering high correlations between intrinsic, importance, and utility values within each of workplace and trade school learning contexts (Table 3), similar testing was conducted between all pairs of STVs within learning contexts. Results across all paired STVs revealed two-factor solutions demonstrated significant improvement in fit over one-factor solutions – all  $\Delta \chi^2$  (1) > 25.90,  $p < .001$ .

### **Descriptive and correlation statistics**

Table 3 presents the means, standard deviations, and latent correlations among the variables. There were moderate positive correlations between like-values across learning contexts (i.e., trade school and workplace) for both licenced and unlicensed trades; ranging from intrinsic value ( $\phi = 0.41, 0.45$  for licenced and unlicensed, respectively) to emotional cost ( $\phi = 0.67, 0.71$ ). Notably, correlations were larger within learning contexts. Licenced and unlicensed apprenticeships reported similar in their latent mean levels for importance, utility, emotional cost, planned persistence and occupational departure. Intrinsic value for unlicensed trade apprentices was statistically significantly higher compared with licenced apprentices ( $p = .002$ ), but this represented a small effect size (Cohen's  $d = 0.25$ ).

Regarding the control variables, licenced apprentices were statistically significantly older (i.e., 10 months), and higher in SES and prior education as compared with unlicensed apprentices, but with small effect size (Cohen's  $d = 0.16, 0.09, 0.14$ , respectively).

**Table 2.** Confirmatory factorial analyses (CFA) fit indexes.

Model	$\chi^2$	df	CFI	TLI	RMSEA	SRMR
1. Hypothesised 10-factor model <sup>a</sup>	1061.456**	347	0.97	0.97	0.03	0.03
2. Alternate 6-factor model <sup>a</sup>	8452.673**	377	0.70	0.66	0.10	0.09
3. Alternate 4-factor model <sup>b</sup>	5765.555**	386	0.80	0.78	0.78	0.10

<sup>a</sup>Four workplace values, four trade school values, intentions to persist in apprenticeship, and intentions to leave occupation.

<sup>b</sup>Four values (combining each parallel factor across workplace and school), intentions to persist in apprenticeship, and intentions to leave occupation.

<sup>c</sup>Workplace motivation (four values combined), trade school motivation (four values combined), intentions to persist in apprenticeship, and intentions to leave occupation.

\* $p < .05$ , \*\* $p < .001$ .

Table 3. Descriptive statistics and latent intercorrelations among constructs in unlicensed (below diagonal) and licenced trades.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Endogenous variables</i>															
1. Training persistence															
2. Occupation turnover	-.79**														
<i>Exogenous variables</i>															
3. Intrinsic value (JOB)	.67**	-.74**													
4. Importance value (JOB)	.60**	-.59**	.83**												
5. Utility value (JOB)	.56**	-.58**	.80**	.94**											
6. Low emotional cost (JOB)	.45**	-.71**	.49**	.46**	.43**										
7. Intrinsic value (SCH)	.48**	-.47**	.45**	.36**	.31**	.23**									
8. Importance value (SCH)	.47**	-.39**	.43**	.54**	.51**	.27**	.80**								
9. Utility value (SCH)	.47**	-.46**	.41**	.53**	.50**	.28**	.78**	.91**							
10. Low emotional cost (SCH)	.30**	-.56**	.27**	.30**	.27**	.71**	.41**	.32**	.34**						
11. Age	.03	-.01	-.05	-.05	-.08*	.11**	.06	.01	.01	.09*	.09	.02	.03	-.04*	.01
12. SES <sup>a</sup>	.04	-.04	.08*	.06	.04	.10*	-.02	-.01	.00	.09*	.01	.02	.28**	-.04	-.08*
13. Prior education	.06	.01	.00	.05	.06	.09*	.01	.01	.03	.05	.22*	.32**	.15**	.00	-.01
14. Pre-apprenticeship <sup>b</sup>	.05	-.01	.07	.02	.02	-.06	.07*	.02	.00	-.02	-.07	-.05	-.05	.02	-.03
15. Employer type <sup>c</sup>	.00	-.05	.04	.01	.04	.04	.03	.01	.01	.05	-.03	.06	.02	-.01	.11*
Unlicensed – M	5.98	2.36	5.66	6.17	6.20	5.51	5.20	5.79	5.95	5.39	20.4	4.00	3.39	0.34	0.21
(SD)	(.05)	(.06)	(.05)	(.04)	(.04)	(.08)	(.06)	(.06)	(.06)	(.06)	(4.52)	(.07)	(.05)	(.02)	(.02)
Licensed – M	6.00	2.31	5.58	6.14	6.14	5.53	4.90	5.82	5.91	5.21	21.2	4.14	3.55	0.33	0.18
(SD)	(.06)	(.05)	(.04)	(.03)	(.03)	(.06)	(.06)	(.05)	(.05)	(.06)	(5.31)	(.05)	(.04)	(.02)	(.02)

<sup>a</sup>Social economic status: scaled 1 to 7. <sup>b</sup>Pre-apprenticeship: 1 = pre-apprenticeship, 0 = no pre-apprenticeship. <sup>c</sup>Employer type: 1 = group training organisation, 0 = direct training contract with employer. \* $p < .05$ , \*\* $p < .001$ .

### Structural model of STVs across study and job contexts

Differences between licenced and unlicensed trade apprentices were explored for the eight contextualised STVs as predictors of outcomes. The hypothesised model (Figure 1) showed good fit for all participants ( $\chi^2(447) = 1243.829$ , CFI = 0.97, TLI = 0.97, RMSEA = 0.03, SRMR = 0.03), and when modelled separately for licenced and unlicensed trade apprentices (Licenced trade apprentices:  $\chi^2(447) = 953.467$ , CFI = 0.96, TLI = 0.95, RMSEA = 0.04, SRMR = 0.03; unlicensed trade apprentices:  $\chi^2(447) = 953.467$ , CFI = 0.96, TLI = 0.95, RMSEA = 0.04, SRMR = 0.03). Measurement invariance tests (see Supplementary materials) supported scalar invariance for all factors, across licenced and unlicensed apprentices.

The modelling (Table 4) revealed *trade school* STVs differentially predicted planned apprenticeship persistence and occupational departure intentions for licenced and unlicensed trade apprentices supporting Hypothesis 3. Unlicensed trade apprentices were more likely to plan to persist in their apprenticeship for intrinsic reasons ( $\gamma = 0.23$ ), while licenced apprentices were more inclined to plan to persist due to their importance value ( $\gamma = 0.26$ ). These parameters were significantly different between groups;  $p = .04$  for both intrinsic and importance values using  $\Delta\chi^2$  test. Trade school utility value predicted lower likelihood of intentions to leave the occupation, similarly for licenced and unlicensed apprentices' (i.e., the difference was not statistically significant).

Workplace STVs revealed similar effects for both unlicensed and licenced apprentices. Both were more likely to plan to persist in their apprenticeship ( $\gamma = 0.48$  and  $0.60$ ) and less likely to intend to leave their occupation ( $\gamma = -0.71$  and  $-0.66$ ) if they held high workplace intrinsic value. Lower emotional cost similarly predicted unlicensed and licenced apprentices were more likely to plan to persist in their apprenticeship ( $\gamma = 0.16$  and  $0.13$ ) and less inclined to leave the occupation ( $\gamma = -0.27$  and  $-0.37$ ).

The control variables had little to no effect. Prior education, SES levels, and the type of employer did not predict intentions to leave the occupation or remain in the apprenticeship. Older licenced apprentices were slightly higher in intentions to persist with their studies and occupation – this was not the case for unlicensed apprentices. Finally, licenced apprentices who had taken a pre-apprenticeship course prior to their apprenticeship predicted slightly higher intentions to leave their occupation.

**Table 4.** Predicting planned apprenticeship persistence and occupational departure intentions: Standardised results from structural equation modelling.

	Planned apprenticeship persistence		Occupational departure intentions	
	Unlicensed	Licenced	Unlicensed	Licenced
<i>Trade school values</i>				
Intrinsic	<b>0.23*</b>	-0.06	-0.06	0.09
Importance	-0.06	<b>0.26*</b>	0.37	-0.06
Utility	0.12	0.00	<b>-0.45*</b>	-0.13
Low cost	-0.08	0.05	-0.12	-0.05
<i>Workplace values</i>				
Intrinsic	<b>0.48**</b>	<b>0.60**</b>	<b>-0.71**</b>	<b>-0.66**</b>
Importance	0.25	-0.31	0.47	0.10
Utility	-0.12	0.31	-0.19	0.14
Low cost	<b>0.16*</b>	<b>0.13*</b>	<b>-0.27**</b>	<b>-0.37**</b>
<i>Control Variables</i>				
Age	0.01	<b>0.02*</b>	0.01	<b>-0.02*</b>
SES <sup>a</sup>	-0.02	0.00	0.03	-0.04
Prior Education	0.05	0.03	0.04	-0.02
Pre-App <sup>b</sup>	0.04	0.07	0.03	<b>0.15*</b>
Employer type <sup>c</sup>	-0.06	-0.08	0.01	-0.02
Variance explained	0.52	0.54	0.78	0.68

All multi-item constructs were modelled as latent variables. <sup>a</sup>Social economic status: scaled 1 to 7. <sup>b</sup>Pre-apprenticeship: 1 = pre-apprenticeship, 0 = no pre-apprenticeship. <sup>c</sup>Employer type: 1 = group training organisation, 0 = direct training contract with employer. \* $p < .05$ , \*\* $p < .001$ .



*Bifactor modelling of study and workplace value*

Bifactor modelling explored the presence of general workplace and trade school values. Bifactor SEM provides a method of modelling construct-relevant multidimensionality (Morin, Katrin Arens, and Marsh 2016) whereby each observed item is assumed to explain the variance in the general value construct (i.e., general workplace/school value) after accounting for the variance explained in STVs (e.g., workplace intrinsic, importance, utility, and low cost values).

The bifactor model as represented in Figure 2 was scalar invariant and demonstrated moderate fit ( $\chi^2$  (436) = 1789.729; CFI = 0.95; TLI = 0.94; RMSEA = 0.04; SRMR = 0.06). General trade school and workplace value had good reliability ( $\omega_h$  = 0.82 and 0.85, respectively) supporting Hypothesis 2. There were no significant differences in the predictive paths from general values to the outcomes between licenced and unlicensed apprentices, contradicting Hypothesis 3 at the general level. Item loadings were highest for measures of intrinsic, importance and utility values; substantially smaller for low emotional cost.

Both general trade school and workplace values were significant predictors of planned apprenticeship persistence and intentions to leave the occupation. Workplace general value was more important than trade school general value in predicting intentions to persist with the apprenticeship ( $\gamma$  = 0.58 and 0.18, respectively) and intentions to leave the occupation ( $\gamma$  = -0.61 and -0.13, respectively). Comparing these prediction effects to first-order correlations (see Table 5) demonstrated dimensional comparison. The general trade school value effect ( $\gamma$  = 0.18 and -0.13) was much smaller than the first-order correlation with both outcomes ( $\phi$  = 0.50 and -0.48, respectively), while the general workplace value effects were similar to the correlations ( $\phi$  = 0.67 and -0.68). This indicated a contrast effect on general trade school value explained by dimensional comparison focused on general workplace value.

**Discussion**

The present study is the first to evaluate four distinct subjective task values (STVs) within parallel learning contexts among different types of apprentices (licenced and unlicensed). Trade apprentices' intrinsic, importance, utility, and emotional cost values within trade school were distinct from their workplace values, supporting **Hypothesis 1**. This provided the basis to successfully explore a meaningful combination of STV measurement items to measure general workplace and trade school value (**Hypothesis 2**). Higher general workplace value more strongly predicted higher planned apprenticeship persistence and lower intentions to leave the occupation when compared to general trade school value. Moreover, higher general workplace value appeared to lower the relationship between trade school value and retention-related outcomes (i.e., a contrast effect). To illustrate, an apprentice might espouse, 'the more I value what I learn at work, the less important is my trade school when it comes to my intentions to finish the apprenticeship or leave this trade.'

Comparing both general and specific STVs for workplace and trade school between licenced and unlicensed trade apprentices provided partial support for differing relationships with retention-related plans (**Hypothesis 3**). Differences were only detected at the distinct STVs' level, not at the 'general' values level. At the STV level, planned apprenticeship persistence was higher for unlicensed trade apprentices who found their *trade school* experience more enjoyable (i.e., intrinsic value).

Table 5. Latent intercorrelations among outcomes and general valuations within learning contexts.

	Planned apprenticeship persistence	Occupation departure intentions
General workplace value	0.67**	-0.68**
General trade school value	0.50**	-0.48**

\* $p < .05$ , \*\*  $< .001$ .



Licensed trade apprentices, on the other hand, were more likely to persist when they perceived their trade school to be highly important.

*Workplace STVs* were similar between licensed and unlicensed trade apprentices, where workplace intrinsic value and emotional cost were important predictors of both outcomes. Both interest and disinterest in the type of work have been associated with apprenticeship retention and attrition (Bednarz 2014; Harris and Simons 2005). Workplace anxiety-provoking situations have also been linked to higher levels of apprenticeship attrition, including mismatched expectations, poor training, a lack of respect, and being treated as cheap labour (Snell and Hart 2008). Notably, importance and utility value for workplace learning were not statistically significant predictors of planned apprenticeship persistence or occupational departure. Since importance value has much to do with identity (Eccles 2009), it may indicate that first- and second-year apprentices had not developed a strong sense of workplace identity or appreciated the merit of what they were learning at work as useful to their future endeavours.

STVs for trade school demonstrated differing associations with planned apprenticeship persistence for licensed and unlicensed trades. Results indicate the qualification mandate may play a key role; required for licensed and optional for unlicensed trades. For unlicensed trade apprentices (i.e., carpenters and bricklayers), intrinsic value was the sole predictor of planned apprenticeship persistence among trade school STVs, consistent with prior research on optional activities for adolescents. This was not the case for licensed trade apprentices (i.e., electricians and plumbers) where importance value was the sole significant trade school STV predictor. The importance value effect may relate to the higher status (Dickie, McDonald, and Pedic 2011) and esteem (Harris et al. 2001b) attributed to the required qualification. Findings appear to deviate from research on high school students involving utility value. For instance, students have perceived required courses as instrumental (Watt et al. 2012) and high school vocational qualifications as an avenue for general labour market access (Dumont et al. 2017). This may indicate that licensed trade apprentices in a tertiary level setting initially build identity around the mandatory qualification before occupational identity on-the-job occurs.

Trade school and workplace values were interrelated due to within-person dimensional comparisons across the two learning contexts. This study revealed higher values within the workplace learning context could undermine values for trade school; a 'contrast' effect using Möller and Marsh's terminology (2013). The findings are in keeping with research that highlights the relative importance of the workplace over trade school in relation to apprenticeship retention (Bednarz 2014), but also partially explains a motivational process whereby apprentices' workplace value may diminish the effect of trade school value on planned apprenticeship persistence and occupation departure intentions.

The underlying mechanisms behind this compensatory effect may be signalled by past apprenticeship research which compares learning contexts by content, modality of learning, and social interactions (Barnett and Ceci 2002). Content is often distinguished as conceptual and theoretical in trade school versus practical in the workplace (Harris et al. 2001b). In Australia, trade school may also recall memories of poor high school experiences, particularly for the 65% of apprentices who were early school leavers – a group less inclined to recognise the merit of trade school (Dommers et al. 2017) or participate in learning activities (Illeris 2006). Learning modality comparisons seem self-evident, given the research highlighting workplace learning as a pathway to re-engage early school dropouts (Lamb et al. 2015), through active and experiential learning in the workplace versus passive and reflective classroom learning processes. However, the character of workplace experience is largely dependent upon the learning opportunities afforded apprentices by Australian employers whose training of apprentices on-the-job is unregulated. Social interactions, including interpersonal difficulties with employers (Bednarz 2014) and lack of employer support (Cully and Curtain 2001), are oft-cited reasons for not completing an apprenticeship, and may distinguish from more formalised learning relationships with trade school teachers. In summary, the dissimilarities described support a dimensional motivational process whereby within-person learning context comparisons diminish value for trade school and effects on planned retention.

### ***Practice implications***

Understanding STVs within different learning contexts provides insight into potential levers for improving retention and engagement through study and workplace motivation. Motivational values were much more important predictors of apprenticeship retention than demographic characteristics prevalent in apprenticeship retention research. Even though licenced apprentices entered with higher levels of SES and prior education compared with unlicensed apprentices, such differences did not predict persistence in study and work after accounting for motivation.

This study indicated the key to employers raising apprentices' intentions to persist in study and work is via raising apprentices' interest, and reducing their workplace anxiety, over encouraging the usefulness or importance of their workplace learning. Practical approaches could include structured and active workplace teaching with a variety of activities suited to lifting apprentices' workplace interest, through novelty (Bergin 1999) and support which trigger and promote interest (Hidi and Ann Renninger 2006). Reducing emotional cost may require greater clarity on evolving roles, to mitigate mismatched expectations (Snell and Hart 2008) and interpersonal differences on-the-job (Bednarz 2014) which have been associated with lower retention. Given the strong relationship between workplace motivations and apprentices' intentions to persist in study and work, there is an argument for *employer* regulation and training that target employers' on-the-job activities to motivate apprentices in specific ways. Employing policies that regulate who can employ an apprentice may improve retention rates by ensuring employers have the appropriate skills to support apprentice learning in ways that hold their interest and reduce anxiety. Given research that shows (a) employers are frequently uncertain how to implement workplace training (Smith 2000) and, (b) the negative relationship between unstructured approaches to workplace learning and retention rates (Bednarz 2014), the findings in this study encourage turning policy attention towards the workplace learning environment. Employers who create an uninteresting and anxiety-provoking learning environment pose a significant risk to apprenticeship persistence and commitment to the occupation.

Trade school STVs may be an easier pathway to intervene with larger groups of apprentices but must account for differences between licenced and unlicensed trades. Emphasising the importance of the qualification along with the status and esteem bestowed (Harris et al. 2001b) seems an important driver of planned retention for licenced trade apprentices. However, where the qualification is optional (unlicensed trades), presenting trade training in a manner that stimulates apprentices' interest would seem more critical to raising intentions to remain in the apprenticeship. For unlicensed apprentices, interest in trade school may be supported by greater variety in learning competencies, site visits, and guest speakers since novelty and modelling tend to promote situational interest (Hidi and Ann Renninger 2006). Even though trade school may be perceived as useful, important, and in a format that reduces anxiety, this may matter little for apprentices who find their optional training uninteresting.

### ***Limitations and future directions***

Study strengths include a large representative sample of trade apprentices in the four trade occupations across public VET institutions in Australia, during their first- and second-years when most dropouts occur. This study also had some limitations that deserve comment. The study used self-report measures, which are common in assessing social-cognitive constructs (Diener 1994) and EVT studies. It is acknowledged that this approach would inflate relationships with outcomes that are self-reported.

The study was also limited by cross-sectional data. Exploring longitudinal development of EVT motivations across contextualised learning settings provides a promising area for future apprenticeship research. The specificity of contextual covariates in those settings (e.g., quality of employer teaching, course difficulty at trade school) can offer informative and practical avenues to influence motivational processes and persistence.

## Conclusion

The present study supported distinct subjective task values (STVs) *within* learning contexts (workplace and trade school) which demonstrated differences across occupations (licenced and unlicensed trades) in predicting apprentices' intentions to persist with their study and work. Trade school STVs differed across licenced and unlicensed trade apprentices, suggesting different approaches to motivating apprentices are needed regarding intentions to persist with apprenticeship training. Extending prior findings on the importance of workplace over trade school experiences, these findings support employer training and regulation to enhance apprentices' retention in their apprenticeship and commitment to the occupation.

This study highlights the importance of raising workplace interest and lowering workplace anxiety, over other workplace STVs. Workplace value was more important, regardless of whether the trade was licenced or not. The study has contributed to the expectancy-value body of literature by showing that STVs can be discriminated across learning contexts even within the same knowledge domain, exhibit dimensional comparisons, and differentially predict important choice outcomes between occupations.

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### Supplementary Material

#### *Testing discriminant STVs across learning contexts*

Parallel STVs were tested for discriminant validity across trade school and workplace learning contexts using nested 2-factor models within 1-factor models (Brown 2015, 144). The Satorra-Bentler scaled  $\chi^2$  difference test (2001) was utilised to control for non-normal distributions (Table S1).

Table S1. Chi-square difference tests for STVs across learning contexts.

Comparing 2 versus 1 factor	$\Delta \chi^2$
<i>Across contexts</i>	
Intrinsic value	6879.700**
Attainment value	3002.897**
Utility value	1693.907**
Low cost value	349.271**
<i>Within trade school</i>	
Intrinsic-Attainment values	866.697**
Intrinsic-Utility values	482.312**
Attainment-Utility values	75.668**
<i>Within workplace</i>	
Intrinsic-Attainment values	131.292**
Intrinsic-Utility values	112.348**
Attainment-Utility values	25.896**

Note. \*  $\chi^2$  difference test is Satorra-Bentler corrected. \*  $p < .05$ , \*\*  $p < .001$ .

