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**The relationship between epistemological beliefs and the propensity  
for lifelong learning.**

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## Abstract

The characteristics of lifelong learners have been extensively discussed in the literature and generally encapsulate two broad dimensions; skills and abilities related to learning, and beliefs about learning and knowledge. This study examined the factors that may predict such characteristics and thus an individual's propensity to engage in lifelong learning in a sample of university students. Together, openness to experience, change readiness, approaches to learning, self-efficacy and epistemological beliefs significantly predicted lifelong learning characteristics. In particular, the unique contribution of epistemological beliefs to the profile of a lifelong learner was supported. Results indicate that these beliefs may be a key predictor of lifelong learning.

## Introduction

The focus on graduate skills and attributes in the higher education sector has been strengthening for a number of years. It has been argued that graduate skills and attributes such as critical thinking, problem-solving, communication and information management skills, intellectual creativity, and ethical practice, should characterize the fundamental achievements of higher education (Higher Education Council, 1992). A capacity for, or commitment to, lifelong learning is one particular attribute that is currently being given considerable attention by higher education institutions, as well as industry and employer groups who recognize the value of, and need for, these skills in the workforce (Cervero, 2000; Kember, Leung and Ma, 2007; London and Mone, 1999). Many Australian universities have made statements regarding their graduate outcomes such as; “A graduate...is prepared for lifelong learning in pursuit of personal development and excellence in professional practice” (University of South Australia, 2007); and that graduates become “critical and creative thinkers, with an aptitude for continued self-directed learning” (University of Melbourne, 2007).

### *Lifelong learning*

Lifelong learning has been characterised as the "capacity to respond flexibly to changing circumstances, to learn throughout a career, and to integrate theory and practice...to deal capably with previously unmet situations" (Bligh, 1982), but also more broadly, embracing learning in a variety of formal, informal, planned and opportunistic settings (Candy, Crebert, and O'Leary, 1994). It is considered important not only for national competitiveness, but also social cohesion; as Berman (1984, 105) states, lifelong learning is “necessary if one is to be a useful and productive citizen both of the immediate and the broader community”. However, there has been debate regarding who should be responsible for ongoing education - tertiary institutions, professional associations, or the individual

themselves – and whilst some argue that the individual should take a major responsibility, it is also suggested that many professionals may not have actually gained the required skills and abilities needed for lifelong learning (Livneh and Livneh, 1999).

Research into the characteristics of lifelong learners has tended to focus on demographic and socioeconomic variables (e.g., gender, self and familial education level, employment position) as predictors of engagement in lifelong learning activities (Desimone et al. 2002; Gorand et al. 1998; Leonard, 1994; Smylie, 1988), rather than examining development of lifelong learning characteristics themselves. Several studies have also sought to develop instruments to measure lifelong learning, such as the Characteristics of Lifelong Learning in the Professions (CLLP) survey (Livneh, 1988) and the Oddi Continuing Learning Inventory (OCLI; Oddi, 1986). These studies however have produced inconclusive results particularly in terms of factor structure and predictor variables (Marra, Campese and Litzinger, 1999).

For example, the CLLP factor structure differed across three studies of professional groups; educators (Livneh, 1998), pharmacists (Hanson and DeMuth, 1992) and human services workers (Livneh and Livneh, 1999). Those factors that were significant predictors of ongoing learning also differed. For example, ‘educability’ and ‘future orientation’ scales predicted engagement for educators, whereas ‘self-motivated learning’ and ‘external motivation’ predicted engagement for the human services. Similarly, although the OCLI includes three factors which were generated on a theoretical basis (proactive vs. reactive drive; commitment vs. apathy, and cognitive openness vs. defensiveness) results from the original scale development study were weak, with no clear factor structure emerging based on these theoretical constructs (Oddi, 1986).

Whilst being able to predict existing professionals’ propensity to engage in lifelong learning is important, a more pertinent question for higher education institutions is whether

students are developing a belief in, and commitment to, lifelong learning. Therefore, taking a step back and looking at the factors that contribute to the characteristics of lifelong learning themselves can form an important part of developing educational practices that support students in becoming lifelong learners. Recent research has examined the nature of learning environments that are associated with the development of generic capabilities, such as the skills necessary for lifelong learning (Kember et al. 2007) but knowledge of the underlying factors within the individual that are required for the development of such skills is needed for deliberate and successful intervention at this level.