#### *Measurement Invariance*

Measurement invariance tested whether latent constructs had similar psychometric properties across the two occupational groups of licensed and unlicensed apprentices. This involved a stepped review of (a) a *configural invariance* model which assumes items tap same constructs across groups, (b) *metric invariance* which assumes same item loadings across groups, and (c) *scalar invariance* which additionally assumes same item intercepts (Cheung and Rensvold 2002). Each model is compared to the prior

model for any loss of model fit due to additional equality constraints. With large but unequal sample sizes across the groups (i.e.,  $n = 1213$  for licensed trades, and  $n = 856$  for unlicensed trades), the more restrictive cut-off values as suggested by Chen (2007) were used. As such, in testing metric invariance a change of .01 or lower in CFI, supplemented by a change of 0.015 or lower in RMSEA or a change of .03 or lower in SRMR, would indicate invariance across the two groups. To test scalar invariance, changes smaller than .01 for CFI, supplemented by changes of close to .015 or lower for RMSEA or a change in SRMR close to .01 or lower would indicate invariance across licensed and unlicensed trades.

Measurement invariance was supported across licensed and unlicensed trades for the 10-factor model (Table S2), providing the basis for multigroup SEM modelling.

Table S2. Invariance fit indices for lower order values (licensed and unlicensed apprentices)

	$\chi^2$ *	df	p-value	CFI	RMSEA	SRMR
Configural	1492.155	694	0.000	0.972	0.033	0.032
Metric	1531.811	714	0.000	0.971	0.033	0.037
Scalar	1580.991	734	0.000	0.970	0.033	0.038
<i>Differences in fit</i>	$\Delta \chi^2$ <sup>a</sup>	$\Delta df$	$\Delta p$ -value	$\Delta$ CFI	$\Delta$ RMSEA	$\Delta$ SRMR
Metric v Configural	39.974	20	0.005	-0.001	0.000	0.005
Scalar v. Metric	51.048	20	0.000	-0.001	0.000	0.001

Note. <sup>a</sup>  $\chi^2$  difference test is Satorra-Bentler corrected, CFI = Comparative fit index, RMSEA = Root mean square error of approximation, SRMR = Standard root-mean square residual.

Measurement invariance across licensed and unlicensed trades for the bifactor model confirmed that latent constructs had similar psychometric properties (Table S3).



Table S3. Invariance fit indices for bifactor model (licensed and unlicensed apprentices)

	$\chi^2$	df	p-value	CFI	RMSEA	SRMR
Configural	1682.202	684	0.000	0.965	0.038	0.047
Metric	1746.128	726	0.000	0.964	0.037	0.054
Scalar	1766.345	744	0.000	0.964	0.036	0.055
<i>Differences in fit</i>						
	$\Delta \chi^2^a$	$\Delta df$	$\Delta p$ -value	$\Delta$ CFI	$\Delta$ RMSEA	$\Delta$ SRMR
Metric v Configural	73.818	42	0.002	-0.001	0.001	0.007
Scalar v. Metric	18.361	18	0.432	0.000	-0.001	0.001

Note. <sup>a</sup>  $\chi^2$  difference test is Satorra-Bentler corrected, CFI = Comparative fit index, RMSEA = Root mean square error of approximation, SRMR = Standard root-mean square residual.

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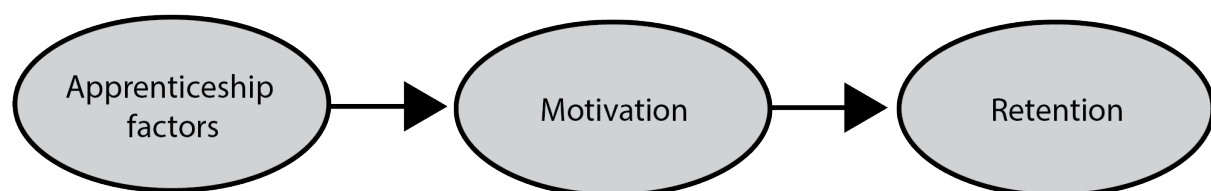
## Chapter 6 - Study 3

### 6.1 Preface

The final study of the current research explored whether dropout considerations were predicted by the growth in motivational values during the apprenticeship, and how such growth trajectories could be influenced by apprenticeship factors. Study 3 ( $N = 2,387^7$ ) built on the findings of Studies 1 and 2. Study 1 provided guidance on key apprenticeship factors relating to pre-entry (i.e., role models, timing of choice, career information, and career indecision) and during the apprenticeship (employer teaching, job security, training wages, expertise perceptions, and excessive work). Study 2 highlighted important subjective task values (STVs) that predicted apprentices' planned persistence; namely workplace intrinsic value (positively) and emotional cost (negatively).

**Figure 6.1**

*Focus of Study 3*



*Note.* Shaded ovals represent focus of Study 3, within the three components of the psychological process examined in this PhD.

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<sup>7</sup> The sample size in this study was larger than Study 2 ( $N = 2,069$ ) because additional apprentices could complete surveys after the first measurement occasion.

Building on the same longitudinal dataset in Study 2 across further collected measurement occasions, Study 3 analysed the developmental trajectories of intrinsic value and emotional cost using latent growth modelling (LGM). Notably, the growth trajectories demonstrated substantial variance between- and within-apprentices. However, almost half of this variance was explained (predicted) by apprenticeship pre-entry factors and experienced factors during their apprenticeship. This suggested that motivations are malleable and provide a more informed understanding of why certain factors influence dropout considerations, while others do not.

## **Understanding why apprentices consider dropping out – Longitudinal prediction of apprentices' workplace interest and anxiety**

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**Abstract:** Although apprenticeships ease the school-to-work transition for youth, many apprentices seriously consider dropping out. While associated with noncompletions, dropout considerations are a very anxious time for apprentices and can impact current apprentices' quality of learning and engagement. Few studies have addressed apprentices' dropout intentions using comprehensive theoretical frameworks. To address this gap, this study examined how apprentices' growth trajectories of interest and anxiety predicted dropout considerations and associated with perceived resources and demands, grounded in expectancy-value theory (EVT) and the job demands-resources (JD-R) model. Australian apprentices ( $N = 2,387$ ) were surveyed at 6-month intervals utilising an accelerated longitudinal design, on their workplace interest and anxiety, job-related resources (role model, timing of choice, employer teaching, expertise, job security, and training wages) and demands (lack of information, career indecision, and excessive work). Latent growth models (LGM) within a structural equation modelling framework showed apprentices began with high interest which declined over time, and low anxiety which increased in the latter half of their first year until the end of their second year. Apprentices' dropout considerations were predicted by initial interest and anxiety levels (at the beginning of their apprenticeship), and by interest losses during their apprenticeship (but, not by increases in anxiety). Almost half the variance in interest and anxiety trajectories was explained by perceived resources and demands: resources had a greater effect on promoting interest than reducing anxiety, whereas demands were more important in exacerbating anxiety.

**Keywords:** Apprenticeships, interest, anxiety, expectancy-value theory, job demands-resources model

## Introduction

Trade apprenticeships that combine work and study are widely praised as a means of easing the school-to-work transition (OECD, 2009a), reducing youth unemployment (OECD, 2017), and producing a well-skilled labour force (OECD, 2010a). Initial workplace experiences can take on heightened importance in *post school* apprenticeship systems. Experience of unemployment in the first year beyond high school has been linked to increased likelihood of future unemployment and more frequent future spells out of the workforce (Lamb & McKenzie, 2001).

Approximately one-third of current apprentices consider dropping out of their apprenticeship, in studies from Australia (Gow, Hinschen, et al., 2008; Powers, 2015) and Germany (Seidel, 2019). Meta-analyses have identified dropout considerations as strong predictors of actual student dropout (e.g., Bean & Metzner, 1985; Sandler, 2000), and as the strongest predictor of employee turnover (see meta-analyses; Allen et al., 2010; Bauer et al., 2007; Griffeth et al., 2000). Even if apprentices who seriously consider dropping out during their training remain in their apprenticeship, dropout considerations can undermine workplace satisfaction and commitment (Allen et al., 2010), engagement (Halbesleben & Wheeler, 2008), future performance (Bakker & Costa, 2014), and associate with stress at work (Allen et al., 2010). Dropout considerations are worth examining in their own right because they reflect a negative quality of apprenticeship experience which may accumulate over time (Hobfoll, 2012).

This raises important questions about what motivates individuals to consider leaving an apprenticeship. Despite research into a multitude of personal demographics, socialisers, and structural components associated with apprenticeship entry and attrition (Bednarz, 2014), many acknowledge that a “league table” of background and external factors has not led to

results which are generalisable (Harris, Simons, et al., 2001; Virtanen et al., 2014).

Employers, trade teachers and apprentices widely believe individual motivation is a central factor in enhancing retention (Harris & Simons, 2005), but motivation is often ill-defined, assuming lay definitions (Kanfer et al., 2017). Drawing on expectancy-value theory (EVT; Eccles-Parsons et al., 1983) this study examined apprentices' underlying psychological motivational values as the main drivers of dropout considerations. In turn, contextual influences on apprentices' values were examined by locating recurrent themes in the apprenticeship retention literature within the job demands-resources model (JD-R; Demerouti et al., 2001) to explain differences across apprentices and variations over time.

### **Australian apprenticeships**

The Australian apprenticeship system is based on the *dual system* involving on- and off-the-job training at the tertiary-level which incorporates a national curriculum and a training contract registered with the State or Territory Training Authority. While Australian trade apprentices experience a highly regulated trade school environment, there is little regulation on the nature of employers who may take on an apprentice (Smith & Kemmis, 2013). This is particularly concerning, given apprentices spend 80% of their time on-the-job, and employment-related reasons are the most commonly cited amongst the 44-46% trade apprentices who do not complete their training in Australia (Bednarz, 2014; NCVER, 2020b). Countries with similarly unregulated on-the-job oversight, also highlight employment-related reasons for apprenticeship dropouts: the UK (Berglund & Loeb, 2013) and New Zealand (Alkema et al., 2016) are both examples.

### **Workplace motivation**

In a broad sense, motivational psychologists try to understand what drives people to action, and why they think and do what they do (Wigfield et al., 2015). Expectancy-value

theory (EVT; Eccles-Parsons et al., 1983) is one of the major frameworks for achievement motivation. According to EVT, occupational and education intentions are directly influenced by subjective valuation of a task in terms of interest, usefulness, importance, and different kinds of costs (e.g., emotional cost; akin to anxiety). In a recent cross-sectional study of 2,069 trade apprentices, workplace *interest* and *anxiety* were found to be the main drivers of dropout considerations, above and beyond usefulness and importance values (Powers, 2020). Altogether, if apprentices are losing interest, develop heightened anxiety, and seriously consider dropping out, this would constitute an undesirable quality of apprenticeship experience even if those apprentices do not drop out of their training. This study sought to extend our understanding of workplace interest and anxiety over time and what determines their trajectories.

### ***Evolving interest***

Interest has a long history in the literature on occupational choice (Holland, 1997; Lent et al., 1994) and employment outcomes (Nye et al., 2017). Large-scale Australian studies have revealed students take-up vocational pathways (Gore et al., 2017) and trade apprenticeships in particular (NCVER, 2020b) due to an abiding interest in the type of work performed in those occupations.

How vocational and educational interests develop over time for young adults has revealed mixed trends. A recent meta-analysis of longitudinal data from 49 primary studies in the United States and Canada (Hoff et al., 2018) revealed vocational interests increased during high school and remained constant during tertiary study. Other studies revealed decreases in academic interest during students' schooling (see meta-analysis by Scherrer & Preckel, 2019) including school-based apprentices (Swiss apprentices; Gurtner et al., 2012) and university students (Jones et al., 2010). It has been suggested that declining levels of

interest reflect initially idealistic views becoming tempered by students' experience (Jones et al., 2010). Consequently, this study sought a better understanding of how apprentices' interest evolves through the apprenticeship.

### ***Anxiety***

While EVT has demonstrated anxiety is important to choice, far less empirical work has been conducted on cost factors compared with interest (Wigfield et al., 2009). Anxiety is conceptualised in terms of the negative aspects of engaging in a task and has been found to predict tertiary level studies and career intentions (Battle & Wigfield, 2003). Research into apprenticeship attrition signals similar results. Higher levels of actual dropout were associated with apprentices feeling their employer abused, harassed, exploited, or treated them unfairly (Harris & Simons, 2005; NCVER, 2020b).

How apprentices' anxiety unfolds over time is less well understood. It has been argued that some subject-related anxieties are more sensitive to specific instructional environments (Eccles & Midgley, 1989). This may inform findings from a UK longitudinal study ( $N = 11,801$ ) where high school students experienced higher levels of anxiety when progressing to university, as compared to no change in anxiety for students who entered apprenticeships (Symonds et al., 2016). How anxiety evolves and is influenced *during* post-school apprenticeships has yet to be examined.

### **Apprentices' perceived resources and demands**

The job demands-resources model (JD-R; Demerouti et al., 2001) proposes a framework that links job resources to motivation (e.g., interest) and job demands to strain (e.g., anxiety). Although cross-paths from resources to anxiety and demands to interest are not outlined by the model, some studies have found such relationships (Schaufeli & Bakker, 2004). Consequently, their potential existence was also explored in the present study. Job-



related resources and demands refer to physical, psychological, social, and organisational aspects of the work environment which have been associated with turnover intentions (Schaufeli & Bakker, 2004; Skaalvik & Skaalvik, 2018) and turnover behaviour (de Lange et al., 2008). In this study, we drew on the themes from apprenticeship literature to explore influential resources and demands which are experienced both *prior* and *during* an apprenticeship.

### ***An informed choice***

There are several resources and demands potentially experienced prior to entering an apprenticeship. Newcomers to any new workplace, including a new trade, reflect on the clarity of their role, which may be informed by realistic job previews (Allen et al., 2010) as they struggle with their level of career choice uncertainty (Ellis et al., 2015; Saks & Gruman, 2018). Inadequate information on apprenticeships (Misko et al., 2007; Snell & Hart, 2008) may reflect difficulty in finding relevant information (Powers, 2015), or accessing inaccurate information regarding the job-related activities (Eccles, 2005). Misinformation may lead to career indecision, although in some sense both these pre-entry factors could be considered as personal resources brought by the apprentices into their apprenticeship. An Australian study involving 1,016 plumbing apprentices revealed those who were initially indecisive about their occupational choice were 37% more likely to consider dropping out (Powers, 2015).

Pre-entry engagement with tradespeople was an important source of information for one-third of entering Australian trade apprentices (NCVER, 2020b). While pre-apprenticeship training has been related to higher completion rates in construction trade apprenticeships, such effects vary across other occupations (Karmel & Oliver, 2011). Notably, plumbing apprentices who had been encouraged to take up the trade by plumbers were 66% less likely to consider dropping out (Powers, 2015). While this may suggest that

prior information concerning the occupation is important, others advise information about the apprentices' employers are more critical for retention (Stalder & Schmid, 2016).

### ***On-the-job learning resources and demands***

On-the-job training provision is often viewed as a key resource and the employer's most important obligation (Smith et al., 2011). Yet, many apprentices cite difficult working conditions (NCVER, 2020b) and poor on-the-job training as key reasons for their planned (Seidel, 2019) and actual dropout (Cully & Curtain, 2001; Snell & Hart, 2008). Alternatively, job security in ongoing and future work prospects has been associated with apprenticeship commitment (Harris & Simons, 2005; NCVER, 2020b). However, the association between job security and apprentices' dropout considerations was found to be tenuous when controlling for career choice anxiety and interest (Powers, 2015). Low training wages are commonly cited as a key reason for apprentice dropouts (Dickie et al., 2011), although this features more strongly in qualitative research. Amount of payment, in and of itself, has been a poor predictor of employee turnover decisions (Allen et al., 2010) prompting different conceptualisations of training wages (e.g., compared to alternative jobs; Karmel & Mlotkowski, 2011). For instance, apprentices who anticipate a larger pay increase upon completion are less likely to drop out (Karmel & Mlotkowski, 2010b). Another conceptualisation which is adopted in the present study is whether apprentices regard training wages as a fair trade for learning on-the-job, which has been noted in qualitative studies (Snell & Hart, 2008).

### **The current study**

The present longitudinal study investigated trajectories of work-related interest and anxiety for 2,387 Australian trade apprentices utilising six timepoints of data from the FLARe Project (Factors Lifting Apprenticeship Retention expectations). A theoretically

integrative approach was employed, anchored in expectancy-value theory (EVT; Eccles-Parsons et al., 1983) for the psychological process, and the job demands-resources model (JD-R; Demerouti et al., 2001) to contextualise key demand and resource factors from apprenticeship research literature. Latent growth modelling (LGM) assessed latent growth trajectories (slopes) and initial levels (intercepts at T1) of interest and anxiety, and tested the influence of demands and resources on between- and within-apprentice differences (Preacher et al., 2008). Specifically, there were three examined questions:

1) How do apprentices' interest and anxiety develop through the apprenticeship? Considering the lack of clear direction in the literature on how apprentices' interest and anxiety develop over the apprenticeship, there was no preconceived hypothesis on growth. Mean composite scores were utilised for all factors to ensure the sample size was appropriate for model complexity<sup>8</sup> (Shi et al., 2018).

2) Is dropout consideration predicted by apprentices' levels of interest and anxiety at the beginning of their training, and their rate of change during their first 2 ½ years? The hypothesis was that higher initial interest and lower interest losses would negatively predict dropout considerations. On the other hand, higher initial anxiety and growth in anxiety were expected to positively predict dropout considerations.

3) How are interest and anxiety trajectories explained by job-related resources and demands? Regarding contextual influences on these motivational processes, the hypothesis for the third research question was that job-related resources would positively predict interest trajectories, whereas job-related demands would positively predict anxiety trajectories in line with the JD-

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<sup>8</sup>  $N \geq p^2$ , where  $p$  represents observed variables.

R model (Bakker & Demerouti, 2017). The potential for direct effects of resources on anxiety and demands on interest was also explored given that some studies have identified such cross-paths (Schaufeli & Bakker, 2004).

Apprentices may differ because they *enter* their apprenticeships with varying levels of resources (experience with a role model, timing of choice) or demands (lack of information and career indecision). Apprentices' experiences may also vary *over time during* their apprenticeship, due to job-related resources (active teaching by employer, job security, fair training wages, occupational expertise) and demands (excessive work).

## **Method**

### ***Participants***

The present longitudinal study included 2,387 apprentices from four trades – carpentry, bricklaying, plumbing and electrical – involving 30 of the 54 public Australian VET providers, with representation from all states and the capital territory. The apprentices were surveyed on four measurement occasions (M1-M4) approximately six months apart, beginning in early 2015. Using an accelerated longitudinal design, apprentices were in four cohorts based on their apprenticeship progress at M1: just beginning (Cohort 1), first year semester 1 (Cohort 2), first year semester 2 (Cohort 3), and second year semester 1 (Cohort 4). Table 1 presents sample size for each cohort along with planned and unplanned missingness. Planned missing was by design, in the form of the cohort-sequential accelerated longitudinal design whereby apprentices at different stages of their training were each surveyed across four measurement occasions within two years, to collectively span six timepoints (T1-T6) from the beginning to the third year of their apprenticeship. Planned missing data are controlled by the investigator and can be regarded as missing completely at random (MCAR) rather than introducing potential bias to the results. This contrasts with

unplanned missing data which refers to surveys that we aimed to collect but were unsuccessful in obtaining participants' responses.

Table 1. Cohort sample size, measurement periods and missingness

	Beginning	1 <sup>st</sup> year		2 <sup>nd</sup> year		3 <sup>rd</sup> year
	T1 <sup>a</sup>	T2	T3	T4	T5	T6
Cohort 1 ( <i>n</i> = 548)	M1	M2	M3	M4		
Cohort 2 ( <i>n</i> = 646)		M1	M2	M3	M4	
Cohort 3 ( <i>n</i> = 731)			M1	M2	M3	M4
Cohort 4 ( <i>n</i> = 462)				M1	M2	M3
Responses	493	771	1,212	1,225	956	576
Unplanned missing	55	423	713	1,162	883	617
Unplanned missing (%)	10%	35%	37%	49%	48%	52%
Planned missing	1,839	1,193	462	0	548	1,194

<sup>a</sup>Apprentices' initial attendance at trade school (less than 1 month).

The mean age of apprentices starting their apprenticeship was 20.4 (*SD* = 5.2) and 22.9 (*SD* = 5.2) in their fifth semester. Participants were predominantly male (99.1%). Almost a quarter (23.5%) entered their apprenticeship with no higher than grade 10 education; 18.7% had attained grade 11, while the remainder (57.8%) had attained grade 12 (the final year of secondary schooling in Australia) or higher (e.g., post-secondary degree) before entering their apprenticeship.

### Measures

Paper surveys were completed by apprentices at trade schools, to assess their workplace interest, anxiety, and perceived resources and demands, every six months. At the initial measurement (M1), apprentices reported additional background variables and pre-entry resources and demands relating to their career preparation (see Appendix A for complete list of items). Questions were assessed on a 7-point Likert-type scale (1 – *Not at all*, to 7 –

*Extremely*) except for background variables and timing of choice, which were categorical.

#### *Motivational values*

*Interest* was measured by 3 items (Watt & Richardson, 2006) adapted to trade apprentices, e.g., “My current job experience is something I like.” The internal reliability (Cronbach  $\alpha$ ) ranged from .87 to .91 across the 6 timepoints. *Anxiety* was assessed with 3 items (Gaspard, Dicke, Flunger, Schreier, et al., 2015) adapted to gauge apprentices’ perception of their workplace experience as worrisome or annoying, e.g., “My current job experience is something I’d rather not do, because it only worries me” ( $\alpha$  range: .89 to .90).

#### *Background variables*

*Prior education* was reported by apprentices from one of 7 levels which measured their highest prior level of education attained: less than grade 10, grade 10, grade 11, grade 12, certificate (post-secondary), diploma (post-secondary), or university degree. *Socioeconomic status* (SES) was operationalised as the mean of two items: (a) the highest parent education level, and (b) highest parent occupational status score (i.e., AUSEI06 score, McMillan et al., 2009) derived from parents’ occupations as reported by apprentices. Parents’ education level used the same 7 levels as for apprentices, and AUSEI06 which assigns occupations a score ranging from 0 to 100, was rescaled from 1 to 7 for equal weighting.

#### *Pre-entry resources and demands*

The following pre-entry predictors were collected at the first measurement occasion to explain between-apprentice variations in interest and anxiety trajectories.

*Lack of information* was measured by 3 items tapping apprentices’ pre-entry perception of their need for career information related to the trade, e.g., “I wish I had more information on where a career in this trade might take me in the future.” ( $\alpha = .86$ ). Items were purpose-developed for the FLARe Project based on prior findings that career information

associates with intentions to persist in apprenticeships (Powers, 2015).

Experience with *role models* measured apprentices' prior-to-entry experience with individuals currently working in the occupation. Two items (Watt & Richardson, 2007) were adapted to apprenticeships, e.g., "Before entering my apprenticeship, I've experienced good role-models in the trade." A third new item was added to reflect individuals who actively communicated with tradespeople. This item was, "Before entering my apprenticeship, I talked with people in the trade" ( $\alpha = .68$ ).

*Timing of choice* was a single item gauging how long individuals had contemplated their apprenticeship before entering. The question (adapted from Watt & Richardson, 2007), "When did you decide that you wanted to go into this trade?" provided 6 choices: *right before you were hired, a few weeks before, a few months before, a year, greater than 1 year but less than 5 years, 5 or more years*.

*Career indecision* was assessed by adapting 3 items from a generalised scale on personal indecisiveness (Gati et al., 1996) to the domain of apprenticeships. An example item is, "I could have used some support or confirmation that this apprenticeship was a good choice for me." The reliability was lower ( $\alpha = .56$ ) than in Gati and colleagues' study ( $\alpha = .69$ ).

#### *Workplace resources and demands (time-varying predictors)*

Time-varying predictors were measured at each timepoint (T1-T6) to capture experiences on-the-job during the apprenticeship to explain within-person variations in value trajectories over time.

*Employer active training* assessed apprentices' perception that their employer took an active and thoughtful role in workplace training versus a passive role. This construct was measured with 3 purpose-developed items for the FLARe project, e.g., "I can tell my boss has

put careful thought into my training” ( $\alpha$  ranged from .82 to .85), based on past findings that employers who were actively involved in teaching improved plumbing apprentices’ planned persistence (Powers, 2015).

*Expert career* included 3 items to assess apprentices’ level of perceived expertise and technical knowledge required for the trade. Two were existing items (Watt & Richardson, 2007), plus an additional purpose-developed item – “This trade involves highly specialised knowledge” ( $\alpha$  ranged from .82 to .86).

*Job security* gauged expectations of steady work within the occupation using 3 items (from Watt & Richardson, 2007) adapted to reflect the subcontracting nature of trade work. An example item is, “This trade always has lots of work available” ( $\alpha$  ranged from .83 to .88).

*Fair training wage* items were developed for this study (3 items), e.g., “The apprentice wage is a reasonable trade-off to learn the trade”, to assess apprentices’ perception of lower apprenticeship pay as a fair exchange for workplace learning ( $\alpha$  ranged from .77 to .82).

*Excessive work demands* experienced on-the-job were assessed by 3 items tapping workplace pressure and work overload (Hart et al., 2000), e.g., “There is constant pressure for workers to keep working” ( $\alpha$  ranged from .69 to .75).

#### *Outcome variable: Dropout consideration*

At each measurement occasion beyond the first completed survey (i.e., M2 to M4), apprentices were asked to answer whether “I have seriously considered dropping out of my apprenticeship within the last 6 months”. The response options were *Yes* or *No*. When responses were reviewed in accelerated longitudinal design, (T2 to T6), dropout considerations increased from 11% at T2 to 16% at T6. These answers were summarised to a



single dichotomous outcome variable reflecting apprentices who answered “Yes” at any occasion.

### ***Analytic plan***

First, all repeated latent constructs were tested for measurement invariance (see Appendix B) to ensure similar meaning over time for apprentices involved in this study. Second, two models tested various polynomial forms (i.e., linear, quadratic, cubic and piecewise linear) with LGM for each of interest and anxiety trajectories to establish shapes of change. Third, a combined parallel LGM was fitted which related trajectories for both interest and anxiety to the dependant variable of dropout considerations. A final fourth model then predicted trajectories of both interest and anxiety from a range of resources and demands to predict between- and within-apprentice variations in trajectories. All analyses were undertaken using Mplus version 8.4 (Muthen & Muthen, 2017).

## **Results**

### ***Missing data analysis***

Of the 2,387 apprentices involved across the four measurement occasions, almost two-thirds (63%) completed at least three of the four surveys. The response rate across measurement occasions was M1 = 84%, M2 = 51%, M3 = 57%, and M4 = 48%. For the accelerated timepoints, the unplanned missing rate of participants ranged from 10% at T1 to 52% at T6 (see Table 1). Of those who started a survey, the average item missingness ranged from 4% to 6% across all timepoints. Mean differences were explored for interest and anxiety between apprentices who completed all surveys and those who were missing at least one, within each cohort using *t*-tests. Only the fourth cohort at the first survey timepoint indicated a significant difference on anxiety ( $t = 2.404$ ,  $df = 311$ ,  $p = .02$ ), with a higher mean for those who had missing surveys ( $M = 2.68$  vs. 2.14 on the 1-7 scales). Little’s MCAR test revealed

the data were not missing completely at random ( $\chi^2 = 187.78$ ,  $df = 105$ ,  $p < .001$ ). As such, two auxiliary variables were included to improve full information maximum likelihood (FIML) estimation<sup>9</sup>; missingness was related to career choice satisfaction (highest  $r = -.12$ ,  $p < .001$  across timepoints) and occupational identity conflict (highest  $r = -.17$ ,  $p < .001$ ).

### ***Descriptive results***

Table 2 presents Pearson correlations for interest and anxiety across the six timepoints, time-invariant predictors, and apprentices who “considered dropping out.” Due to the high number of time-varying predictors measured over 6 timepoints (5 constructs x 6 timepoints = 30 variables), Table 3 presents correlations between time-varying predictors at T4 only, with all other variables. Correlations were indicative of relatively stable relationships with the time-varying predictors. As expected, interest and anxiety were negatively correlated at all timepoints. Predictors correlated with interest, anxiety, and dropout consideration in the directions anticipated: resources correlated positively with interest, and negatively with anxiety and dropout considerations; demands were related in the opposite direction. Of note, 33% of all participants had “seriously considered dropping out” at some time during their apprenticeship.

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<sup>9</sup> Auxiliary variables are used as missing data correlates and are external to the substantive model, whose meaning and relationship to other measures are inconsequential.

Table 2. Estimated Pearson correlations and descriptive statistics for motivation variables used in LGM and time-invariant predictors

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1 Anxiety - T1																			
2 Anxiety - T2	.37**																		
3 Anxiety - T3	.32**	.35**																	
4 Anxiety - T4	.30**	.33**	.33**																
5 Anxiety - T5	.25**	.31**	.30**	.33**															
6 Anxiety - T6	.25**	.26**	.30**	.33**	.35**														
7 Interest - T1	-.35**	-.19**	-.15**	-.15**	-.09**	-.10**													
8 Interest - T2	-.19**	-.40**	-.18**	-.16**	-.14**	-.10**	.52**												
9 Interest - T3	-.16**	-.19**	-.38**	-.16**	-.13**	-.10**	.46**	.51**											
10 Interest - T4	-.15**	-.16**	-.15**	-.38**	-.13**	-.12**	.45**	.47**	.48**										
11 Interest - T5	-.10**	-.16**	-.14**	-.14**	-.33**	-.12**	.35**	.44**	.45**	.46**									
12 Interest - T6	-.09**	-.10**	-.13**	-.13**	-.13**	-.14**	.34**	.38**	.44**	.47**	.50**								
13 Prior Education	-.02	-.03	-.03	-.03	-.03	-.38	-.09**	-.03	-.02	-.03	-.01	.02							
14 SES	-.08	-.05	-.03	-.05*	.01	.03	.03	.02	.02	.04	.01	-.01	.22**						
15 Lack of info	.23**	.24**	.20**	.16**	.15**	.12**	-.09**	-.12**	-.10**	-.10**	-.12**	-.10*	.02	-.02					
16 Timing of choice	-.11**	-.09**	-.09**	-.12**	-.10**	-.09**	.21**	.21**	.21**	.22**	.21**	.21**	-.01	.04	-.10**				
17 Role model	-.18**	-.17**	-.16**	-.12**	-.15**	-.16**	.43**	.42**	.36**	.32**	.28**	.28**	.01	.09**	-.03	.16**			
18 Indecision	.32**	.34**	.25**	.22**	.15**	.15**	-.29**	-.31**	-.24**	-.24**	-.20**	-.19**	.09**	.00	.28**	-.17**	-.12**		
19 Considered dropping out	.16**	.17**	.16**	.16**	.15**	.15**	-.24**	-.26**	-.24**	-.25**	-.25**	-.26**	-.01	-.01	.10**	-.14**	-.16**	.19**	
Mean	2.45	2.30	2.51	2.58	2.72	2.72	5.80	5.68	5.55	5.43	5.30	5.22	3.47	4.10	3.83	3.33	4.85	2.79	.33
SD	1.50	1.39	1.49	1.45	1.46	1.46	1.06	1.08	1.14	1.15	1.16	1.21	1.13	1.51	1.57	1.46	1.23	1.69	.47

*Note.* FIML accommodated all available cases of mean composite constructs and observed variables.

\*\*  $p < .01$ , \*  $p < .05$

Table 3. Estimated Pearson correlations, means, and *SD* for time-varying predictors (at T4)

Variables	Predictors of within-apprentice (T4)				
	Employer training	Job security	Fair wages	Expert career	Excessive work
Anxiety - T1	-.12**	-.08**	-.08**	-.07**	.14**
Anxiety - T2	-.14**	-.08**	-.09**	-.07**	.17**
Anxiety - T3	-.15**	-.10**	-.10**	-.07**	.19**
Anxiety - T4	-.22**	-.16**	-.09**	-.10**	.30**
Anxiety - T5	-.14**	-.09**	-.06**	-.06**	.15**
Anxiety - T6	-.13**	-.08**	-.06**	-.04*	.14**
Interest - T1	.23**	.15**	.14**	.17**	-.10**
Interest - T2	.24**	.16**	.14**	.19**	-.11**
Interest - T3	.28**	.22**	.13**	.18**	-.12**
Interest - T4	.41**	.34**	.15**	.25**	-.14**
Interest - T5	.25**	.19**	.09**	.15**	-.10**
Interest - T6	.23**	.21**	.10**	.16**	-.08**
Prior Education	-.09**	-.09**	-.01	.13**	-.03
SES	.05	.02	.01	.10**	-.11**
Lack of info	-.10**	-.02	-.08*	.03	.13**
Timing of choice	.13**	.02	.05	.05	-.11**
Role models	.27**	.18**	.11**	.18**	-.02
Career indecision	-.11**	-.10**	-.09**	-.02	.16**
Considered dropping out	-.06**	-.04**	-.04**	-.03**	.04**
Mean	4.73	4.90	3.59	5.23	4.26
<i>SD</i>	1.29	1.06	1.34	1.07	1.17

\*\*  $p < .01$ , \*  $p < .05$

### *Shape of latent growth*

The optimal growth shape that characterised within-individual change over time was explored through LGM for each of interest and anxiety. An intercept model was used as the baseline of comparison representing the simplest mean structure (i.e., no slope). Subsequent models added functions of slope (e.g., linear, quadratic, cubic, linear piecewise) in order to inspect model fit. When comparing models, improved fit was indicated by a significant chi-square difference test ( $\Delta\chi^2$ ) and changes in CFI of 0.01 or greater (Chen, 2007) for nested

models. For non-nested models, such as piecewise, where growth may change at certain timepoints, reduction in AIC values were relied upon (Brown, 2015).

Upon inspection of raw means, *interest* appeared relatively linear (negatively) and was supported by relative improvement to the baseline model in fit when a linear slope was added (see Table 4). The quadratic and cubic models were also compared but did not significantly improve fit (i.e.,  $p > .05$  and  $\Delta\text{CFI} < .01$ ), supporting a linear decline as well-suited to describe apprentices' change in interest through their apprenticeship.

Table 4. Comparing shape of slope for interest and anxiety

LGM model tested	$\chi^2$	df	$\Delta\chi^2$		CFI	$\Delta$ CFI	AIC
			p-value				
<i>Interest</i>							
Intercept only	188.428**	16			0.749		22230
Linear (vs Intercept)	29.092**	13	<b>0.000</b>		0.977	<b>0.228</b>	22027
Quad (vs Linear)	29.330**	12	0.626		0.975	0.002	22029
Cubic (vs Linear)	31.878**	11	0.248		0.970	0.007	22035
<i>Anxiety</i>							
Intercept only	98.381**	16			0.784		25011
Linear (vs Intercept)	35.275**	13	<b>0.000</b>		0.942	<b>0.158</b>	24931
Quad (vs Linear)	37.383**	12	0.147		0.933	0.009	24937
Cubic (vs Linear)	35.520**	11	0.885		0.936	0.003	24938
Piecewise 1 (vs Linear) <sup>a</sup>	28.045**	13	--		0.961	--	<b>24921</b>
Piecewise 2 (vs Piecewise 1) <sup>b</sup>	23.618*	13	--		0.972	--	<b>24915</b>

*Note.* Both quadratic models did not converge due to negative variance on linear slope, resolved by fixing the variance to zero. Both cubic models did not converge, resolved by holding the linear and quadratic variances to zero.

<sup>a</sup> Piecewise model with linear slope1 at T1-T5 and slope2 at T6 = 0.

<sup>b</sup> Piecewise model with slope1 at T1 and T2=0; linear slope2 at T3-T5 and slope 3 at T6 = 0.

\*\*  $p < .01$ , \*  $p < .05$

The shape of anxiety was more complex. *Anxiety* appeared to decrease in the first six months and then increase until the end of second year (T5), when it plateaued. A linear growth pattern showed significant improvement over the baseline intercept model, but the addition of quadratic and cubic terms did not demonstrate improved fit (see Table 4). Given the equal raw means at T5 and T6, a piecewise model holding the growth to be zero between those time periods revealed improved AIC fit. A model with negative linear growth between T1 and T2 was attempted but did not converge. Given overlapping 95% confidence intervals for means at T1 and T2, a further adapted piecewise model specified zero growth between T1 and T2. The reduction in AIC suggested this model fitted better. The final shape of anxiety supported linear growth only between T2 and T5 (see Figure 1), with plateau effects (i.e., zero growth) at both the beginning (between T1 and T2) and the end of apprentices' studies (between T5 and T6). That is, only one latent slope parameter was supported for anxiety, representing growth from the first (T2) to fourth semesters (T5).

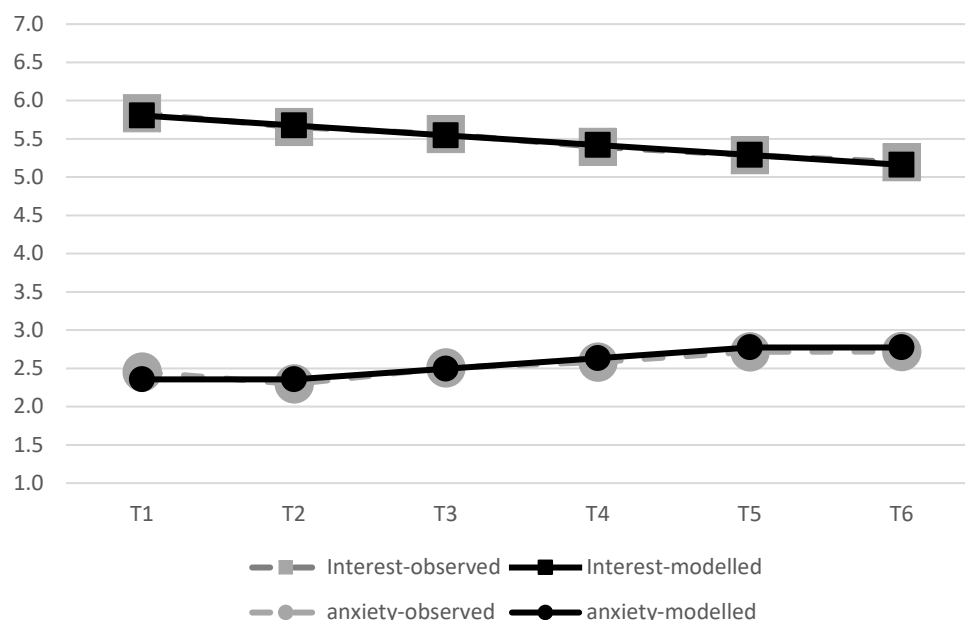


Figure 1. Latent growth models and observed means for interest and anxiety.

***Unconditional parallel process LGM***

A parallel LGM of interest and anxiety as presented in Figure 2 demonstrated good fit ( $\chi^2 = 73.34$ ,  $df = 46$ , CFI = .98, TLI = .98, RMSEA = .02). The intercept and slope correlated negatively within each construct (see Table 5). This was due to individuals who held higher levels of interest at the beginning of their apprenticeship, tending to experience steeper declines in interest over time ( $r = -.41$ ); whereas individuals who initially held higher levels of anxiety showed smaller increases in anxiety between T2 to T5 ( $r = -.47$ ). There were also inter-construct relationships. Higher initial levels of interest were associated with lower levels of initial anxiety ( $r = -.51$ ). The interest and anxiety slopes were similarly related ( $r = -.54$ ). There was no detectable relationship between the cross-construct slope and initial level of either interest or anxiety.

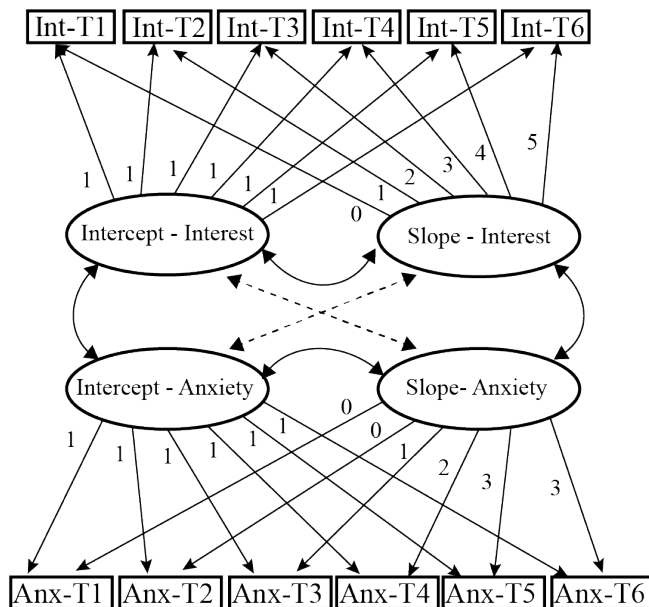


Figure 2. Unconditional parallel latent growth model.