Perhaps one of the most influential writers on lifelong learning is Candy (1991; Candy et al. 1994), who has proposed five key attributes of the lifelong learner: (1) an inquiring mind (love of learning, sense of curiosity); (2) helicopter vision (awareness of how knowledge is created and limitations of this); (3) a sense of personal efficacy (positive self-concept as a learner); (4) information literacy (skills to research, manage, evaluate information); and (5) a repertoire of learning skills (knowledge of own strengths, range of strategies and ability to apply these). Similarly, Knapper and Cropley (2000, 170) describe several attributes of a lifelong learner, including: being able to plan and assess their own learning; being active rather than passive learners; learning in both formal and informal settings and from peers, teachers, mentors and others; being able to integrate knowledge from different subject areas; and use different learning strategies for different situations. As suggested by Livneh and Livneh (1999), these studies also seem to indicate that there are two major elements in lifelong learning: having possession of the necessary learning skills and intellectual ability, as well as the internal motivation to gain further knowledge.

#### *Associated characteristics for lifelong learning*

The above list of lifelong learning attributes can be linked to several well-known constructs that are used to describe and understand individuals. For example, information

literacy and learning skills are often examined in relation to students' *approaches to learning* or studying (e.g., Biggs, 1987). Personal efficacy, or *self-efficacy* (Bandura, 1986), is an enduring concept in human behaviour research, particularly in relation to learning (Pajares, 1997). Having 'an inquiring mind' or a sense of curiosity, can be linked to personality constructs such as '*openness*' (Cattell, 1965) and, in terms of learning and development, '*change readiness*' (Kriegel and Brandt, 1996). Finally, a 'helicopter vision', the awareness of how knowledge is created and also its limitations, could reflect the need for an individual to have developed sophisticated epistemological awareness, or *epistemological beliefs* – that is, beliefs about knowledge and learning that reflect the changing, sometimes uncertain and complex nature of knowledge (Pintrich, 2002), including beliefs regarding what is knowledge, how we come to know, what can be known and what cannot (Brookfield, 2000). Therefore, this final characteristic is perhaps the 'keystone' of being a lifelong learner, because along with having the skills and ability for lifelong learning, an individual would need to have a certain view or particular beliefs about knowledge in order to also possess the internal motivation to engage in a process of discovering new knowledge or building on existing knowledge. These five constructs will be reviewed in turn, in order to situate the current study within the relevant literature.

*Approaches to learning.* The way students approach their learning, the strategies they use and the motivations that drive their actions has been the focus of much educational research. Although different models and measures have been developed (Biggs, 1987; Entwistle and Ramsden, 1983; Pintrich et al. 1993), typically two broad dimensions are used to describe students' approaches to learning and studying; the surface or reproducing approach, and the deep or meaning approach. A surface approach is typically characterised by a focus on repetitive learning or superficial memorising of facts and details, rather than attempts to search for meaning and understanding, integrating new information with existing

knowledge, which are more typical of a deep approach. Approaches to learning have been examined in relation to learning environments, student characteristics, teaching style, type of learning activity, and so on. Generally, a deep approach is more likely to be associated with high quality learning outcomes compared to a surface approach (Biggs, 2003). Approaches to learning have also been used to examine information literacy skills such as information-seeking behaviours (e.g., Heinström, 2000), where students who show a deep approach tend to gather information from many sources in order to form their own opinion, but students with a surface approach tend to focus on superficial information and seek out only what is cued as the important sources (Ford, 1986). Also, research has shown that academic achievement is significantly related to learning approaches, which in turn, are related to epistemological beliefs (Cano, 2005). Specifically, students with naïve beliefs are more likely than their peers to use surface approaches and have poorer academic learning outcomes. These findings align somewhat with the notion that epistemological beliefs may provide an important underpinning to the development of lifelong learning capabilities.

*Self-efficacy.* Bandura's (1986) well-known theory of human action has at its core the notion of self-efficacy. Self-efficacy represents a person's beliefs and judgements about his/her ability to accomplish a task or succeed in some endeavour, and these beliefs can determine how people feel, think, motivate themselves and behave. The relationship between self-efficacy and learning is strong, and can be influential in different ways (Pajares, 2002) including the choices students make, the effort expended on a learning activity, perseverance and resilience, and the degree of stress and anxiety experienced whilst engaged in learning. Studies have found that self-efficacy is significantly related to personal goals and academic performance (Mone, 1994), as well as cognitive strategy use in the classroom (Pintrich and DeGroot, 1990). Firmin and Miller (2005) argue that lifelong learners are motivated to learn through a positive attitude, confidence in themselves and the ability to manage negative

feelings effectively. Smylie (1988) examined the antecedents to individual teacher development and found that personal efficacy had the most direct impact on staff engagement in change and development. Therefore, individuals with high self-efficacy are more likely to be engaged in lifelong learning.

*Openness to experience.* Of the core personality traits identified in the literature, openness to experience is one that is of most interest to education. Individuals who show openness to experience are described as ‘...curious, original, imaginative, creative, and unconventional and have a broad spectrum of interests’ (Blickle, 1996, 338). Openness can impact on learners’ motivation and engagement as well as their use of strategies and persistence after failure (Blickle, 1996). For example, Farsides and Woodfield (2003) examined academic success up to 3 years after final grading, and found that openness to experience significantly predicted student performance even when including measures of intellect, application and motivation. Also, along with need for achievement, openness to experience has been related to intelligence and creativity in a group of adults (Harris, 2004), as well as decision-making performance in a changing task context (Lepine, Colquitt and Erez, 2000). Moreover, in terms of lifelong learning, Barrick and Mount (1991) found that of the “Big-5” personality dimensions, openness was consistently related to job performance specifically through training proficiency across a range of occupations, including professionals, police, managers, salespersons, skilled and un-skilled workers.

*Change Readiness.* The concept of ‘change readiness’ has traditionally been examined in relation to psychotherapy and health behaviour concerns such as addiction and obesity (e.g., Prochaska, Redding and Evers, 1997), and also within the organisational context, examining workers adaptability, motivation, or willingness to change (e.g., Ingersoll et al. 2000). It is through the relationship to organisational research that change readiness has also been explored in relation to adult learning (Rogers, 1995; Cervero, 1985). Cervero’s model

for understanding how behavioural change is brought about in a workplace system through continuing professional education, includes organisational characteristics and individual characteristics such as motivation to change and learning style. Indeed, Gunzburger (2007) reported that along with high-school class rank and parents' level of education, tendency for change was strongly related to continuous learning in a sample of medical students. More directly, in Kolb's (1984, 213) well-known work on adult learning he theorised that 'adaptive flexibility' is an important aspect to lifelong learning and development, whereby 'Adaptive flexibility and the mobility it provides...are the means by which people transcend the fixity of their specialised orientation...Fixity...implies the closing of growth...".

*Epistemological beliefs.* Epistemological beliefs historically have been viewed as developmental in nature, and as such more sophisticated beliefs are associated with age and experience (Hofer, 2001). Research by Perry (1970) based on in-depth interviews with college students indicated that when students begin university they see knowledge as either right or wrong, as handed down by authority. With the accumulation of more knowledge comes the realisation that truth is relative to context. At the final stage of development, students are aware of multiple perspectives, and the need to commit to their own ideas at times. Following this initial work by Perry, many researchers have developed models consisting of similar developmental sequences (e.g., Baxter Magolda, 1992; Kitchener and King, 1981).

However, an alternative approach is the system model conceptualised by Schommer (1990), which assumes that personal epistemology is comprised of different dimensions which can develop at different rates. For example, an individual may believe that knowledge can be interrelated (sophisticated belief), while still believing in the certainty of knowledge (naïve belief). Schommer hypothesized that there were five distinct beliefs related to epistemology, including the fixed ability to gain or generate knowledge (fixed ability vs.

acquired ability), simple knowledge (simple vs. complex), certain knowledge (certain vs. tentative), quick learning (quick vs. gradual acquisition) and source of knowledge (authority vs. observation) which is sometimes referred to as omniscient authority. Subsequent studies have provided varying levels of support for these factors, with four-factor structures (excluding source of knowledge) tending to be reported by other researchers (e.g., Bendixen, Dunkle and Schraw, 1994).