*Note.* Int = Interest, Anx = Anxiety. Covariance between observed variables at same timepoints are not drawn for simplification. Dotted lines =  $p > .05$ . Solid lines all significant.

Table 5. Estimated correlations for unconditional latent growth curve model

	Interest		Anxiety	
	Intercept	Slope	Intercept	Slope <sup>a</sup>
Interest intercept	--			
Interest slope	-0.41**	--		
Anxiety intercept	-0.51**	0.17	--	
Anxiety slope <sup>a</sup>	0.17	-0.54**	-0.47**	--

<sup>a</sup> Slope for T2 to T5.

\*\*  $p < .01$

The intercept and slope means for interest and anxiety were significant, as was the variance for each parameter (see Table 6), indicating that explanatory variables could be usefully added to the model.

Table 6. Parameter estimates for unconditional parallel latent growth curve model in interest and anxiety

Parameter	<i>M</i>	<i>SE</i>	Variance	<i>SE</i>
Interest intercept	5.81**	0.03	0.80**	0.09
Interest slope	-0.13**	0.01	0.04**	0.01
Anxiety intercept	2.35**	0.04	1.09**	0.12
Anxiety slope	0.14**	0.02	0.10**	0.03

\*\*  $p < .01$

### *Predicting dropout considerations*

The latent trajectories for interest and anxiety were used to predict apprentices' serious consideration of dropping out. The data fitted the model well ( $\chi^2 = 81.04$ ,  $df = 54$ , CFI = .99, TLI = .99, RMSEA = .02) and explained 23% of the variability ( $R^2$ ) in dropout consideration. Each of the intercept and slope for interest significantly predicted lower dropout consideration (see Table 7). The anxiety intercept predicted higher dropout consideration, but its slope did not.



Table 7. Prediction parameters of dropout consideration

Parameter	Est. <sup>a</sup>	SE	Std. <sup>b</sup>	SE
Interest intercept	-0.20**	0.02	-0.39**	0.05
Interest slope	-0.71**	0.19	-0.30**	0.08
Anxiety intercept	0.08**	0.02	0.18**	0.05
Anxiety slope	0.11	0.13	0.07	0.09

<sup>a</sup> unstandardized estimates, <sup>b</sup> standardised estimates.

\*\*  $p < .01$

### Conditional model

The single overarching conditional LGM model as presented in Figure 3, introduced pre-entry (predictors which explain variations between apprentices) and concurrent (predictors which explain within-person variation over time) resources and demands to ascertain significant predictors of interest and anxiety trajectories. The model showed good

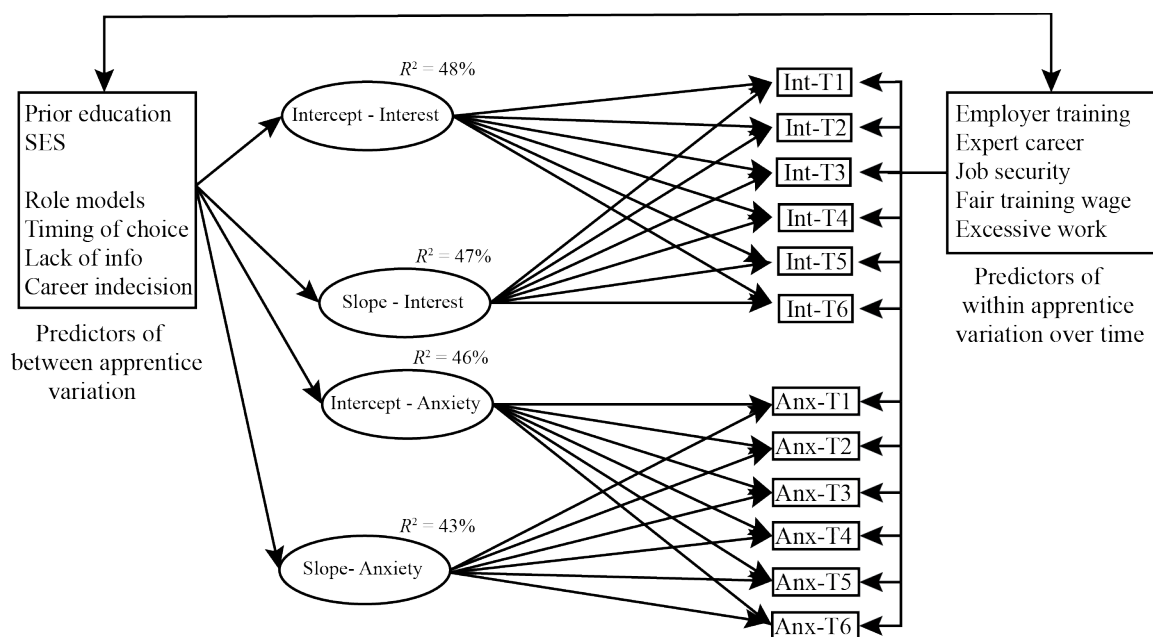


Figure 3. Conditional LGM with time-varying and time-invariant predictors.

*Note.* Int = Interest, Anx = Anxiety. Covariances across latent variables, and observed variables at same timepoint excluded for simplicity in presentation.

fit ( $\chi^2 = 612.51$ ,  $df = 385$ , CFI = .98, TLI = .95, RMSEA = .02). All predictors were grand-mean centred, such that the results refer to mean levels for all apprentices in the sample. The regression parameters were held equal across time for each time-varying predictor, as releasing that constraint did not demonstrate significant improvement in model fit ( $\Delta\chi^2 = 59.78$ ,  $\Delta df = 50$ ,  $p = .16$ ;  $\Delta CFI = .001$ ). Taken together, the time-varying and pre-entry predictors explained almost half of the variance for interest and anxiety trajectories ( $R^2$  ranged from 43% to 48%).

*Between-apprentice resources and demands (prior to entry)*

The conditional model (Figure 3) revealed ‘prior to entry’ resources (role models, timing of choice) were significant positive predictors of between-apprentice differences in initial level of interest but had no effect on interest growth (see Table 8). Role models were more important than timing of choice ( $\beta = .26$  versus  $\beta = .13$  respectively) in predicting initial levels of interest. Regarding job-demand characteristics, lack of information did not predict individual differences in interest trajectories. Apprentices with higher levels of career indecision predicted lower interest intercepts but less steep declines (slope).

Differences between apprentices’ level of anxiety were unrelated to both examined pre-entry resources (i.e., role models and timing of choice). For demands, lack of information ( $\beta = .14$ ) and career indecision ( $\beta = .37$ ) were related to higher initial anxiety (i.e., intercept). Higher career indecision associated with less growth in anxiety ( $\beta = -.30$ ) whereas, lack of information had no impact on growth (i.e., slope).

*Time-varying resources and demands*

The same conditional model (Figure 3) also revealed within-apprentice experiences over time shaped the trajectories of their motivations. Resources measured over time (employer active training, job security, fair training wages, expertise career) had a stronger

positive effect on within-apprentice differences in interest, compared with anxiety (see Table 9). The standardised prediction coefficients for interest ranged from a high of 0.24 for employer active teaching, to 0.04 for fair training wage. Fair training wage was not significantly related to anxiety, whereas the other three resources demonstrated small prediction effects ( $\beta$  ranged from -.06 to -.09). Excessive work significantly and positively predicted anxiety ( $\beta = .25$ ), and negatively predicted interest ( $\beta = -.05$ ).

Table 8. Predictors of between-apprentice variation for latent trajectories (standardised)

Between-apprentice predictors	Interest		Anxiety	
	Intercept	Slope	Intercept	Slope
<i>Background</i>				
Prior education	<b>-0.09*</b>	<b>0.14*</b>	-0.03	-0.06
SES	0.01	-0.04	-0.06	0.13
<i>Resources</i>				
Role models	<b>0.26**</b>	-0.04	-0.04	-0.13
Timing of choice	<b>0.13**</b>	0.10	-0.03	-0.04
<i>Demands</i>				
Lack of information	0.01	-0.03	<b>0.14**</b>	-0.03
Career indecision	<b>-0.30**</b>	<b>0.15*</b>	<b>0.37**</b>	<b>-0.30**</b>

\*\*  $p < .01$ , \*  $p < .05$

Table 9. Predictors of within-apprentice variation (standardised)

Within-apprentice predictors	Interest	Anxiety
<i>Resources</i>		
Employer active training	<b>.24**</b>	<b>-.09**</b>
Expert career	<b>.15**</b>	<b>-.06**</b>
Job security	<b>.16**</b>	<b>-.08**</b>
Fair training wage	<b>.04**</b>	.00
<i>Demand</i>		
Excessive work	<b>-.05**</b>	<b>.25**</b>

\*\*  $p < .01$ , \*  $p < .05$

## Discussion

The present study examined the growth trajectories of apprentices' interest and anxiety during their first 2 ½ years, how these predicted dropout considerations, and how perceived work-related resources and demands explained differences in interest and anxiety trajectories across apprentices and over time. This study focused on dropout considerations rather than actual dropout, because even though the two have been established to be importantly linked (Allen et al., 2010), it is not desirable for apprentices to be feeling this way through their apprenticeship. The first research question concerning motivational trajectories demonstrated that, on average, apprentices commenced with high interest that declined over time, and low anxiety which increased. Interestingly, the trajectory for anxiety showed this increase began in the latter half of apprentices' first year until the end of their second year. For the second research question, results supported the hypothesis that 'seriously considering dropping out' was predicted by lower initial levels and declines in interest. However for anxiety, higher initial levels but not growth in anxiety predicted dropout considerations. Not all apprentices reported same levels of initial interest and anxiety, nor the same growth – as hypothesised, their differentially experienced resources and demands prior to, and during their apprenticeship, predicted motivational trajectories. In answer to the third research question, resources had a greater effect on buffering interest declines than on reducing anxiety; demands were more important in elevating anxiety, suggesting a dual process that aligns to that outlined by JD-R research (Bakker & Demerouti, 2017).

### *Evolving values during the apprenticeship*

Trade apprentices' trajectories of interest and anxiety painted a picture of a positive start that deteriorated over time. It is quite likely that the transition from high-school to VET studies prompts positive initial motivations due to an increase in person-environment fit

(Eccles & Midgley, 1989) with regard to instruction and task structure, which have been previously associated with apprenticeship retention (Powers, 2015). Starting an apprenticeship may represent a welcome reprieve from the academic focus of high school, reducing anxiety (Symonds et al., 2016), since Australian apprentices tend to have a poor self-perception of their high school academic ability (Gore et al., 2017).

Both declines in interest and growth in anxiety suggest that initial levels are tempered over time with the reality of experience, as suggested in other tertiary studies (Jones et al., 2010). The lack of growth in anxiety between starting an apprenticeship and the end of the first semester may suggest that employers view the first few months as a transitional period to acclimatise apprentices to the working environment. This aligns with findings sourced from bricklaying employers ( $N = 453$ ) who described their biggest challenges in the first few weeks of taking on an apprentice involved keeping them “keen” and having patience to explain things (Powers, 2013).

### ***Why consider dropping out?***

Initial levels of interest and anxiety for commencing apprentices were important predictors of their future dropout considerations, as were their declines in interest. Notably, the rate of change for anxiety did not significantly predict dropout considerations, when controlling for interest trajectories. Despite reported anxiety-provoking behaviours by employers and their association with attrition (Cully & Curtain, 2001; Harris & Simons, 2005; Snell & Hart, 2008), it appears that losses in interest are the more critical motivational drivers of dropout consideration *during* the apprenticeship.

### ***Starting with higher motivation***

Prior to entry, apprentices who experienced good role models and had decided on their occupation earlier than others, started their apprenticeship with higher levels of interest.

Since these resources did not significantly predict differences in the slope, this initial boost had a lasting benefit, compared to apprentices who did not experience good role models or who had decided on their occupation later.

Apprentices who were indecisive about their career choice entered with reduced interest and higher levels of anxiety. However, these detrimental effects were muted by higher growth in interest and a greater reduction in anxiety over time, when compared to apprentices who had been more decisive. Given the negative motivational impact earlier in the apprenticeship, career indecisiveness may partially explain higher levels of dropouts reported in the first year of apprenticeships (Bednarz, 2014).

### ***Information that supports new apprentices' motivation***

While apprentices' attrition has been linked to various sources of information such as career advisors, training institutes, and supply companies (Powers, 2015), the current study indicated which information content may be most important to dropout considerations. Surprisingly, a lack of information on where a career in the trade might take a person in the future did not predict trajectories of interest, net of other predictors. Notably, experience with a role model and career indecision were the most important predictors of interest at the beginning of an apprenticeship. One might assume that prior experience with a role model should be informative and diminish career indecisiveness, but these two aspects were largely unrelated. This may suggest experience with role models may inform apprentices on trade-related work expectations (Taylor et al., 2014) but still leave them indecisive on their career choice because they had not considered alternative occupations (Eccles, 2005).

Anxiety at the beginning of an apprenticeship was heightened by career indecision and, to a lesser degree, lack of information about the career path. Neither experience with a role model or extended time considering their choice reduced anxiety, suggesting a better

understanding of the workplace was unrelated to anxiety. It appeared that anxiety was more affected by long-term occupational concerns – is this the right career for me and where will it take me in the future?

### ***Motivating apprentices at the workplace***

Throughout the apprenticeship, workplace resources were generally stronger predictors of interest trajectories, compared with demands. The crucial role of on-the-job training (Smith et al., 2011) was supported by the findings in this study. Apprentices who perceived their employer to be active and thoughtful in their provision of workplace training, showed greater growth in interest. Positive influences on growth in interest also included apprentices' perception of occupational expertise, and job security. Taken together, this implies a transactional relationship between apprentices and employers, where apprentices' expectations of the employer relate to their training of technical skills. This supports the proximal importance of employer training skills over social support suggested by prior research (Powers, 2015). However, further longitudinal studies are needed to test this conjecture directly.

Apprentices who viewed their low training wages as a fair exchange for training had a more positive interest trajectory, which consequently predicted lower levels of dropout considerations. This contrasts with findings from prior studies where actual wages (not measured in this study) had a negative impact on dropout intentions (Allen et al., 2010), or no impact on dropout intentions (Gow, Hinschen, et al., 2008; Powers, 2015). The individual appraisal of training wages has motivational consequences. Concordant with studies that found attrition was associated with apprentices feeling exploited when the level of pay was not viewed as commensurate with the value of work (Cully & Curtain, 2001; Harris & Simons, 2005), this study demonstrated positive effects when training wages were framed as

fair exchange for workplace training. This finding supports the commonly espoused benefits of “earning while learning” for apprentices.

### **Practical implications**

Although the literature indicates dropouts occur early within the apprenticeship (Bednarz, 2014) interestingly in this study, dropout consideration increased over time. While it is not desirable for apprentices to be feeling this way, this apparent paradox could be explained by dropout considerations being less likely to translate to actual dropout the further apprentices are through their training, likely due to the effort and level of investment they have already expended. This study sought to better understand why one-third of apprentices considered dropping out and how their motivations to do so might be explained. Here, we emphasise identified key resources and demands which are amenable to change, affording opportunities to intervene where individuals demonstrate low interest or heightened anxiety. Those contemplating a trade apprenticeship are urged to take time to consider their choice, talk to someone working in the trade, and compare their choice with other career pathways to affirm their career decisiveness. Such active measures supported higher levels of workplace interest through the apprenticeship; noting that work-related interest has been linked to vocational aspirations (Gore et al., 2017), occupational choice (Holland, 1997; Lent et al., 1994) and positive employment outcomes (Nye et al., 2017). Anxious apprentices would benefit from more information on where their chosen trade career can lead in the future, as well as comparisons with other occupations, to counter their occupational indecision. Such targeted interventions grounded in the longitudinal empirical findings of this study offer promise to improve apprenticeship retention.

Active and thoughtful training by the employer had the largest effect in raising apprentices’ interest growth, which in turn, reduced their likelihood of dropout



considerations. Given the lack of oversight on provision of workplace training in Australia (Smith & Kemmis, 2013), there is a strong argument to be made for regulation in this area, which also has support from employers (Powers, 2013). The employers' critical role in motivating dropout considerations suggests not all employers should be encouraged to train apprentices. Funding employers with a record of high apprentice dropouts appears financially wasteful and unfair to apprentices placed in their charge. Employer funding may increase the quality of apprenticeship workplace training by targeting employers who actively train, thus motivating apprentices to remain interested in their apprenticeship. An employer who thoughtfully plans training can help apprentices more successfully navigate their apprenticeship experience, regardless of their actual dropping out, since there are good reasons for apprentices to drop out; employers who manages an exit strategy appropriately are equally valuable (Stalder & Schmid, 2016). Redirecting funds into training for employers who are committed to providing quality workplace training for apprentices would likely have beneficial impacts. Given the differentiated nature of the trades (Powers, 2015), such training is best delivered by industry groups and/or trade schools with intimate knowledge of the occupation-specific worksite context.

The findings include important policy implications regarding the quality of apprentices' training experience provided both for workplace training and trade school. First, in terms of workplace training this study suggests that structured and planned training is important in both its delivery and communication to the apprentice. Employers who cater and adjust their training to individual needs and tailor the pace of work substantially reduce dropout considerations, especially at the beginning of the apprenticeship when dropouts are most likely to occur. Apprentices' awareness of employers' structured training provides value that seems to frame low apprenticeship wages as a fair exchange for trade learning. Second,

findings indicate trade schools need to consider a wider scope beyond the individual apprentice to include the employers' capacity to train onsite. Given the importance of workplace motivations (Powers, 2020) in predicting apprentices who seriously consider dropping out, it would be negligent for trade schools to ignore apprentices' workplace training situations. Apprentices may be doomed to a very negative experience when hired by an employer poorly skilled for workplace training. The policy that requires trades schools to accept an apprentice hired by any qualified employer may require modification. Trade schools may require added scope for entry that considers whether apprentices' employers are adequately suited for training.

### **Limitations**

This study is not without limitations. On the one hand, a strength of the study is that four trade occupations were included (bricklaying, carpentry, plumbing, and electrical). On the other hand, there are noticeable differences across these four trades, such as plumbing and electrical being licensed trades that require apprentices to obtain a trade qualification before they can practice, while unlicensed trades are less competitive to enter and often attract lower wages upon completion. It was not possible to examine interactions between the tested effects and the type of trades within our study in view of the sample size. While this is a limitation, very large samples of each trade would be required in order to model these processes and examine their interactions across particular trades. Further, not all values contained in EVT were included in the models. Adding other kinds of values (i.e., utility value and other costs) or expectancies, may provide a richer understanding of apprentices' developing motivations. However, workplace interest and anxiety have demonstrated stronger associations with apprentices' intentions to leave their training, beyond other values, in other research (Powers, 2020). It is acknowledged that the focus of this study was on dropout considerations rather

than actual dropouts. Future research may be informed by exploring reasons why considerations lead to different outcomes. Finally, it is acknowledged that data were self-reported which may lead to bias. Although, self-reports were used to capture individuals' subjective values and experience, employer reports would have strengthened the methodology.

## **Conclusion**

The present study was designed to investigate how and why apprentices' motivations develop and consequences for dropout considerations. Using large-scale longitudinal Australian data and latent growth modelling, this study has demonstrated that, in line with expectancy-value theory, (EVT; Eccles-Parsons et al., 1983), workplace interest and anxiety trajectories predicted apprentices' dropout considerations. How interest and anxiety differed across individuals and over time was examined through the lens of the job demands-resources model (Demerouti et al., 2001). The findings supported a dual engagement-stress process where higher resources promoted initial interest and buffered against interest losses, and lower demands reduced the development of anxiety.

Even at the beginning of the apprenticeship, initial levels of interest and anxiety were important indicators of dropout considerations, suggesting early detection and warning is possible. During the apprenticeship, workplace interest decreased whereas anxiety started to increase after the first six months. While workplace-related reasons are those most commonly cited for not completing an apprenticeship in Australia (Bednarz, 2014; Cully & Curtain, 2001), this study found resources such as employer training, job security and perceptions of occupational expertise could enhance workplace interest through the apprenticeship. This suggests that much can be done to support the quality of apprentices' training experience and risk of dropping out. In comparison to other studies which found low training wages to have

deleterious effects (Cully & Curtain, 2001), or no effects (Gow, Hinschen, et al., 2008; Powers, 2015), results of this study demonstrated a small positive effect when wages were perceived as a fair exchange to learn the trade.