Epistemological beliefs have consistently been reported to be significantly related to learning outcomes (Cano, 2005) and other associated variables such as learning goals (Cavallo et al. 2003), comprehension and interpretation of information (Schommer-Aikins and Hutter, 2002), conceptual change (Qian and Alvermann, 1995), and reasoning (Bendixen et al., 1994), where students with naïve beliefs tend to be less successful than students with sophisticated epistemological beliefs. A small number of studies have examined epistemological beliefs along with concepts such self-regulated learning (Paulsen and Felman, 2005; 2007) but not lifelong learning. Paulsen and Feldman found that students with sophisticated epistemological beliefs were more likely than their peers to engage in positive motivational, cognitive and behavioural self-regulated learning strategies. Boden (2005) also reported a significant relationship between epistemological beliefs and university students' perceptions of readiness for self-directed learning, particularly in terms of openness to learning opportunities, view of self as an effective and independent learner, responsibility and initiative, and creativity in learning; concepts which parallel many of Candy et al's (1994) characteristics of lifelong learners. Also, others have reported that self-regulated learners tend to have sophisticated beliefs about knowledge and learning (Hofer, 2001), and that together, self-regulated learning and epistemological beliefs might be effective predictors of performance (Bell, 2006).

*Current study*

While research has focussed on using measures of lifelong learning characteristics in order to predict engagement in lifelong learning activities, examining predictors of these characteristics themselves has been given little focus. Given the importance of lifelong learning as an attribute of graduates of the higher education process, the purpose of the present study was to examine potential predictors of a lifelong learner. The key constructs identified above - approaches to learning, self-efficacy, openness to experience, change readiness and epistemological beliefs - are hypothesised to be significantly related to the characteristics of lifelong learning. Following the proposition that sophisticated epistemological beliefs are a 'keystone' characteristic of being a lifelong learner, it is also hypothesised that after accounting for all other constructs, epistemological beliefs will significantly add to the prediction of lifelong learning.

## Method

### *Participants*

The sample consisted of 110 university students who took part voluntarily in the study. Participant ages ranged from 16 to 65 (Mean = 22.50, SD = 8.47), with the majority being under 22 years (70%). Most participants were female (75%) and were studying full-time (87%) in a range of disciplines including health sciences, arts, education, law and business. The majority of participants identified their nationality as Australian (74%) with the remaining from a variety of countries in Africa, Asia, the Middle East, Europe and America.

Participants' level of education was predominantly senior high-school (61%), with 12% having completed a certificate or diploma, and 22% held at least a bachelor degree. Mother's and father's level of education were similarly distributed, with the majority having completed junior high school (31% and 24%) or senior high-school (23% and 15%), a

bachelor degree or higher (25% and 32%), certificate/diploma (9.5% and 10%), or trade certificate (7% and 14%).

### *Materials and Procedure*

Participants completed a questionnaire including demographic questions (age, gender, year level, program of study, self and parent education level) followed by the measures of lifelong learning, approaches to learning, self-efficacy, openness, change readiness, and epistemological beliefs. The questionnaire took appropriately 20 minutes to complete. Each of these measures is described below.

*Lifelong learning (LLL).* The lifelong learner profiles discussed in the literature (Candy et al. 1994; Knapper and Cropley, 2000) were used in conjunction with the CLLP (Liveneh, 1998) to generate a list of items which covered the five characteristics important for lifelong learning, as discussed above: an inquiring mind; helicopter vision; personal efficacy; information literacy; and learning skills. Participants respond to each item using a 7-point Likert agreement scale where 1 = strongly disagree and 7 = strongly agree. There were 39 items in total, with some being negatively worded in order to avoid response bias. These were recoded, such that higher scores reflect a greater tendency for lifelong learning.

*Approaches to learning (AL).* The Approaches to Study Questionnaire (short-form) is a 32-item measure which includes two main approaches to learning, the meaning and reproducing orientations (Richardson, 1990). The *meaning orientation* contains four subscales (deep approach, comprehension learning, relating ideas, and use of evidence and logic), as does the *reproducing orientation* (surface approach, improvidence, fear of failure, and syllabus-boundedness). Satisfactory levels of test-retest reliability and internal reliability have been reported (Richardson, 1990), although the main factors are generally more stable and reliable than the subscales. Responses are made using a 5-point Likert scale, where 1 = disagree very much, and 5 = agree very much. Higher scores on all scales indicate a stronger

tendency toward the particular approach. As it is recognized that learning approaches tend to be context dependant, and can vary within the individual, participants were asked to give the answer that applies to them generally, in the majority of situations.

*Self-efficacy (SE).* The General Self-Efficacy Scale (Sherer et al. 1982) comprises 17 items which participants respond to using a 14-point Likert agreement scale (1 = strongly disagree and 14 = strongly agree), and higher scores are associated with more positive self-efficacy. The scale was designed to measure generalized feelings of competence rather than being specific to a particular situation/behaviour (e.g., “I give up easily”, “When I make plans, I am certain I can make them work”). The scale has shown sound internal reliability ( $\alpha = .71$  to  $.86$ ), and there is also evidence of construct validity with strong correlations between this scale and related constructs such as locus of control, interpersonal competence, and self-esteem (Sherer et al. 1982).

*Openness to experience (O).* Goldberg’s International Personality Item Pool (IPIP; 1999) personality inventory includes an Openness to Experience scale that includes six subscales, each including 10 items (5 items positively worded and 5 items negatively worded): *Imagination* (e.g., “I like to indulge in my fantasies”); *Artistic Interests* (e.g., “I see the beauty in things that others might not notice”); *Emotionality* (e.g., “I enjoy examining my feelings about myself and my life”); *Adventurousness* (e.g., “I would prefer to stick to doing things that I know”); *Intellect* (e.g., “I am not interested in theoretical discussions”); and *Liberalism* (e.g., “I believe that there is no absolute right or wrong”). All subscales have sound internal reliability ( $\alpha = .77$  to  $.86$ ). Responses are made using a 5-point Likert scale, where 1 = very inaccurate of me, and 5 = very accurate of me (note: the Liberalism subscale was not included in this study).

*Change readiness (CR).* Kriegel and Brandt (1996) developed a measure of change-ready traits in relation to personnel and business management containing seven subscales;

*Resourcefulness* (e.g., “I look in unusual places to find solutions”), *Optimism* (e.g., “I believe in not getting your hopes too high”), *Adventurousness* (e.g., “I prefer the familiar to the unknown”), *Drive* (e.g., “I can’t wait for the day to get started”), *Adaptability* (e.g., “It’s hard to give up on something even if it isn’t working out”), *Confidence* (e.g., “I rarely second-guess myself”) and *Tolerance for Ambiguity* (e.g., “I hate to leave things unfinished”).

Responses are made on a 6-point Likert agreement scale (1 = strongly disagree, 6 = strongly agree).

*Epistemological beliefs (EB)*. The Epistemic Beliefs Inventory (Schraw, Bendixen and Dunkle, 2002) is a 28-item instrument modelled from Schommer’s (1990) original five-factor measure of epistemological beliefs. The five factors include *Omniscient Authority* (e.g., “People shouldn’t question authority”), *Certain Knowledge* (e.g., “What is true today will be true tomorrow”), *Quick Learning* (e.g., “Working on a problem with no quick solution is a waste of time”), *Simple Knowledge* (e.g., “Instructors should focus on facts instead of theories”), and *Innate Ability* (e.g., “How well you do in school depends on how smart you are”). Responses are made on a 5-point Likert agreement scale, where 1 = strongly disagree and 5 = strongly agree. Internal reliability estimates are moderate ranging from .58 to .68 (Schraw et al., 2002). Higher scores indicate more naïve beliefs.