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**Appendix A – Measurement items**

Table A1. Multi-item latent construct items

Construct	No. of items	Items
Interest <sup>a</sup>	3	<i>My job experience ...</i> ...is something I like ... matches my interest ... is something I enjoy the more I do
Emotional cost <sup>b</sup> (Anxiety)	3	<i>My job experience ...</i> ... is something I'd rather not do, because it only worries me ... when I have to deal with this, I get annoyed ... is a real burden to me
Lack of information	3	<i>I wish I had more information on ...</i> ... where a career in this trade might take me in the future <sup>c</sup> ... the variety of career choices in this trade <sup>c</sup> ... what other people in the trade find interesting about this work <sup>c</sup>
Experience with role model	3	<i>Before entering my apprenticeship ...</i> ... I've encountered inspirational individuals in the trade <sup>d</sup> ... I've experienced good role-models in the trade <sup>d</sup> ... I talked with people in the trade <sup>e</sup>
Indecision <sup>f</sup>	3	<i>Before entering my apprenticeship ...</i> I found it difficult to make the decision I could have used some support or confirmation that this apprenticeship was a good choice for me I was happy to make the long term commitment (R)
Employer active training <sup>e</sup>	3	My boss takes time to show me new skills My boss has given me specific tasks to help me learn new things I can tell my boss has put careful thought into my training
Expert career <sup>d</sup>	3	<i>This trade ...</i> ... involves highly specialised knowledge ... involves high levels of expert knowledge ... involves high levels of technical knowledge
Job security	3	<i>This trade ...</i> ... provides job security <sup>d</sup> ... offers steady work <sup>e</sup> ... always has lots of work available <sup>e</sup>
Fair training wage <sup>e</sup>	3	<i>Thinking about your pay as an apprentice:</i> The apprenticeship pay is a fair deal The apprenticeship wage is a reasonable trade-off to learn the trade The pay is far too little while you are an apprentice (R)
Excessive work demands <sup>g</sup>	3	<i>Sample item</i> There is constant pressure for workers to keep working

Note. All anchors ranged from 1-*Not at all* to 7-*Extremely*.

a (Watt & Richardson, 2006)

b (Gaspard et al., 2015)

c Modified from general "Lack of information about occupations" (Gati et al., 1996) to apprenticeship-specific lack of information

d (Watt & Richardson, 2007)

e FLARe Project

f Modified from general indecisiveness (Gati et al., 1996) to apprenticeship career choice indecision  
g (Hart et al., 2000)

## Appendix B – Measurement invariance test

Longitudinal measurement invariance was inspected for all time varying-measures.

Establishing measurement invariance permits the inference of true change over time rather than changed meaning of the variable. Measurement invariance was determined across the 6 timepoints using the common stepwise procedure (Van De Schoot et al., 2012), including: (1) configural model which assumes that observed items associate with same latent factors across time; (2) weak invariance model (metric) whereby item loadings are equivalent across time; and (3) strong invariance model (scalar) that additionally assumes equality of item intercepts across time. Each step is judged for relative loss of model fit compared to the prior step after applying the described constraints. All measures were considered invariant (see Table 1) where  $\Delta CFI < .01$  and  $\Delta RMSEA < .015$  (Chen, 2007), except for fair training wage which was partially invariant where the majority of items (i.e., 2 of 3) were invariant (Vandenberg & Lance, 2000).

Table B1. Tests for measurement invariance on repeatedly measured factors

Measurement models	$\chi^2$	<i>df</i>	CFI	$\Delta$ CFI	RMSEA	$\Delta$ RMSEA
<i>Interest</i>						
Configural invariance model	170.17	93	0.988	--	0.019	--
Weak factorial invariance	179.41	98	0.988	0.000	0.019	0.000
Strong factorial invariance	203.45	108	0.986	-0.002	0.019	0.000
<i>Anxiety</i>						
Configural invariance model	178.09	93	0.985	--	0.020	--
Weak factorial invariance	184.79	98	0.985	0.000	0.019	-0.001
Strong factorial invariance	195.76	108	0.985	0.000	0.019	0.000
<i>Employer active teaching</i>						
Configural invariance model	173.05	93	0.984	--	0.019	--
Weak factorial invariance	182.74	98	0.983	-0.001	0.019	0.000
Strong factorial invariance	196.19	108	0.983	0.000	0.019	0.000
<i>Job security</i>						
Configural invariance model	195.63	93	0.980	--	0.022	--
Weak factorial invariance	207.85	98	0.979	-0.001	0.022	0.000
Strong factorial invariance	234.17	108	0.975	-0.004	0.022	0.000

*Fair training wage*

Configural invariance model <sup>a</sup>	217.94	87	0.968	--	0.025	--
Weak factorial invariance	225.66	92	0.968	0.000	0.025	0.000
Strong factorial invariance	254.80	102	0.963	-0.005	0.025	0.000

*Expert career*

Configural invariance model	178.36	93	0.985	--	0.020	--
Weak factorial invariance	198.40	98	0.982	-0.003	0.021	0.001
Strong factorial invariance	264.96	109	0.973	-0.009	0.025	0.004

*Excessive work demand*

Configural invariance model	226.56	93	0.957	--	0.025	--
Weak factorial invariance	228.18	98	0.958	0.001	0.024	-0.001
Strong factorial invariance	259.66	108	0.951	-0.007	0.024	0.000

*Note.* Configural model restricted all items to equal loading at each timepoint, in line with use of composite measures in LGM.

<sup>a</sup> Released one item (loading) across all 6 timepoints.

## Chapter 7 - General Discussion

The aim of this PhD was to examine factors which motivated trade apprentices' intentions to persist or dropout from their apprenticeships. The focus evolved from concerns over persistently high attrition rates for trade apprenticeships in Australia, despite decades of research (Bednarz, 2014), given the stated benefits of apprenticeships easing the school to work transition (OECD, 2009a). The main theoretical proposition was that the effect of apprenticeship factors on dropout considerations would be better understood through considering their psychological pathways via motivational values. Motivation was operationalised drawing on the prominent expectancy-value motivation theory (EVT; Eccles-Parsons et al., 1983), focusing on the subjective task values (STVs) elements. Influential apprenticeship factors were grounded in existing Australian research on apprenticeship retention and dropout. This proposed psychological process was explored across two kinds of contexts:

- (1) occupational context; it was hypothesised that predictive factors would differ across apprenticeship occupations, as signalled by varying dropout rates among licensed and unlicensed apprenticeship trades (Seymour et al., 2012; Stromback & Mahendran, 2010).
- (2) learning context; this study explored whether motivational values were distinguishable between trade school and workplace learning environments in order to better understand apprentices' dropout intentions. The concurrent learning environments of trade school and workplace differentiate apprenticeships from the "study first, then work" model (OECD, 2010b, p. 53) providing a unique opportunity to explore their situated values within each setting.

This research involved three sequenced publications that collectively explored the psychological process for how apprenticeship factors influence STVs which, in turn, predict apprentices' dropout considerations or intentions to persist. The first publication (Chapter 4) explored occupational differences on the apprenticeship factors comprising the outset of the proposed process pathway. The second publication (Chapter 5) tested the hypothesised differences in motivational values across trade school versus workplace learning environments. Building on the findings of the first two studies, the third publication (Chapter 6) examined the longitudinal trajectories of apprentices' workplace values, relationships with dropout considerations, and a range of supportive and undermining apprenticeship factors.

### **7.1 Key Findings: Studies 1 to 3**

Findings from Study 1 highlighted apprenticeship factors which predicted dropout considerations differed for each of plumbing and bricklaying apprentices. Examined *pre-entry* factors included individual beliefs, influential individuals, career advisors and career information sources. Encouragingly, several pre-entry factors (e.g., enjoy working with their hands, like to see the results of their work, discussed their choice with a tradesperson, career advisor, information sources, and indecision about their career choice) predicted apprentices' dropout considerations. Some previously identified sources of influence and career information were not significant predictors of dropout considerations (e.g., family business employment opportunities, having completed a pre-apprenticeship program) while others *increased* the likelihood of dropout considerations (e.g., school advisors' encouragement, information from trade supply stores), suggesting that even well-intentioned informants may be counterproductive. This issue is taken up in the discussion that follows. In addition to pre-entry aspects, other factors that tapped the apprenticeship experience in both trade school and workplace were examined in Study 1 (e.g., training facilities, aspects of teaching in trade

school and workplace, workplace disrespect). Findings revealed different predictive factors across the two occupations, suggesting that dropout considerations may be differentially impacted, potentially requiring occupation-specific interventions.

Study 2 revealed that apprentices held distinct motivational values (i.e., STVs of intrinsic, attainment, utility and emotional cost) for each of their trade school and workplace learning environments, which differentially affected their intentions to persist with their apprenticeship, as well as their intentions to leave their occupation. The effects of trade school values differed across licensed (plumbing and electrical) versus unlicensed (bricklaying and carpentry) occupations. When disaggregated using multigroup modelling, for licensed occupations, intention to persist was predicted by trade school attainment value; whereas for unlicensed occupations, trade school intrinsic value was a significant predictor. However, *workplace* intrinsic value (positively) and emotional cost (negatively) were additionally important predictors across both licensed and unlicensed occupations.

The design of Study 3 incorporated findings from the two prior studies to examine: (a) how apprenticeship dropout considerations were predicted by apprentices' trajectories of workplace intrinsic value and emotional cost trajectories, and (b) how these trajectories were influenced by workplace factors framed within the lens of the job demands-resources model (JD-R; Demerouti et al., 2001; Schaufeli & Bakker, 2004). These workplace factors included pre-entry factors (e.g., role model, career indecision), as well as factors relating to the apprenticeship workplace experience (e.g., structured teaching, excessive work). The former suggests selection effects, and the latter that a number of the motivations associated with dropout considerations were malleable and may influence apprenticeship dropout considerations.

The sections that follow integrate the key findings from each of the three studies, discuss their theoretical and methodological contributions, implications for practice and policy, and outline study limitations and future research directions.

## **7.2 Discussion of Collective Key Findings**

This PhD was important in examining a theoretically grounded psychological motivation process to understand how apprentice-specific factors associate with apprentices' intentions to persist or dropout, across trade occupations (see Table 7.1 for outline of the three studies). Studies 1 and 2 each tested differences in apprenticeship factors (Study 1) and motivational values (Study 2) between licensed and unlicensed trades. Importantly, apprentices learning different trades reported different motivational influences on their planned persistence, and thus did not follow the same psychological process. Study 3 consequently added workplace environment factors, drawing on EVT and JD-R theoretical frameworks to evaluate how key pre-entry and time-varying demands and resources, together with workplace-situated values, evolved for apprentices throughout their training. The following five sections each present findings on the psychological motivation process to address its explanatory value in understanding how apprenticeship factors are linked to dropout considerations. The following sections describe how apprentices: (a) are motivated to make an informed choice; (b) perceive wages in ways that are pro-motivational; (c) experience workplace learning in ways that are effective in lowering dropout considerations; and (d) come to consider dropping out as a result of two distinct motivational processes.



**Table 7.1***An Outline of the Three Publications Conducted for this PhD*

Study	Datasets	Participant apprentices	Predictors	Outcomes	Covariates	Statistical approach
1	DEEWR	Bricklayer ( $n = 369$ ) Plumber ( $n = 1,016$ )	143 single items	Dropout considerations		Logistic regression
2	FLARe Project	Australian apprentices ( $N = 2,069$ )	Trade school and workplace values: - Intrinsic - Attainment - Utility - Emotional cost	Intentions to persist with apprenticeship  Intentions to leave occupation	SES Age Prior education Pre-app <sup>a</sup> GTO	SEM Discriminant analysis Bifactor analyse Group comparisons
3	FLARe Project	Australian apprentices ( $N = 2,387$ )	Workplace values: - Intrinsic value - Emotional cost Pre-entry factors: - Role model - Timing of choice - Lack of information - Indecision Workplace factors: - Employer teaching - Expertise - Job security - Fair training wage - Excessive work	Dropout considerations	SES Education	Latent growth models Accelerated longitudinal design Time-invariant and time-varying predictors of latent trajectories

*Note.* DEEWR = Australian Commonwealth Department of Education, Employment and Workplace Relations; FLARe = Factors Lifting Apprenticeship Retention expectations; SES = social economic status; GTO = group training organisation; SEM = structural equational modelling.

<sup>a</sup> Pre-apprenticeship program (yes/no).

### 7.2.1 *Informed Choice*

“Is this apprenticeship for me?” seems a clear starting point for any individual considering an apprenticeship. While dropouts may represent a good decision in circumstances that present opportunities to reorientate to more satisfying occupations or employers (Schmid & Stalder, 2012; Stalder & Schmid, 2016), leaving an apprenticeship can also produce a “scarring effect” (Gambin & Hogarth, 2016) that undermines the individual’s future workforce integration (OECD, 2009a) and career progression (OECD, 2010b). However, what informs the decision to drop out may be less clear, and findings from the present research revealed how motivational values inform this decision process.

Study 1 demonstrated access to information about their chosen apprenticeship predicted reduced apprentices’ dropout considerations, in line with Australian apprenticeship research that has demonstrated higher dropout rates by apprentices who entered with a lack of information about the occupation (Callan, 2000, 2001; Cully & Curtain, 2001; Misko et al., 2007). Even for students considering an apprenticeship, a lack of adequate information has been cited as a reason they were less decisive about entering into an apprenticeship (Brown, 2017; Misko et al., 2007). Study 1 affirmed apprentices’ career indecision (e.g., *Is bricklaying really for me?*) predicted increased dropout considerations. Others have argued that apprentices enter well-informed about the occupation, and it is the lack of information on employer-apprentice fit that predicts dropout (Stalder & Schmid, 2016), in the Swiss apprenticeship context. Notably, Study 1 found dropout considerations were not predicted by apprentices’ enjoying learning from their employer, or not enjoying the people they worked with.

However, some pre-entry factors intended to inform individuals about their chosen apprenticeship were not significant predictors of future dropout intentions in Study 1; for example, pre-apprenticeship programs, friends in a trade or apprenticeship, and family

members in the same or a different trade. Given pre-apprenticeships programs are intended to provide students with a realistic preview to support a more informed choice (Stromback, 2012), this result was somewhat surprising. It adds to the inconsistent results concerning the effect of pre-apprenticeship programs on completion rates (Karmel & Oliver, 2011) – some finding little or no effect (NCVER, 2010), while others indicate higher completion rates (Seymour et al., 2012; Stromback & Mahendran, 2010). However, none of these studies – including the current research – attempted to measure perceived quality of the such programs which may explain the inconsistent findings.

While Study 1 affirmed both information about the apprenticeship and individual career decisiveness were related to dropout considerations, subsequently exploring these factors through psychological motivational processes in Studies 2 and 3 explained *how* they inform apprentices' decision process. Study 3 revealed apprentices' initial career indecision (i.e., "*I could have used some support or confirmation that this apprenticeship was a good choice for me*") undermined their workplace values, which in turn, predicted higher dropout considerations. Specifically, higher career indecision at the beginning of the apprenticeship was the most important predictor of lower levels of apprentices' workplace intrinsic value and higher emotional cost. A lack of information had no effect on intrinsic value and only a small effect on apprentices' initial level of emotional cost on commencing their apprenticeship (Study 3). The fact that career indecision was weakly correlated with pre-entry lack of information, suggested that some indecisive apprentices could be well-informed about their occupational choice, while others may not be, as the two factors were quite distinct.

Given that a lack of information concerning the chosen apprenticeship had limited effect on the psychological process, apprentices' career indecision was clearly due to other factors. It is likely that making comparisons with other occupational choices, for example, may support career choices that better fit with their values (Eccles, 1994). Such comparisons

appear to occur where individuals trial an alternative occupation through a pre-apprenticeship program. For example, a study by Karmel and Oliver (2011) found construction apprentices who completed an *unrelated* pre-apprenticeship program were more likely to complete their apprenticeship when compared to apprentices who had not completed any pre-apprenticeship program.

### **7.2.2 The Value of Money**

The current research informs the ongoing debate concerning the relationship between apprenticeship wages and apprenticeship retention process (Bednarz, 2014). Study 1 found no wage effect on dropout considerations. Similarly, a study involving 13 Australian apprenticeship trades ( $N = 326$ ) found apprenticeship wage was not a significant predictor of intentions to quit (Gow, Hinschen, et al., 2008) when controlling for workplace and individual characteristics. Apprentice dropouts have cited “low wages” as a reason for dropping out, but the proportions who nominated this reason ranged substantially, from 6.7% (NCVER, 2020a) to 35.8% (Callan, 2000). Other quantitative studies have contested the direct effect of apprenticeship wages on apprentices’ retention (Gow, Warren, et al., 2008; Karmel & Mlotkowski, 2010b). In a review conducted by Deloitte Access Economics (2012) for the Australian Government, the authors found that the apprenticeship wage level did not predict retention but suggested the results may be confounded by other factors (without naming those).

In the present research it was argued that the apprenticeship wage effect on dropout considerations can be better understood through the lens of motivational values, than in direct dollar terms. How apprentices perceived their wages affected their motivational values. Apprentices reported higher levels of workplace intrinsic value if they framed apprenticeship wages as “*a reasonable trade-off to learn the trade*” (Study 3). Extant Australian apprenticeship literature which has identified wages as a salient reason for dropout has been

predominantly qualitative (Cully & Curtain, 2001; Snell & Hart, 2008). Given participants in these studies had already dropped out, it is unsurprising their view on apprenticeship wages was largely negative. Such studies have reported the main reason apprentices discontinued their apprenticeship to be because of their perceived treatment as “cheap labour” (Cully & Curtain, 2001; Snell & Hart, 2007), “slave labour” (Dickie et al., 2011), and exploitation because their wages did not reflect the value of their work (Harris & Simons, 2005; Misko & Wibrow, 2020). However, when the question of wages was framed more positively in Study 3 – as whether they regard it as a reasonable trade-off for the training they obtain – that actually this had a small but positive effect in the psychological process which supported lower dropout considerations.

### ***7.2.3 Intentional Versus Incidental Workplace Learning***

One of the contributions of this research was the examination of apprentices’ workplace factors in relation to dropout considerations, given that workplace-related factors are most often cited by apprentices to explain their dropout (Cully & Curtain, 2001; Karmel & Mlotkowski, 2010a; Snell & Hart, 2008). Extant apprenticeship research commonly note factors such as poor employer training and working conditions, a lack of feedback, and meaningful work across a variety of tasks (Bednarz, 2014), to name a few. The present study revealed that simply gaining experience on-the-job was insufficient to reduce dropout considerations. Study 1 demonstrated that dropout considerations were not associated with apprentices’ experiences of job variety, using different skills every day, or working on different job sites. However, apprentices who rated their employer highly on teaching skills and answering questions, were less likely to consider dropping out (Study 1). Longitudinal findings similarly revealed that apprentices who perceived their employer put careful thought into their training exhibited higher levels of workplace intrinsic value throughout their apprenticeship, which in turn, reduced their dropout considerations. Thus, it was the

apprentice's perception of employers' intentional instruction which motivated them rather than workplace tasks in and of themselves.

This contrasts with prior findings that a greater range and variety of work experienced on the job related to higher retention (Harris & Simons, 2005), and a narrower range of skills with dropout (Snell & Hart, 2007). While incidental learning occurs in workplace environments (Lave & Wenger, 1991), the opportunity to participate in a range of activities may not automatically increase apprentices' learning (Fuller & Unwin, 2004) or workplace motivation. While prior qualitative research has linked skill variety *tailored* to apprentices' developmental needs to higher likelihood of planned persistence (Brooker & Butler, 1997; Dickie et al., 2011), the present research has also revealed the centrality of apprentices' perception of their employer as an active and thoughtful teacher.

#### ***7.2.4 Occupational-specific Drivers of Dropout Considerations***

Consistent with studies revealing dissimilar apprenticeship dropout rates across different trade occupations (Seymour et al., 2012; Stromback & Mahendran, 2010), the present research found occupational differences in apprenticeship factors (Study 1) and trade-school values (Study 2) which predicted apprentices' dropout considerations. Such occupational differences provide a framework to consider tailored levers for lifting apprenticeship retention with particular trade occupations.

Study 1 revealed roughly half of the 23 factors predicting dropout considerations differed between bricklaying and plumbing apprentices. Some reflected differing characteristics of the occupation (e.g., bricklaying apprentices who worried about the physical work were more likely to consider dropping out); others appeared to relate to occupational stereotypes (e.g., plumbing apprentices who rated the trade as less respected were more likely to consider dropping out). Occupational stereotypes can be problematic and give individuals a false idea about the apprenticeship, if they are not familiar with the

occupation. Prior studies have shown that working bricklayers perceive their occupation to be well understood by the general public (Walker & Powers, 2009), but working plumbers believe the broader community are unaware of the occupation's breadth and perceive the occupation narrowly as a "dirty trade" (Walker & Powers, 2010). School career advisors (who were influential in apprentices' decision to start their apprenticeship) predicted lower dropout considerations for bricklaying apprentices, and higher dropout considerations for plumbing apprentices (Study 1). It may be that school career advisers hold incorrect stereotypes about plumbing, that they passed on to apprentices. However, apprentices who talked with *tradespeople* prior to enrolment, had lower likelihood of dropout considerations, both for plumbing and bricklaying apprentices (Studies 1 and 3). This suggests that when socialisers familiar with the occupation had input to apprentices' choice, apprentices were more likely to enjoy their workplace experience and consequently less likely to consider dropping out (the motivational mechanism examined in Study 3), presumably as they received realistic advice beforehand.