## Results

### *Preliminary Analyses*

Table 1 presents the descriptive statistics for all scales, including bivariate correlations, means and reliabilities. Scale reliability was checked for all existing measures including subscales. The self-efficacy (SE) and openness to experience (O) measures showed good internal consistency for existing scales and subscales. The change readiness (CR) subscales showed poor reliability, with Cronbach’s alpha being below .60 for four of the seven scales. Similarly, the epistemological beliefs (EB) scales as per previous analyses (Nussbaum and

Bendixen, 2003; Schraw, et al., 2002) did not show sound internal consistency. Therefore, the EB and CR measures were factor analysed using Principal Components Analysis with Varimax rotation.

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 Table 1. about here  
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Analysis of the EB items revealed three factors that were interpretable, although scale reliabilities were only marginally improved ( $\alpha = .59$  to  $.68$ ). These three factors reflected constructs similar to previous studies, but in slightly different clusters. For example, the first factor reflected the stability or *certainty of knowledge and learning* (e.g., “Most things worth knowing are easy to understand”; “If you don’t learn something quickly, you won’t ever learn it”). The second factor reflected a belief in *simple knowledge and authority* (e.g., “Too many theories just complicate things”; “People shouldn’t question authority”). The final factor reflected a belief in the *innate ability and success* of individuals (e.g., “Smart people are born that way”, “How well you do in school depends on how smart you are”).

Analysis of the CR items revealed four interpretable factors, with reasonable internal reliabilities ( $\alpha = .61$  to  $.77$ ). The first factor reflected an individual’s tendency for *problem-solving and coping* (e.g., “If things aren’t going well, I’ll find a way to make them work out”), while the second factor reflected *pessimism* (e.g., “I believe in not getting your hopes up too high”). The third factor reflected an individual’s need for *familiarity and closure* (e.g., “I get frustrated when I can’t get a grip on something new”; “I hate to leave things unfinished”), and the final factor reflected an individual’s difficulty with *ambiguity* (e.g., “I don’t like dealing with issues that have no clear answers”).

*Lifelong Learning.* The Lifelong Learning (LLL) measure was also analysed using Principal Components Analysis (PCA) in order to establish its factor structure. After

inspection of initial communalities, 10 of the 39 items had values less than .3, and so were removed from further analysis. PCA was again computed, and results showed that there were two interpretable factors, accounting for 44% of the variance (eigenvalues = 9.87 and 2.31). The first factor represented *beliefs* about learning and knowledge, and the second factor represented an individual's *abilities* in relation to learning and development (see Table 2 for items and factor loadings). Internal reliabilities were high for both factors ( $\alpha = .86$  and  $.85$ , respectively), as well as for the overall measure ( $\alpha = .88$ ).

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 Table 2. about here  
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#### *Prediction of the characteristics of lifelong learning*

Bivariate correlations among the predictor variables and LLL showed that all scales and subscales were significantly related to lifelong learning except two CR scales, *familiarity* and *ambiguity*. Age was not significantly related to LLL, and showed only weak significant correlations with one EB scale (*certainty*) and one CR scale (*familiarity*), and so it was not included in the model. To predict the characteristics of lifelong learning, and test the notion that epistemological beliefs are a 'keystone' component of lifelong learning development, a hierarchical multiple regression analysis was conducted. At step one, SE, AL, O, and CR measures were entered, and EB were entered at step two (see Table 3). Regression diagnostics showed that the assumptions of normality, linearity and homoscedasticity of residuals were met. Mahalanobis distance statistics and Tolerance values showed no evidence of multivariate outliers or multicollinearity.

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Overall, the model accounted for 57.4% ( $Adj R^2$ ) of the variance in lifelong learning,  $F(13, 86) = 11.28, p < .0001$ . At step 1, self-efficacy, approaches to studying, openness to experience and change readiness accounted for 54.9% ( $Adj R^2$ ) of the variance in lifelong learning,  $F(10, 89) = 5.77, p < .0001$ . *Meaning orientation* (AL scale) ( $\beta = .26, t = 3.32, p < .001$ ), *pessimism* (CR scale) ( $\beta = -.19, t = -2.09, p < .05$ ), and *intellect* (O scale) ( $\beta = .36, t = 3.54, p < .001$ ) were all significant individual predictors. At step 2, epistemological beliefs accounted for a significant additional 3.6% of the variance in lifelong learning,  $F change(3, 86) = 2.80, p < .05$ . Of the EB scales, *certainty of knowledge and learning* ( $t = -2.62, p < .01$ ) was a significant individual predictor, but *innate ability and success* and *simple authority* were not. Examination of the beta weights for the predictor variables in the final model indicated that *certainty of knowledge and learning* ( $\beta = -.27$ ) and openness of *intellect* ( $\beta = .27$ ) were the most important predictors of lifelong learning, followed by a *meaning orientation* to studying ( $\beta = .25$ ) and *pessimism* regarding change ( $\beta = -.18$ ).

## Discussion

The purpose of this study was to advance knowledge of the factors that may predispose an individual to engage in lifelong learning. As discussed above, the literature regarding lifelong learners generally focuses on two broad dimensions: (1) skills and abilities such as being able to plan and monitor their own learning, learning in a variety of settings and using a variety of strategies, and information literacy skills; and (2) beliefs about learning, themselves as learners, and knowledge. This study has attempted to operationalise these characteristics of a lifelong learner and assess the relative contribution of existing related constructs in the prediction of an individual's capacity for lifelong learning. In particular, the unique contribution of epistemological beliefs to the profile of a lifelong learner was examined, given the proposal that these beliefs are a key predictor of lifelong learning.

Results show that together, approaches to learning, self-efficacy, openness to experience, change readiness, and epistemological beliefs significantly predict the characteristics of a lifelong learner. In terms of the most important predictors of lifelong learning, those students who: hold sophisticated epistemological beliefs regarding the certainty of knowledge and learning (i.e., beliefs that knowledge is not always certain, that learning just doesn't 'happen'); have an openness to intellectual experiences (i.e., enjoy problem-solving, abstract ideas, challenging discussion); take an approach to learning that focuses on understanding and comprehension of meaning, relation of ideas and use of evidence and logic; and, have a positive attitude towards change are more likely than their peers to be lifelong learners.

Importantly, these results show that above and beyond approaches to learning, self-efficacy, openness to experience and change readiness, epistemological beliefs make an independent and significant contribution to the prediction of lifelong learning characteristics. Although this unique contribution is small, it is an encouraging result, and not surprising in its magnitude given the degree of intercorrelation among the predictor variables. However, on the assumption established in previous studies, that having the characteristics of a lifelong learner leads to engagement in continuous learning activities (e.g., Hanson and DeMuth, 1992; Livneh and Livneh, 1999), these findings point to the importance of focusing on the development of sophisticated epistemological beliefs in students when lifelong learning is a desired outcome of the educational process.

Epistemological beliefs and an openness to intellectual experience personality were the two most important individual predictors of the characteristics of lifelong learning. While it may be very difficult to impact on personality through educational design, specifically targeting epistemological belief development is a reasonable goal for curricula in higher education. Some research has already evaluated the effectiveness of educational

designs/interventions for changing students epistemological beliefs (e.g., Brownlee, Purdie and Boulton-Lewis, 2001; Gill, Ashton and Algina, 2004; Tolhurst, 2007; Valanides and Angeli, 2005). For example, Valanides and Angeli (2005) investigated the effects of teaching critical-thinking principles on undergraduate students' epistemological beliefs and found that in general, there was a tendency to show more sophisticated beliefs post-intervention. Course-level interventions (e.g., semester of study) have also been examined by Tolhurst (2007) and Brownlee et al. (2001) where teaching and learning activities (such as reflective diaries, small group and independent work, case study and research tasks) were specifically designed to develop students' epistemological beliefs. Results generally showed some move towards more sophisticated epistemological beliefs, although mostly these findings were weak. This most likely reflects the relatively short time-span examined, and is not surprising given that other studies have shown the development of epistemological beliefs in students can take several years (e.g., Cano, 2005). However, there is scant attention paid to the development of epistemological beliefs through published large-scale curriculum evaluations (e.g., program level, such as a bachelor degree). Whilst it is consistently reported that age and education are positively related with epistemological beliefs, little thorough examination of how best to facilitate the development of sophisticated epistemological beliefs has been conducted. Moreover, given the likelihood that students studying in different disciplines show differences across the dimensions of epistemological beliefs as well as different developmental trajectories (Bath, Smith and Dalgleish, 2007; Hofer, 2004), and that teaching and curriculum design also differs across disciplines (Hativa and Marinovich, 1995), it is important that any future research in the area take such factors into account.