Study 2 demonstrated trade school STVs differentially predicted planned persistence for licensed (plumbing and electrical) versus unlicensed (bricklaying and carpentry) trade occupations. Specifically, for the trade school environment, planned persistence was predicted by intrinsic value for unlicensed occupations, but by attainment value for licensed occupations. Given the recent increased emphasis in EVT literature on situational contexts (Eccles & Wigfield, 2020), the present findings encourage future exploration of how trade school STVs may be influenced by occupation-specific factors, as suggested by the results from Study 1.

### **7.2.5 Dual Motivational Drivers of Apprenticeship Retention**

Findings from Study 2 demonstrated the importance of workplace values over trade school values in predicting apprentices' intentions to persist – specifically workplace intrinsic

value and emotional cost. Apprenticeship research has long emphasised employer-related factors as the key drivers of retention and dropouts (Bednarz, 2014; Cully & Curtain, 2001; Gow, Hinschen, et al., 2008; Snell & Hart, 2008), but without investigating the underlying psychological process that links these to apprentices' decision to drop out.

Study 3 linked the two theoretical frameworks of EVT and JD-R to specifically examine the psychological process intervening between apprenticeship factors and dropout considerations, for each of the JD-R posited dual (positive vs. negative) pathways (Bakker, Demerouti, & Schaufeli, 2003; Schaufeli & Bakker, 2004). Findings indicated apprentices' dropout considerations were largely influenced by a dual motivational process, driven positively by workplace intrinsic value (interest), and negatively by emotional cost (anxiety). Framing key previously researched apprenticeship factors within the JD-R model as job resources and demands, workplace intrinsic value linked job resources, and emotional cost linked job demands to apprentices' dropout considerations. Specifically, resources (i.e., role models, employer teaching, expertise, job security and fair training wages) supported apprentices' workplace intrinsic value, while demands (i.e., career indecision, lack of information, and excessive work) exacerbated emotional cost.

Study 3 examined this dual motivational process longitudinally, using latent growth models. While workplace demands provoked emotional cost as anticipated, emotional cost moderately predicted dropout considerations only during the start of the apprenticeship. This is in line with apprenticeship research suggesting such anxiety-provoking workplace demands are more important to dropping out in the first year (Dickie et al., 2011; Karmel & Mlotkowski, 2010a). Workplace intrinsic value, on the other hand, remained an important predictor of dropout considerations throughout the apprenticeship. These findings highlight that addressing demands to reduce apprentices' emotional cost early in the apprenticeship,



and tailoring resources to sustain their intrinsic value throughout the apprenticeship are important levers to reduce dropout considerations.

### **7.3 Theoretical Contributions**

This PhD research contributed to research on dropout considerations by integrating expectancy-value theory (EVT) and the JD-R theory to examine the psychological processes that explain apprentices' dropout considerations. The theoretically interesting context of apprenticeships afforded the opportunity to distinguish motivations and motivational influences across apprentices' concurrent trade school and workplace training contexts. Direct comparisons of the effects of workplace and trade school STVs and their interplay on dropout considerations revealed the stronger role of workplace over trade school values, suggesting a more targeted avenue to consider how apprentices' resources and demands influence workplace-situated values. Licensed and unlicensed apprentices considered dropping out for different reasons, highlighting the influence of occupational context. These differences suggested the need to contextualise potential interventions at the occupational level, representing a shift away from the current focus on apprenticeships 'in general'.

To my knowledge, this PhD research program was first to distinguish and examine the developmental consequences of four STVs across learning environments (i.e., workplace and trade school) within the same domain of trade apprenticeship (Study 2). This demonstrated context-specificity of STVs (Eccles & Wigfield, 2020). Past EVT research is typified by domain-specific STVs (e.g., Eccles-Parsons et al., 1983; Eccles, 2005; Wigfield et al., 2016), in terms of different subject domains. Studies have compared school students' subject-specific STVs (e.g., Guo et al., 2017; Wigfield et al., 2016), examined longitudinal changes in STVs (Fredricks & Eccles, 2002; Jacobs et al., 2002; Watt, 2004), and studied how values interrelate (Guo et al., 2017; Watt et al., 2019; Wigfield et al., 2020). The present research extended the study of STVs to apprentices' within-domain situated learning environments of

trade school versus workplace, often overlooked in apprenticeship quantitative research (Mikkonen et al., 2017).

Differentiating STVs across learning contexts within the same domain afforded the opportunity to explore how trade school and workplace motivations were interrelated within apprenticeship training. In this study, workplace and trade school STVs were interrelated in a manner reflecting within-person dimensional comparison (i.e., dimensional comparison theory; Möller & Marsh, 2013). Dimensional comparison occurs when people compare their own abilities (Möller & Marsh, 2013) and/or values (Gaspard et al., 2018; Nagy et al., 2008) in one domain with those of another domain. Central to this internal comparison is the moderating effect by the perceived similarity or dissimilarity of the compared domains (Möller et al., 2016). Where domains are perceived as dissimilar, the effect of the less valued domain is reduced in comparison to the more highly valued domain. Conceptualising apprentices' STVs as distinct across trade school and workplace contexts provided the capacity to empirically test this interrelationship.

#### **7.4 Methodological Contributions**

The longitudinal dataset of apprentices recruited and followed by the PhD researcher for Studies 2 and 3, represents the largest Australian survey of trade apprentices measuring motivational values, along with apprenticeship factors (i.e., including personal characteristics, pre-entry background experiences, and training-related factors). This involved an accelerated longitudinal design, which across the two years of data collection (4 measurement occasions) collectively encompassed the entire apprenticeship period. Taken together, this PhD tested trade apprenticeship factors as predictors of apprentices' motivational values, which, in turn, predicted dropout considerations.

The present research endeavoured to better understand the underlying psychological process, grounded in motivational theory and employing sophisticated methods fashioned to

address the research questions. State-of-the-art analyses were utilised which have been long called for in apprenticeship research (Mikkonen et al., 2017; Shah, 2017). The sequenced analyses to ascertain the role of STVs in apprentices' dropout considerations consisted of, first, confirmatory factor analyses to distinguish situated motivational values across workplace and trade school learning environments. Discriminant validity was successfully established for STVs both within- and across-learning contexts. STVs, each measured by multiple item indicators, showed strong psychometric properties, while sharing a degree of unexplained variance within each of the two learning environments. Bifactor analyses captured both the multidimensionality of STVs within trade school and workplace learning environments while simultaneously estimating a higher-order value factor per learning environment. This allowed predictions from each situated "set" of STVs, and an analysis of their intraindividual comparison (drawing upon dimensional comparison theory; Möller & Marsh, 2013).

### **7.5 Implications for Practice and Policy**

This PhD extended previous research on retention-related apprenticeship factors by examining the proposed psychological process underpinning apprentices' dropout considerations. Exploring apprenticeship factors through their relationship with motivations and subsequent dropout considerations provides a basis to appropriately guide individuals into (or out of) trade apprenticeships, and support "at risk" apprentices through targeted guidance, interventions, and future research.

First, this research demonstrated that not all apprentices are motivated in the same way regarding their intentions to persist or dropout across different trade occupations. Predictive apprenticeship factors and subjective task values (STVs) differed across licensed and unlicensed apprenticeships. Findings support occupation-specific direction for future intervention strategies. Study 1 demonstrated that apprenticeship factors (such as occupation

indecision, sources of career advice, information sources, aspects of teaching on- and off-the-job) can identify apprentices' dropout considerations with a moderate level of accuracy, when the set of factors is tailored to the occupation. This was also the case for the motivational process: STVs associated with dropout considerations differed across licensed and unlicensed trades. The moderating effect of occupation suggests an effective pathway to lift apprentices' retention is via interventions which focus on occupation-specific factors found to influence occupation-specific motivations. This follows recent calls to better understand the situated influences that lead individuals to *value* certain options over others (Eccles & Wigfield, 2020; Wigfield & Eccles, 2020), such as their intentions to persist or dropout of their apprenticeship.

Interventions that focus on context specific STVs introduces new avenues for intervening in the dropout process. Current EVT intervention research among school and college students has targeted utility value (Harackiewicz & Priniski, 2018; Lazowski & Hulleman, 2016), and more recently, also cost (Rosenzweig et al., 2020) as levers to promote students' engagement in STEM domains. Utility value interventions have increased students' academic performance, course persistence (Canning et al., 2018), and future study plans (Hulleman et al., 2010). Although utility value interventions have been associated with positive changes to other STVs (intrinsic and attainment value), such changes have been relatively small (Gaspard, Dicke, Flunger, Brisson, et al., 2015; Hulleman & Harackiewicz, 2009). Pivoting interventions to focus on STVs germane to targeted populations has been recently encouraged (Eccles & Wigfield, 2020). The results of the present study suggest that interventions focused on promoting workplace intrinsic value, as well as reducing emotional cost early during apprenticeships would be most productive to leverage apprentices' intentions to persist.

Second, the findings encouragingly revealed that apprentices' likelihood of dropout considerations could be partly predicted before they start their apprenticeship via pre-entry factors including prior experiences, perceptions of the occupation, socialisers, and sources of information (Study 1). Individuals who entered apprenticeships unsure whether it is the right choice for them (career indecisive), exhibited higher levels of workplace emotional cost at the beginning of their training (Study 3), the time when emotional cost mattered most in predicting dropout considerations. While lack of information had a smaller effect on initial level of emotional cost (Study 3), not all information was found to yield positive effects (Study 1). For example, incorrect information derived from occupational stereotypes were unhelpful, whereas information from people familiar with the trade reduced apprentices' dropout considerations. Individuals who had considered their apprenticeship choice for a longer period of time prior to entry (timing of choice) and talked to tradespeople before choosing their apprenticeship entered with higher levels of workplace intrinsic value which predicted lower dropout considerations. The importance of these pre-entry factors hold important implications for industry bodies, employers, and trade schools who are best placed to attract and select well-suited apprentices into specific occupations (Joyce, 2019). This stands in contrast to government policies which encourage general recruitment into apprenticeships with little occupation-specific guidance tailored to individual needs. Notably, government attempts to increase apprenticeship commencements and completions through wage support and subsidies (Karmel, 2017) have been associated with higher commencements (Nelms et al., 2017) but not necessarily higher completion rates (Deloitte Access Economics, 2012).

While apprenticeships have societal benefits, such as reengaging youth with education, easing the transition from education to work (OECD, 2009a) and reducing employment insecurity in the longer term (Robinson & Lamb, 2009), it seems inappropriate

to recruit indiscriminately and then adjudicate success of the apprenticeship scheme through retention rates. While many studies note the general need for more rigorous recruitment procedures to improve completion rates (Bednarz, 2014; Harris, Simons, et al., 2001; Hogarth et al., 2009; Snell & Hart, 2007; West, 2005), such recommendations have not been translated into occupational needs (Dickie et al., 2011). The results of this research suggest a more targeted approach is required.

Third, findings suggest trade schools can lift apprentices' intentions to persist by leveraging pedagogical approaches that support key subjective task values (STVs) for each of licensed and unlicensed trade occupations. Specifically, licensed trades may benefit from trade school learning approaches which highlight the importance (Study 2) of the required qualification by promoting the trade's licensed status and esteem (Dickie et al., 2011; Harris, Willis, et al., 2001). Employers, as key socialisers for apprentices, may also influence apprentices' perceived importance of trade school for licensed trades, for better (e.g., emphasising the value of skills learnt in trade school not regularly practiced at the workplace; Misko & Wibrow, 2020) or for worse (e.g., expressing reluctance to release apprentices for trade school due to productivity loss; Butler & Brooker, 1998; Misko & Wibrow, 2020). Trade school intrinsic value for unlicensed apprentices was more supportive (versus attainment value for licensed apprentices) of their intentions to persist (Study 2) and suggested trade school task variety (Study 1) may support apprentices' intrinsic value through the deliberate design of novel tasks (Bergin, 1999), surprise, salience, and personal relevance (Hidi & Renninger, 2006). Here again, the employer may play a role in promoting trade school intrinsic value by eliciting the connections between workplace intrinsic value and trade school (context personalisation; Cordova & Lepper, 1996). Leveraging apprentices' workplace intrinsic value into trade school experiences may also reduce complaints by apprentices that trade school lacks relevance (Callan, 2005; Harris & Simons, 2005), and

increase trade school intrinsic value. Such socialisation by employers is emphasised, given that apprentices seemed to evaluate the value of trade school in comparison to their workplace (dimensional comparisons; Study 2).

Fourth, the interrelationship between trade school and workplace motivations have important implications. The influence of apprentices' workplace values diminished the effect of trade school values on their intentions to persist in their apprenticeship (Study 2) – although both exhibited strong bivariate correlations with planned persistence. This may be due to apprentices making intraindividual comparisons of their workplace and trade school learning environments. A downward comparison would suggest that apprentices perceive their trade school and workplace learning environments to be dissimilar, and may partially explain why employment-related reasons are the most often cited reasons for apprentices dropping out (Bednarz, 2014; Callan, 2000; Cully & Curtain, 2001; Dickie et al., 2011; Snell & Hart, 2008). This may imply apprentices value their trade school learning as less important to their decision to drop out if they believe more valued learning takes place on-the-job (Alkema et al., 2016) – indeed, apprentices have reported their trade school learning: lacked workplace relevance (Harris & Simons, 2005); used outdated equipment, tools and technology no longer in use in the workplace (Harris, Simons, et al., 2001; Misko & Wibrow, 2020), and; did not meet their expectations (Callan, 2000, 2001). Consequently, apprentices' internal comparison of their trade school motivation with their workplace motivation may explain why past research on trade school factors had a reduced effect on apprenticeship dropouts when workplace factors were accounted for.

It may be possible to increase the influence of trade school STVs on apprentices' planned persistence, by reducing their perceived dissimilarities between workplace and trade learning environments. Other studies have been able to show that tasks can be manipulated to make them more similar and thereby reduce downward comparisons (Helm et al., 2016). A

recent study demonstrated increased levels of school subject interest (and achievement) were reported by high school students when out-of-school interests were incorporated into their in-school learning tasks (Bernacki & Walkington, 2018). For apprenticeships, this may be accomplished through trade schools' communication with employers to align trade school content delivery and timing with workplace learning activities. Engaging employers as guest lectures to showcase current and novel equipment and technology as they emerge within industry, could enhance perceptions of trade school relevance. Such engagement of employers in pedagogy may also influence employers' workplace training (a key factor associated with workplace intrinsic value) and better align trade school and workplace aims, content, and social interactions (Gurtner et al., 2012; Harris, Willis, et al., 2001).

Finally, considering low retention rates among Australian trade apprentices, the current capacity of employers to manage the workplace learning of apprentices in a manner that motivates them to persist remains an open question. For example, results indicated employer's teaching ability (e.g., flexibility in teaching skills, answering their questions) was more important to reducing dropout considerations than apprentice-employer social relationship (Study 1), through its effect on apprentices' workplace intrinsic value (Study 3). However, employers may not necessarily have the appropriate teaching skill set or acknowledge its importance (Callan, 2000; Harris & Simons, 2005; Smith, 2000; Snell & Hart, 2008) given apprentices describe workplace learning which is often unstructured (Brooker & Butler, 1997), poorly supported (Smith, 2000), and provides insufficient feedback (Callan, 2000; Harris, Willis, et al., 2001; Misko & Wibrow, 2020). Given the critically important effect employers have on apprentices' dropout considerations, it seems neglectful to leave the selection of employers who take on apprentices to chance. The findings strongly suggest that employer selection for apprenticeship training is likely as important as apprentice selection, to lift retention rates. This may involve regulating



employers who take on apprentices, training for employers who take on apprentices, and directing current subsidies to employers who demonstrate a strong record of successful training. While this research is not the first to suggest employer regulation (McDowell et al., 2011; Snell & Hart, 2007), it does explain *why* employer-related factors dominate the Australian apprentices' dropout considerations.

## **7.6 Limitations and Future Research Directions**

This research included large representative samples from licensed and unlicensed trade occupations across public vocational education and training institutions in Australia. Notwithstanding, limitations of the three studies should be considered in interpreting the findings. First, Study 1 was largely exploratory and theoretically generative for the latter two studies; inspiring the use of motivational theory and guidance on important apprenticeship factors. Although Study 1 results indicated occupational differences across individual attitudes, social influencers, information sources, trade school and the workplace experiences, such differences may be overstated as differences were not directly tested between the two occupations because some scales were not the same. Further, these data were collected in 2008/9 and may not reflect changes in training that have occurred in the past ten years.

Second, trade school and workplace STVs were examined in Studies 2 and 3, but their within-person dimensional comparisons were not explored over time. Internal comparison within the framework of dimensional comparison theory (Möller & Marsh, 2013) was examined cross-sectionally in Study 2, to compare how trade school and workplace values were interrelated. Recent studies have demonstrated that internal comparisons also occur temporally for self-concepts (Wolff et al., 2018; Wolff et al., 2019), although these studies have yet to be extended to STVs. Additional longitudinal research is warranted to further explore intraindividual comparison between trade school and workplace values over time, and their potential malleability.

Third, although Study 3 was based on longitudinal data that examined apprenticeship factors which explained within- and between-apprentice differences in workplace STV trajectories and effects on dropout considerations, the study did not assess differences between occupations. While workplace values' prediction paths on planned persistence were found to be invariant across occupations in Study 2, predictive workplace apprenticeship factors differed in Study 1. Research which compares apprenticeship factors across occupations in the motivational process may inform future interventions relevant to particular occupations.

Fourth, the series of studies took a variable-centred approach to modelling the psychological process of apprentices' dropout considerations and planned persistence. Although helpful in providing guidance within particular trade apprenticeships, an alternative approach could employ person-centred approaches as a basis of organising people into meaningful latent subgroups (Pastor & Gagne, 2013) to examine how profiles of different types of apprentices may show different patterns for which trade school and workplace STVs relate to their dropout considerations. While Lüthi and Stalder (2018) applied this approach using apprentices' school and workplace factors (i.e., resources and demands), the current research may build on this approach. For example, might trade school STVs take on greater importance to dropout considerations for certain apprentices, noting licencing requirements can influence students' self-beliefs (Dumont et al., 2017) when valued as a career objective (Harris, Simons, et al., 2001)? Although beyond the scope of this PhD, there is a need to extend the findings of this research – which found that effects were not all the same for different apprenticeship occupations – to explore the degree of heterogeneity within an occupation.

Fifth, this research focused on outcomes of *intentions* to persist or dropout. While there is merit to predicting apprentices “at risk” prior to dropping out, such outcomes are not

the same as studying actual dropouts. Given the samples were self-reports – a common feature in measurement of social cognitive constructs (Diener, 1994) including STVs (Wigfield & Cambria, 2010b) – this approach may inflate relationships between predictors and intention outcomes, through processes such as apprentices' occupational choice justification (choice-supportive bias; Lind et al., 2017), social desirability bias (Krumpal, 2013), or a cognitive bias (Haselton et al., 2005) influenced by preceding survey questions. Additional reports, such as from employers or trade teachers, and observational measures would help disaggregate such self-report effects from true relationships among measured constructs (Diamantopoulos et al., 2008; Kline, 2016).

Finally, this study advanced and tested a theoretically-based psychological process which helped to explained Australian apprentices' dropout considerations. In future research, it will be valuable to directly compare different trade occupations across their workplace and trade school contexts, longitudinally throughout their apprenticeship training, to coherently combine the potential contextual moderators and psychological mediators within integrated models. Further, it would be interesting to examine how such a process would replicate or differ in other countries, with similar or structurally different apprenticeship education systems. Relatedly, the resources and demands experienced by Australian apprentices may differ from other countries which have their own occupational characteristics, norms, and cultures that permeate apprentices' pre-entry factors and perceived experiences during training.

## **7.7 Conclusion**

This PhD presented three empirical studies which tested and found support for a psychological motivational process that linked apprenticeship factors (i.e., pre-entry characteristics and training experiences) with apprentices' dropout considerations, through their influence on apprentices' subjective task values (STVs) including intrinsic, attainment,

utility and emotional cost values. This current research included secondary data for plumbers ( $n = 1,016$ ) and bricklayers ( $n = 369$ ), as well as a new longitudinal study ( $N = 2,387$ ) of four apprenticeship occupations (bricklaying, carpentry, electrical and plumbing) surveyed from 26 trade schools across Australia over a two-year period.

An important goal of this research was to better understand the contextual effects on the studied psychological process. Two key contexts were explored: (a) occupations (licensed and unlicensed trades), and (b) learning environments (trade school and workplace). Apprenticeship factors which predicted dropout considerations differed between licensed and unlicensed trade occupations suggesting that occupationally tailored guidance and training support is required in order to reduce dropout considerations. This study was the first to demonstrate situated STVs across apprentices' dual learning environments, revealing apprentices held distinct motivational values for each. These situated values differentially predicted apprentices' intentions to persist with their apprenticeship. One important conclusion of this study is that only by distinguishing situated STVs across trade school and workplace learning environments was it possible to illustrate a potential downward internal comparison that explained why the effect of trade school values on planned persistence was diminished when workplace values were included as explanatory variables, given the greater importance apprentices may attach to their workplace experience.

*Workplace* intrinsic value and emotional cost were the more important predictors of apprentices' planned persistence, highlighting employers' critical role in apprenticeship retention. Workplace intrinsic value reduced dropout considerations throughout the apprenticeship, whereas apprentices' initial level of emotional cost heightened dropout considerations. Employers, industry groups, and trade teachers can substantially impact apprentices' trajectories by supporting well-informed career choices (i.e., encouraging discussions with someone in the trade, exploring other potential occupations of interest to

reduce career indecision). During the apprenticeship, employers could substantially promote apprentices' intrinsic value through structured and thoughtful training, and lower emotional cost during the start of the apprenticeship by managing excessive workload. Given the low retention in Australian trade apprenticeships, and the critical nature of workplace motivation, stronger regulation concerning employers permitted to take on apprentices is urged. Financial support should follow those most successful in managing apprentices' workplace training to keep such employers engaged in the apprenticeship system. Targeting and supporting employers well suited to the training role should enhance apprentices' retention through promoting their positive valuation of the apprenticeship experience.

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## Appendix A – Sources of Common Australian Retention and Dropout Factors

The following tables list common retention-related factors found in Australian studies over the last 20 years. They are distinguished because of their primarily large sample size, wide array of factors considered within each study, and are commonly commissioned by federal or state governments in their attempt to resolve high apprenticeship dropout rates.

Tables A1 – A3 present individual, trade-school and workplace factors respectively, with associated references for studies in which these factors have been analysed to explore reasons for apprentices' decision to complete their apprenticeship or dropout. Relevant studies were located by searching VOCEDplus<sup>10</sup>, database for Australian studies. Search terms included the following:

- apprentice\* AND
- vocational training or vocational learning or vocational education and training, VET or factors or workplace, on-the-job, trade school, off-the-job AND
- attrition or dropout or retention or persistence or withdrawal.

**Table A1**

### *Studied Apprentice Factors With Sources*

Construct	Quantitative	Qualitative (Mixed)
Age	(Ball & John, 2005; Cully & Curtain, 2001; Gow, Warren, et al., 2008; Ray et al., 2000; Stromback & Mahendran, 2010)	
Level of schooling	(Ball & John, 2005; Callan, 2000; Cully & Curtain, 2001; Misko et al., 2007; Ray et al., 2000; Seymour et al., 2012; Stromback & Mahendran, 2010)	
Geographic location	(Ball & John, 2005; Gow, Warren, et al., 2008; Misko et al., 2007)	
Gender	(Ball & John, 2005; Callan, 2000; Ray et al., 2000; Seymour et al., 2012; Stromback & Mahendran, 2010)	
Pre-apprenticeship	(NCVER, 2010; Stromback & Mahendran, 2010)	(Dickie et al., 2011; Misko & Wibrow, 2020; Mitchell et al.,

<sup>10</sup> VOCEDplus is a free international research database for tertiary education, especially as it relates to workforce needs, skills development, and social inclusion. It encompasses vocational education and training (VET), higher education, adult and community education, informal learning, and VET in Schools. It is international in scope and contains over 80,000 English language records, many with links to full text documents.

Prior work experience	(Cully & Curtain, 2001)	2008)
Country of birth	(Callan, 2000; Stromback & Mahendran, 2010)	(Misko & Wibrow, 2020)
Language	(Stromback & Mahendran, 2010)	
Indigenous status	(Stromback & Mahendran, 2010)	
Personal traits or attributes	(Callan, 2001; Mitchell et al., 2008)	(Harris & Simons, 2005)
Strong interest in occupation	(Callan, 2000, 2001; Cully & Curtain, 2001; Gow, Warren, et al., 2008; Karmel & Mlotkowski, 2010a; Misko et al., 2007; Mitchell et al., 2008; NCVER, 2010)	(Dickie et al., 2011; Harris & Simons, 2005; Misko & Wibrow, 2020)
Family support	(Callan, 2000, 2001; Misko et al., 2007)	(Dickie et al., 2011; Harris & Simons, 2005)
Family in the trade	(Misko et al., 2007)	(Dickie et al., 2011; Misko & Wibrow, 2020)
Peer support	(Misko et al., 2007)	
Realistic expectations	(Callan, 2000, 2001; Gow, Warren, et al., 2008)	(Dickie et al., 2011; Harris & Simons, 2005)
Like working with hands		(Dickie et al., 2011; Misko & Wibrow, 2020)
Determined to complete/succeed	(Callan, 2001; Misko et al., 2007; Mitchell et al., 2008)	(Dickie et al., 2011; Harris & Simons, 2005; Misko & Wibrow, 2020)
Considered alternative occupations	(NCVER, 2010)	(Dickie et al., 2011)
Information about apprenticeship	(Callan, 2000; Cully & Curtain, 2001; Misko et al., 2007)	(Snell & Hart, 2008)
Sources of information	(Callan, 2001)	
SES	(Misko et al., 2007)	
Personal problems	(Cully & Curtain, 2001; Karmel & Mlotkowski, 2010a; NCVER, 2010)	(Misko & Wibrow, 2020)

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**Table A2***Studied Trade-school Factors With Sources*

Construct	Quantitative	Qualitative (Mixed)
Duration of training	(Ball & John, 2005)	
Location/Remoteness	(Stromback & Mahendran, 2010)	
Public vs private RTO	(Stromback & Mahendran, 2010)	(Snell & Hart, 2008)
Value qualification	(Cully & Curtain, 2001)	(Dickie et al., 2011; Harris & Simons, 2005; Snell & Hart, 2008)
Facilities and equipment	(Callan, 2000, 2001)	(Misko & Wibrow, 2020)
Quality of trainers	(Callan, 2000, 2001)	(Harris & Simons, 2005; Misko & Wibrow, 2020; Snell & Hart, 2008)
Able to ask questions		(Callan, 2001)
Training provider support	(Callan, 2000, 2001)	
Satisfaction with teachers' knowledge	(Callan, 2001)	(Harris & Simons, 2005; Misko & Wibrow, 2020)
Mode – block vs. day	(Callan, 2001)	(Misko & Wibrow, 2020)
Relevance to current workplace		(Callan, 2001; Harris & Simons, 2005)
Class size		(Callan, 2001)
Hands-on experience		(Callan, 2001)
Difficulty of course	(Gow, Warren, et al., 2008; Karmel & Mlotkowski, 2010a; NCVER, 2010)	(Misko & Wibrow, 2020)
Duration of contract	(Ball & John, 2005; Karmel & Mlotkowski, 2010a)	

**Table A3***Studied Workplace Factors With Sources*

Construct	Quantitative	Qualitative (Mixed)
Firm size	(Seymour et al., 2012; Stromback & Mahendran, 2010)	(Harris & Simons, 2005; Snell & Hart, 2008)
Firm type (GTO)	(Cully & Curtain, 2001; Ray et al., 2000; Seymour et al., 2012; Stromback & Mahendran, 2010)	(Snell & Hart, 2008)
Occupation/industry	(Ball & John, 2005; Callan, 2000, 2001; Ray et al., 2000; Stromback & Mahendran, 2010)	
Location/Remoteness	(Ray et al., 2000; Stromback & Mahendran, 2010)	
Matching in expectations	(Mitchell et al., 2008)	(Dickie et al., 2011; Harris & Simons, 2005)
Structured training	(Callan, 2000, 2001; Cully & Curtain, 2001)	(Dickie et al., 2011; Mitchell et al., 2008)
Quality of training	(Callan, 2000, 2001)	(Harris & Simons, 2005; Snell & Hart, 2008)
Employer's skill/ability		(Harris & Simons, 2005)
Employer who listens	(Cully & Curtain, 2001)	(Callan, 2001; Mitchell et al., 2008)
Feedback	(Callan, 2000, 2001)	
Employer support	(Callan, 2000, 2001)	(Harris & Simons, 2005; Mitchell et al., 2008; Snell & Hart, 2008)
Appropriate learning at work	(Callan, 2000, 2001; Cully & Curtain, 2001; Misko et al., 2007)	(Dickie et al., 2011; Misko & Wibrow, 2020; Snell & Hart, 2008)
Positive workplace culture		(Dickie et al., 2011; Harris & Simons, 2005)
Pay	(Callan, 2000, 2001; Cully & Curtain, 2001; Karmel & Mlotkowski, 2010a; Misko et al., 2007; NCVER, 2010)	(Dickie et al., 2011; Harris & Simons, 2005; Misko & Wibrow, 2020; Snell & Hart, 2008)
(Difficult) Working conditions	(Cully & Curtain, 2001; Gow, Warren, et al., 2008; Karmel & Mlotkowski, 2010a; Misko et al., 2007; NCVER, 2010)	(Dickie et al., 2011; Harris & Simons, 2005; Snell & Hart, 2008)
Challenging work		(Harris & Simons, 2005)
Emotional challenges (e.g. bullying)	(Callan, 2000; Cully & Curtain, 2001; Misko et al., 2007)	(Harris & Simons, 2005; Misko & Wibrow, 2020; Snell & Hart, 2008)
Respect on-the-job	(Cully & Curtain, 2001)	(Dickie et al., 2011; Snell & Hart, 2008)
Recognition and appreciation		(Harris & Simons, 2005)
Work hours	(Misko et al., 2007)	(Dickie et al., 2011; Harris & Simons, 2005; Misko & Wibrow, 2020; Snell & Hart, 2008)

Meaningful work (vs repetitive)	(Callan, 2001)	(Dickie et al., 2011; Harris & Simons, 2005; Mitchell et al., 2008)
Secure employment	(Misko et al., 2007)	(Harris & Simons, 2005)
Task variety	(Callan, 2001; Misko et al., 2007)	(Harris & Simons, 2005)
Interpersonal relationship with employer	(Callan, 2000, 2001; Gow, Warren, et al., 2008; Karmel & Mlotkowski, 2010a; Misko et al., 2007; NCVER, 2010)	(Harris & Simons, 2005; Misko & Wibrow, 2020)

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### Appendix B – Plumbing Survey Questions Used in Study 1

The following are survey questions used in the ‘Drivers and Impediments’ project (Walker & Powers, 2008), which targeted plumbing apprentices. The survey was distributed in trade classrooms between April to June 2008 ( $N = 1016$ ). The data was used in study 1 in this monogram.

Questions	Response	Answer set
1. What are the top three reasons you took up a plumbing apprenticeship?	tick top three	Working outdoors, plumbing is a highly respected trade, the opportunity to be my own boss, money, the variety of work, I like working with my hands, I like to see the results of my work, lots of work for plumbers (i.e., year round), a friend is also doing an apprenticeship, other reasons you would like to add (optional).
2. Who was influential in your choosing to become a plumbing apprentice?	very influential, somewhat influential, not influential	parent or guardian, family business opportunity, other family members, friends not working in a trade, friends in an apprenticeship/trade, secondary school teacher/career advisor, TAFE teacher, a plumber you know, a tradesperson other than a plumber, job network provider, other (please specify)
3. What were your biggest worries or concerns when you first considered taking up a plumbing apprenticeship?	you may choose more than one answer	are any of my friend doing a plumbing apprenticeship?, can I handle the physical work?, can I handle the training while still working?, is plumbing really for me?, job security – would my boss give me the time for training?, making time for school, my family commitments, not making money while at school, the schoolwork would be too difficult, will I enjoy the training, will I find an employer to do my apprenticeship with?, will I find work as a plumber when I finish my apprenticeship?, other (please specify).
4. How would you rate the secondary school career advisor(s) on:	very good, good, average, poor, very poor	knowledge of general trades career options, knowledge of the plumbing trade as a career option, providing information on how to go about getting an apprenticeship, giving advice on where to find more information on apprenticeships, other (please specify).
5. Which pathway did	strongly	trades in general, university, plumbing

your secondary school career advisor(s) encourage you to take?	encouraged, encouraged, no opinion, discouraged, strongly discouraged	apprenticeship, TAFE
6. How did the following people respond when you told them you were taking up a plumbing apprenticeship?	very encouraging, somewhat encouraging, no opinion, somewhat discouraging, very discouraging	secondary school teachers/career teacher, parents or guardian, spouse/partner, close friends, other family members, other (please specify)
7. How easy or difficult was it to find information about plumbing apprenticeships when you first considered it?	very easy, fairly easy, fairly difficult, very difficult	
8. Where did you FIRST go looking for information on plumbing apprenticeships?	make only ONE choice, please	secondary school career advisor, other plumbers, TAFE or other plumbing training school, Australian apprenticeship centres, friends, newspaper advertising/articles, internet, recruitment agency, plumbing supply company, parents, other (please specify)
9. Which was the best source of information for you?	make only ONE choice, please	same as above
10. Which source(s) were most frustrating to deal with?	you may choose more than one	same as above
11. How flexible has the school been with	very flexible, somewhat	training times/block dates, scheduling classes to fit in with your on-the-job work requirements, giving



the following:	flexible, average, somewhat inflexible, very inflexible	you extra help with difficult subjects or projects, access to teaching staff, comments you would like to add (optional)
12. How well does the school perform on the following?	excellent, good, average, poor, very poorly	teaching in a way that is easy for you to understand the material, teaching in a way that you enjoy, teaching plumbing techniques that are up to date, provide appropriate information and communication for you, provide appropriate facilities, provide appropriate tools and material, comments you would like to add (optional)
13. Choose the top three aspects you enjoy most about your plumbing training.	top choice, 2 <sup>nd</sup> choice, 3 <sup>rd</sup> choice	learning new skills every day, working outside, group projects, fellow apprentices in my group/class, learning how to do things to a professional standard, learning a life skill/career, my employer, new experiences, training facilities, class discussion, being taught by knowledgeable people, meeting new people, the variety of work, the a hands-on experience, other
14. Choose the top three aspects you enjoy LEAST about your plumbing training.	top choice, 2 <sup>nd</sup> choice, 3 <sup>rd</sup> choice	being taught things I already know, digging holes, too much reading, my employer, the equipment/supplies available, waiting for teachers to check work, the variety of work, getting appropriate direction at school, too much slack time while at school, understanding the by-laws, working outside, long days, the costs of training, technical requirement for drawing and sketching, group projects, lack of information about next training block/session, travel time to training, other
15. How flexible has your employer been with the following:	very flexible, somewhat flexible, somewhat inflexible, very inflexible	teaching you skills on the job, ensuring that you attend trade school as required, answering questions you may have, giving you a variety of jobs (e.g., roofing, gas, sanitary, etc.), comments you would lie to add (optional)
16. Choose the top three aspects you enjoy the most about	1 <sup>st</sup> choice, 2 <sup>nd</sup> choice, 3 <sup>rd</sup>	financial freedom, hands on experience, learning a life skill/career, learning form my boss/employer, learning how to do things professionally, learning

your work experience.	choice	new skills every day, seeing the results of my work, the people I work with, the variety of work, working on different sites, working on large projects, working outdoors, other choices (optional)
17. Choose the top three aspects you LEAST enjoy about your work experience	1 <sup>st</sup> choice, 2 <sup>nd</sup> choice, 3 <sup>rd</sup> choice	being left alone to do jobs I don't fully understand, being treated without respect, long hours, my boss/employer, not getting experience in all streams of plumbing, physical labour like digging holes, the people I work with, the variety of work, the weather, working outdoors, other choices (optional)
18. Have you ever seriously considered dropping out of your apprenticeship training?	yes, no	

**Appendix C1 – Follow-Up Email to Lead Teachers**

RE: FLARe Project (Factors Lifting Apprenticeship Retention)

ATT: FLARe informational flyer

Hello

Thanks for taking my call today. As mentioned, the FLARe project is a national endeavour to identify the key factors which have the most impact on apprentices' decision to enter and continue with their trade training. This project will survey 1<sup>st</sup> and 2<sup>nd</sup> year apprentices on four occasions – every 6 months starting in 2015. I am looking for your help to gain the involvement of RTOs that deliver carpentry, electrical, bricklaying, and/or plumbing.

This project follows on from previous work in the trades. By identifying the most important factors for committed apprentices, we will be able to better market the trades, identify apprentices at risk of becoming disengaged, and support those most suited to the trade. Furthermore, this project will compare the trades to see how they may differ. Are the motivations for bricklaying the same as being an electrician? Are certain apprentices more suited to the work environment of one trade over another?

This project asks apprentices about their training and job experience. It asks them whether they feel they are well suited to the trade, interested in their training experience, how important they feel the qualification is, and how useful they find their trade training. Additionally, they are asked about their views on the trade (e.g., status, expertise, wages), how they are treated/trained on-the-job (e.g., feedback, variety of experience, working conditions), and how they perceive the trade school training (e.g., teaching approach, facilities, difficulty). These questions are specifically tuned to the trades.

By tracking individuals over four time periods, this project will be able to ascertain how apprentices grow into the role, and why some may become dissatisfied with their apprenticeship. This project will provide measurable outcomes.

What is needed? I am looking for RTOs from all States and Territories to participate with the FLARe project. Specifically, I would like to get an email, or telephone call with the following information:

- Name of the RTO/TAFE
- Trade teacher/manager that will coordinate for your trade
- Contact details: email, and phone number
- Rough estimate of how many 1<sup>st</sup> and 2<sup>nd</sup> year apprentices you expect in the trade next year (best guess if fine).

I am conscious that time is a rare commodity for trade teachers. I will ensure that the process and communication is straightforward. The surveys will take 20-25 minutes for the apprentices to complete. By being involved in this project, you will be the first to receive feedback as the project progresses.

I look forward to your involvement and know that you will be very interested in the result!

Most sincerely,

Tim Powers

## Appendix C2 – Promotional Flyer for Trade Teachers



# FLARe

Factors Lifting Apprenticeship Retention



MONASH University




**The FLARe project aims to identify (and measure) what motivates trade apprentices to commit to their occupation and complete their apprenticeship.**

The project will follow apprentices over a 1-year period to explore their motivations, values and job perceptions in order to:

- predict who will thrive in their apprenticeship and who is at risk,
- attract and retain trade apprentices,
- target resources where they will have the most impact.

### What is this project about?

*Identifying the most important factors for trade apprentices' commitment and retention*

**What motivates apprentices?**  
 Is being truly interested in the trade enough?  
 How do apprentices value their training?  
 Do opinions of their trade impact risk profile?

**Training school impacts.**  
 Is it the way we teach?  
 Do facilities and equipment make a difference?

**Employer influences.**  
 How important is the employer's approach to training?  
 Does social support really help?  
 Are apprentices proud to be working in the trade?

### What are you asking of me?

*Be part of this project & get the results first!*

**We are looking for RTO's that deliver bricklaying, carpentry, electrical and/or plumbing.**

**Commitment:**  
 Survey of 1st and 2nd year apprentices every 6 months in 2015 and 2016.  
 20 – 25 minute surveys.

**Highlights of results sent out to participating RTO's:**  
 Ethics approved, all personal data protected.

**Contact FLARe**

**Tim Powers**

tim.powers@monash.edu



MONASH University



## TOP 5 reasons to participate

- 1 Identifying apprentices 'most at risk' of dropping out means we can better target support.
- 2 Help your industry focus resources on the right issues when it comes to lifting retention rates for trade apprentices.
- 3 Help inform employers how they can make a difference in apprenticeship commitment.
- 4 Understanding the motivations behind apprenticeship choices will open up new ways of attracting apprentices.
- 5 The trades are different from other occupations: Are the motivations to be an electrician the same as a carpenter?

**“Bricklaying apprentices who had an employer who was good at answering their questions were 9 TIMES MORE LIKELY to stay in their apprenticeship”**

*We are building on some of our more recent findings:*

### Did you know?

#### Plumbing apprentices

- Apprentices who described plumbing as a 'respected trade' were **39% MORE LIKELY** to stay in their apprenticeship.
- Plumbing apprentices who were treated without respect on-the-job were **35% MORE LIKELY** to consider dropping out.
- Apprentices were **83% MORE LIKELY** to stay in their apprenticeship when they enjoyed a variety of work at trade school.

#### Bricklaying apprentices

- Apprentices who wanted to be their own boss in the future were **80% MORE LIKELY** to stay in their apprenticeship.
- Bricklaying apprentices who were most worried about the physical nature of the work were almost **TWICE AS LIKELY** to drop-out.
- Apprentices were **15 TIMES MORE LIKELY** to complete their apprenticeship when apprentices felt they could get good help from trade teachers with difficult subjects.