### *Limitations and conclusions*

The purpose of this study was to examine the factors that may predispose an individual to engage in lifelong learning, by measuring well-established constructs that were

directed related to the key characteristics of lifelong learners that have been described in the literature. The results of this study are therefore dependant on the measures chosen, and whilst the majority of scales had sound to strong reliability, there were some instruments that showed weaker levels of internal consistency. Also, it is recognised that with any measure of individual characteristics, there exists the issue of permanency versus context specificity. For example, the personality and approaches to learning measures asked students to consider themselves or their experiences, *in general*, when responding to items. Obviously, this does not capture the full range of variations within and between individuals on these constructs, and the approaches to learning measures particularly emphasise that students may vary according to context or situation (Richardson, 1990). Moreover, there may have been several constructs that were not included, but are importantly related to the development of lifelong learning skills and beliefs in students. Whilst a substantial amount of the variance in lifelong learning characteristics was accounted for by the model there are obviously some variations between students that were not captured. Moreover, the method of analysis did not allow examination of indirect effects and relationships between variables, and so future research should endeavour to utilise more sophisticated methods such as structural equation modelling, in order to fully examine this potentially complex model.

In addition, the sample in this study was relatively small, and students were primarily in the beginning years of their university study. It is possible that these results may differ with a broader sample of students with greater university experience. However, it is also possible that the reported relationships, particularly between epistemological beliefs and lifelong learning, may actually strengthen as students' progress through university. Nevertheless, it is important that future research aim to examine the relationship between the development of epistemological beliefs and the propensity for lifelong learning in students at varying stages

of their university study. Moreover, as discussed above, it will be important to also consider discipline differences in any endeavour to tease out the specifics of this relationship.

In summary, it is well documented that higher education institutions, government and industry groups place great value on graduate students having developed the necessary skills and predispositions to engage in lifelong learning. Others have also argued for the importance of lifelong learning that goes beyond formal learning, for the betterment of individuals and society. However, it has also been argued that many individuals leave formal education without gaining the required skills and abilities needed for lifelong learning. Therefore, placing a focus on the development of lifelong learning attributes is a key concern for universities, and this study has aimed to contribute both theoretically and practically to this endeavour.

## References

- Bandura, A. 1986. *Social foundations of thought and action*. Englewood Cliffs, NJ: Prentice Hall.
- Barrick, M.R., and M.R. Mount. 1991. The Big-Five Personality dimensions and job performance: A meta-analysis. *Personnel Psychology*: 44 1-26.
- Bath, D.M., Smith, C.D., and M. Dalgleish. 2007. *Does the development of epistemological beliefs differ across academic domains of knowledge?* Manuscript submitted for publication (copy on file with author).
- Baxter Magolda, M. B.1992. Students' epistemologies and academic experiences: implications for pedagogy. *Review of Higher Education*: 15 265-87.
- Bell, P.D. 2006. *Can factors related to self-regulated learning and epistemological beliefs predict learning achievement in undergraduate asynchronous web-based courses?* Unpublished doctoral dissertation, North Carolina State University.
- Bendixen, L. D., Schraw, G., and M. E Dunkle. 1994. Epistemological beliefs and reflective judgement. *Psychological Reports*: 75, 1595-1600.
- Berman, L. M. 1984. Educating children for lifelong learning and a learning society. *Childhood Education*: 61, 99-106.
- Biggs, J.B. 1987. *Student approaches to learning and studying*. Hawthorn, Vic: Australian Council for Educational Research.
- \_\_\_\_\_.(2003. *Teaching for quality learning at university: What the student does* (2nd ed.) Buckingham: Society for Research into Higher Education/Open University Press.
- Bligh, E. 1982. *Professionalism and flexibility in learning*. (Leverhulm Series No 6 Ed.). Guildford: Society for Research into Higher Education.

- Blickle, G. 1996. Personality traits, learning strategies, and performance. *European