**Appendix D – Latent Construct Items**

Construct	No. of items	Items
<i>Antecedents</i>		
Experience with role model	3	<i>Before entering my apprenticeship ...</i> ... I've encountered inspirational individuals in the trade <sup>a</sup> ... I've experienced good role-models in the trade <sup>a</sup> ... I talked with people in the trade <sup>b</sup>
Lack of information	3	<i>I wish I had more information on ...</i> ... where a career in this trade might take me in the future <sup>c</sup> ... the variety of career choices in this trade <sup>c</sup> ... what other people in the trade find interesting about this work <sup>b</sup>
Indecisiveness <sup>d</sup>	3	<i>Before entering my apprenticeship ...</i> I found it difficult to make the decision I could have used some support or confirmation that this apprenticeship was a good choice for me I was happy to make the long term commitment (R)
<i>Subjective task values</i>		
Intrinsic <sup>e</sup>	3	<i>My job/trade school experience ...</i> ...is something I like ... matches my interest ... is something I enjoy the more I do
Attainment <sup>f</sup>	3	<i>My job/trade school experience ...</i> ... is important to me to perform well at ... is important for me to be good at ... means a lot to me to be good at
Utility <sup>g</sup>	3	<i>My job/trade school experience ...</i> ... will be useful to me in the future ... is worth the effort because it will help me in the work I want to do later on ... will help me get future work
Emotional cost <sup>f</sup>	3	<i>My job/trade school experience ...</i> ... is something I'd rather not do, because it only worries me ... when I have to deal with this, I get annoyed ... is a real burden to me
<i>Resources</i>		
Work security	3	<i>This trade ...</i> ... provides job security <sup>a</sup> ... offers steady work <sup>b</sup> ... always has lots of work available <sup>b</sup>
Fair training wage <sup>b</sup>	3	<i>Thinking about your pay as an apprentice:</i> The apprenticeship pay is a fair deal The apprenticeship wage is a reasonable trade-off to learn the trade The pay is far too little while you are an apprentice (R)
Employer teaching <sup>b</sup>	3	My boss takes time to show me new skills My boss has given me specific tasks to help me learn new things I can tell my boss has put careful thought into my training
<i>Demands</i>		
Expertise <sup>a</sup>	3	<i>This trade ...</i> ... involves highly specialised knowledge ... involves high levels of expert knowledge ... involves high levels of technical knowledge
Excessive work demands <sup>h</sup>	3	<i>Sample item (copyrighted scale)</i> There is constant pressure for workers to keep working

*Note.* All anchors ranged from 1-*Not at all* to 7-*Extremely*.

a (Watt & Richardson, 2007)

b FLARe Project

c Modified from general “Lack of information about occupations” (Gati et al., 1996) to apprenticeship-specific lack of information

d Modified from general indecisiveness (Gati et al., 1996) to apprenticeship career choice indecision

e (Watt & Richardson, 2006)

f (Gaspard, Dicke, Flunger, Schreier, et al., 2015)

g (OECD, 2009b)

h (Hart et al., 2000). This copyrighted scale is used with permission.



## Appendix E – Human Ethics Certificate of Approval



**MONASH University**

Monash University Human Research Ethics Committee (MUHREC)  
Research Office

### Human Ethics Certificate of Approval

This is to certify that the project below was considered by the Monash University Human Research Ethics Committee. The Committee was satisfied that the proposal meets the requirements of the *National Statement on Ethical Conduct in Human Research* and has granted approval.

**Project Number:** CF14/3965 - 2014002054

**Project Title:** FLARE Project (Factors Lifting Apprenticeship Retention Expectations)

**Chief Investigator:** Assoc Prof Helen Watt

**Approved:** **From:** 12 January 2015

**To:** 12 January 2020

**Terms of approval - Failure to comply with the terms below is in breach of your approval and the Australian Code for the Responsible Conduct of Research.**

1. The Chief investigator is responsible for ensuring that permission letters are obtained, if relevant, before any data collection can occur at the specified organisation.
2. Approval is only valid whilst you hold a position at Monash University.
3. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval and to ensure the project is conducted as approved by MUHREC.
4. You should notify MUHREC immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.
5. The Explanatory Statement must be on Monash University letterhead and the Monash University complaints clause must include your project number.
6. **Amendments to the approved project (including changes in personnel):** Require the submission of a Request for Amendment form to MUHREC and must not begin without written approval from MUHREC. Substantial variations may require a new application.
7. **Future correspondence:** Please quote the project number and project title above in any further correspondence.
8. **Annual reports:** Continued approval of this project is dependent on the submission of an Annual Report. This is determined by the date of your letter of approval.
9. **Final report:** A Final Report should be provided at the conclusion of the project. MUHREC should be notified if the project is discontinued before the expected date of completion.
10. **Monitoring:** Projects may be subject to an audit or any other form of monitoring by MUHREC at any time.
11. **Retention and storage of data:** The Chief Investigator is responsible for the storage and retention of original data pertaining to a project for a minimum period of five years.

Professor Nip Thomson  
Chair, MUHREC

cc: Mr Timothy Powers, Assoc Prof Paul Richardson

Postal – Monash University, Vic 3800, Australia  
Building 3E, Room 111, Clayton Campus, Wellington Road, Clayton  
Telephone +61 3 9905 5490 Facsimile +61 3 9905 3831  
Email [muhrec@monash.edu](mailto:muhrec@monash.edu) <http://www.monash.edu.au/researchoffice/human/>  
ABN 12 377 614 012 CRICOS Provider #00008C

## Appendix F – Parallel Scoring of Value Items

**(f) Please rate your experience on-the-job, and at trade school ...**

(score the questions down one side, then down the other side)

My current <u>job</u> ...								My <u>trade school</u> training ...						
Not at all			Extremely					Not at all			Extremely			
1	2	3	4	5	6	7	is something I like	1	2	3	4	5	6	7
1	2	3	4	5	6	7	suits my abilities	1	2	3	4	5	6	7
1	2	3	4	5	6	7	teaches new skills that are useful on the job	1	2	3	4	5	6	7
1	2	3	4	5	6	7	It is important to me to perform well at ...	1	2	3	4	5	6	7
1	2	3	4	5	6	7	will be useful to me in the future	1	2	3	4	5	6	7
1	2	3	4	5	6	7	matches the qualities that I possess	1	2	3	4	5	6	7
1	2	3	4	5	6	7	is worth the effort because it will help me in the work I want to do later on	1	2	3	4	5	6	7
1	2	3	4	5	6	7	provides training that I need in my current job	1	2	3	4	5	6	7
1	2	3	4	5	6	7	It is important for me to be good at ...	1	2	3	4	5	6	7
1	2	3	4	5	6	7	matches my interests	1	2	3	4	5	6	7
1	2	3	4	5	6	7	matches my skills	1	2	3	4	5	6	7
1	2	3	4	5	6	7	will help me get future work	1	2	3	4	5	6	7
1	2	3	4	5	6	7	is useful to me now	1	2	3	4	5	6	7
1	2	3	4	5	6	7	is something that I want to do	1	2	3	4	5	6	7
1	2	3	4	5	6	7	It means a lot to me to be good at ...	1	2	3	4	5	6	7
1	2	3	4	5	6	7	is something I'd rather not do, because it only worries me	1	2	3	4	5	6	7
1	2	3	4	5	6	7	when I have to deal with this, I get annoyed	1	2	3	4	5	6	7
1	2	3	4	5	6	7	is a real burden to me	1	2	3	4	5	6	7
1	2	3	4	5	6	7	often makes me nervous	1	2	3	4	5	6	7

## Appendix G – Survey Reminder Emails Sent to Lead Teachers

FLARe Project SURVEYS for upcoming week

Hello <name of lead teacher>,

This is a friendly reminder from the FLARe Project. Our information shows you are expecting <trade> apprentices during the **next week** (week starting on 30 Mar) who you will ask to fill out the FLARe Project survey. Our records show that the following groups will be in attendance:

**<Trade school name>**

1<sup>st</sup> Year/Stage apprentice groups: <class name>

2<sup>nd</sup> Year/Stage apprentice groups: <class name>

We have mailed the following to you (with attached PDFs as backup):

- **“FLARe SURVEY (Time 1)”**. Printed as double-sided copy for each apprentice.
- **“INSTRUCTIONS & CLASS INFO”**. One for each class/group. This sheet is filled out by the class instructor and sent in with the class/group surveys.

Please mail in these items grouped by class. This will be an immense help to us.

FAQ's (Frequently Asked Questions)

- The INSTRUCTIONS & CLASS INFO document explains the survey process
- The same survey is used for 1<sup>st</sup> and 2<sup>nd</sup> year/stage apprentices across all the four trades in this study (i.e., bricklaying, carpentry, electrical and plumbing).
- This first survey takes 20-25 minutes. The second survey (6 months later) will be somewhat shorter because there are no background questions.
- No individual RTO or apprentice will be identified in the resultant reports and results. However, this information is important for a survey conducted over multiple time periods.
- As discussed, your RTO's participation involves four surveys, 6 months apart. You will note in the “Participant Explanatory Statement” that we ask apprentices to consent for up to 4 surveys.

Thank you for your participation in this important project. We look forward to sharing the results with you.

As always, if you have any questions, feel free to contact me at any time.

Kind regards,

**Appendix H – Participant Explanatory Statement****MONASH University****PARTICIPANT EXPLANATORY STATEMENT**

Tim Powers, Monash University, Department of Education  
Tel: (03) 5221 2191 Email: tim.powers@monash.edu

**FLARe Project (Factors Lifting Apprenticeship Retention Expectations)  
For 1<sup>st</sup> and 2<sup>nd</sup> Stage/Year Apprentices**

Taking up an apprenticeship is an important decision and there are many factors that influence this decision and shape the experience. You are invited to take part in this study about your motivations in training as an apprentice and how they are influenced by your experiences on-the-job and in trade school. This project aims to get feedback from you using surveys, which take up to 25 minutes to complete. Your responses will be valuable in understanding what factors influence people's decision to take up an apprenticeship and continue with the training. If you would like further information regarding any aspect of this project, you are welcome to contact me via the phone number and email address listed above.

Participation in this study is voluntary. I ask you to put your name and contact details on the survey for two reasons. First, there will be up to 4 surveys biannually, and I need to be able to match up your responses to these later time-points. Second, I hope to include your views if you are not attending this trade school in the future. I may need to contact you through the post or a telephone call for future surveys if you have moved. I will also invite a small number of participants if they would be interested to share about whether and how their apprenticeship experience changed through their course. Names will in no way be used in the reporting of results, and you are under NO OBLIGATION to agree to a follow-up survey or interview if you participate in this survey. You can withdraw from further participation at any time, without having to give a reason and without consequences. Any refusal to participate or withdraw from the study will not prejudice your care, employment or academic progress in any way.

All responses will be kept strictly confidential and findings reported will be in the form of group averages, so that no individual, training organisations, or employers will be identifiable. Results will be published in reports, academic journals and presented at research conferences. Data will be entered by experienced data entry professionals, and surveys will be kept in a secure location in a locked filing cabinet in Tim Powers' office. The paper-based surveys will be destroyed on completion of the project.

If you have any questions or concerns about the study, please feel free to contact me, Tim Powers, at any time. If you agree to participate in the study, please sign and date the consent form overleaf, answer the questions in the attached questionnaire, and hand it to the person conducting the survey. Alternatively, you can take the questionnaire away to complete at another time if more convenient, and return it to the address on the back page of the survey.

If you would like to receive a summary of the research findings, please contact me anytime. The findings will be accessible for a period of 10 years. Thank you for your consideration!

Tim Powers  
19 January, 2015

The ethical aspects of this study have been approved by the Monash University Human Research Ethics Committee (MUHREC). If you have any complaints concerning the manner in which this research CF14/3965 - 2014002054 is being conducted, please contact the Executive Officer. Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome:

- T: (03) 9905 2052                      E: muhrec@monash.edu
- Research Office, Building 3e, Room 111, Monash University VIC 3800

**PLEASE DETACH THIS INFORMATION FORM AND KEEP IT FOR YOUR RECORDS**

## Appendix I – Survey Administrator Form

## **ADMINISTRATOR INSTRUCTIONS AND CLASS INFORMATION (TIME 1)**

**Tim Powers**  
Monash University  
Faculty of Education  
Tel: (03) 5221 2191  
Mob: 0425 873 733  
tim.powers@monash.edu

**Who is filling out the survey?**

- 1<sup>st</sup> and 2<sup>nd</sup> stage/year apprentices
- ONLY apprentices in plumbing, electrical, bricklaying and carpentry  
(NOTE: ONLY include apprentices in other courses if they are embedded in the same class/unit. For example, cabinetry with carpentry, or fire with plumbers)

**When?**

- 1<sup>st</sup> stage/year apprentices – Any time after 3-4 days of attendance during January, February or March 2015. They need some familiarity to answer the questions on the training experience.
- 2<sup>nd</sup> stage/year apprentices – Any time during January, February or March 2015

**Where?**

- In a classroom or quiet space where they can concentrate uninterrupted.

**STEPS FOR CONDUCTING THE SURVEY**

1. Hand out surveys
2. Instruct apprentices to read and tear off "PARTICIPANT EXPLANATORY STATEMENT" (first page) if they consent to participate. This page is for them to keep. It describes the purpose of the project, voluntary participation, confidentiality, and my contact details.
3. The "PARTICIPANT CONSENT FORM" stays attached to the surveys. Apprentices who volunteer to participate, need to sign this form for my records.  
  
**NOTE:** Please ensure apprentices answer both 'consent to participate' lines in the top box. The value of this study is in apprentices participating in this survey AND the future survey(s).
4. Name of the class / group. Please instruct apprentices to fill in the group identification/name your RTO uses, on page 1 of the survey – top right-hand corner. This will make it easier to locate the apprentices for their next survey.
5. Collect surveys and seal them together in a large envelope – 1 group per envelope.
6. Mail to: Mr. Tim Powers  
The FLARe Project (Room 313)  
Faculty of Education  
29 Ancora Imparo Way  
Monash University, VIC, 3800

**Please fill in the information on the other side of  
this sheet and SEND IN WITH apprentices' surveys.**



## ATTENDANCE FOR FIRST SURVEY (TIME 1)

**Tim Powers**  
Monash University  
Faculty of Education  
Tel: (03) 5221 2191  
Mob: 0425 873 733  
tim.powers@monash.edu

**This is to be filled in by the person administering the survey. You can fill this in while the apprentices are filling in their surveys. Please include this form with the returned surveys, so we can keep this information matched with the group.**

Today's date	<input type="text"/> D	<input type="text"/> D	<input type="text"/> M	<input type="text"/> M	<input type="text"/> Y	<input type="text"/> Y	<input type="text"/> Y	<input type="text"/> Y
Name of trade school:					Campus:			
Suburb:					Postcode:			

<b>Describing the apprentices in the group you are administering the survey to:</b>	
Which trade?	<input type="checkbox"/> Bricklaying <input type="checkbox"/> Carpentry <input type="checkbox"/> Electrical <input type="checkbox"/> Plumbing <input type="checkbox"/> Other: _____
What stage/year are these apprentices in?	1 <sup>st</sup> <input type="checkbox"/> 2 <sup>nd</sup> <input type="checkbox"/> <input type="checkbox"/> Other: _____
How many are enrolled in this class? (In other words, how many did you expect to be attending today?) <div style="border-bottom: 1px solid black; width: 150px; margin-left: 300px;"></div>	
How many are in attendance today? <div style="border-bottom: 1px solid black; width: 150px; margin-left: 300px;"></div>	
What name do you give this class / group in front of you today? (e.g., stage1-group2, 15B) <div style="border: 1px solid black; width: 300px; height: 20px; margin-left: 300px;"></div>	
Please remember to instruct apprentices to fill in their class / group identification/name your RTO uses, on page 1 of the survey – top right-hand corner.	
<b>Thank-you !</b>	

**Please fill in the above and SEND IN WITH  
apprentices' surveys.**



# FLARe

Factors Lifting Apprenticeship Retention

## Highlight 2

### Trade School Impact: Who is planning to stay or go?



Trade school training can motivate (or demotivate) apprentices in various ways. These motivations have a direct bearing on their intentions to stay in their apprenticeship, job and field of occupation – the focus of this report. The “job” is distinguished from occupation, since an apprentice may intend to leave a current employer, while still remaining committed to the trade.

**Why trade school matters?** Apprentices who are motivated at trade school are more likely to persist with their training, stay in their job and remain in their occupation. That is, there is a direct impact if they think trade school is important, useful for their future work, and suited to their abilities; or, takes too much effort and emotionally burdensome. The correlations presented below show clear associations.

The FLARe project is following beginning trade apprentices over time, to identify what motivates them to complete their apprenticeship and commit to their trade. These highlights are from the first survey in early 2015; involving 2,057 surveyed apprentices across Australia, from 30 trade schools and 238 classes representing bricklaying, carpentry, electrical and plumbing trades. 44 factors were measured in detail, specifically tuned to the trades. Next surveys and interviews are currently underway.

#### Correlation between motivations and apprenticeship persistence, occupation/job turnover

Trade school motivations	Apprenticeship persistence	Occupation turnover intentions	Job turnover intentions
Importance	.40	-.31	-.18
Usefulness	.40	-.34	-.20
Ability	.33	-.23	-.09
Effort not worth it	-.44	.54	.39
Emotional cost	-.29	.39	.28

\* all correlations are statistically significant. A positive correlation means that as one factor increases, so too does the intersecting factor. A correlation greater than 0.3 is considered moderate, and greater than 0.5 is considered strong.

- Apprentices intending to continue their apprenticeship studies are more likely to perceive their trade school training as **important**, **useful**, suited to their **abilities**, and lower in **effort** and **emotional cost**.
- Apprentices with intentions to leave their job or occupation are more likely to perceive their trade school as less important, useful, suited to their abilities, not worth the effort and emotionally taxing.

It may seem unsurprising to see the relationship between trade school experiences and planned apprenticeship persistence; however, it is important to know which motivations are most important to promote or undermine apprenticeship retention. It is important to additionally note the relationship trade school motivations have with future intentions to leave the job and occupation.



### Can we predict who is at risk in their apprenticeship?

While we can see how individual trade school motivations rise or fall in tandem with planned apprenticeship persistence, occupation- and job-turnover intentions, the end game is to predict who is at risk. Do all trade school motivations predict equally well? The answer is no. Five motivations alone explain 42% of the variance in apprentices' intention to persist in their apprenticeship, when we look at how motivations perform in combination to predict persistence and turnover<sup>1</sup>. This reveals which motivations are the more important predictors, after taking into account all of the other motivations.

Apprentices who find attending trade school **emotionally** worrisome or are unconvinced it is **worth the effort** are less likely to persist in their apprenticeship. Even though the **importance**, **usefulness** and perceived learning **ability** in trade school play a part in predicting apprenticeship persistence, these motivations are not as influential as the negative impact of effort and emotional worry. While developing the necessary skills and underpinning knowledge are critical, how the learning process is perceived does matter.

Trade school motivations	Predicting apprenticeship persistence
Effort not worth it	-.60
Emotional cost	-.40
Usefulness	.25
Importance	.23
Ability	.17
<b>TOTAL variance explained</b>	<b>42%</b>

### Who is likely to leave the trade?

Apprentices' motivations for trade school training are better at predicting intentions to leave the occupation (i.e. trade), as compared to predicting intentions to leave their current job. Although we have not yet looked at on-the-job factors, it is somewhat surprising that trade school motivations explain 39% of the apprentices' intention to leave the occupation. Although, trade school motivations show a similar trend in their effect on both categories of turnover, we will see in later highlights, that the on-the-job experience is more important to predicting job turnover intentions.

Trade school motivations	Predicting occupation turnover intentions	Predicting job turnover intentions
Effort not worth it	.56	.42
Emotional cost	.37	.28
Usefulness	-.15	-.11
Importance	-.14	-.10
Ability	n.s.*	n.s.*
<b>TOTAL variance explained</b>	<b>39%</b>	<b>18%</b>

\* n.s. = not significant

Although these results are from a single time point, they do emphasise the importance of

motivating apprentices to attend trade school. Explaining why trade school training is worth the effort, while also confronting the emotional worries of attending/learning in trade school are key factors for increasing completion rates. Even though the employer is an important stakeholder in the apprenticeship scheme, apprentices' own motivations to attend trade school are core to their intentions to stay or go. Apprentices show an ability to overlook a poor job situation, and remain in the occupation, if they feel trade school training is worth the effort, useful for future work, not emotionally worrisome, and important to them personally.

<sup>1</sup> Structural Equational Modelling

### Contact FLARe:

Tim Powers  
tim.powers@monash.edu  
Mob: 0425 873 733

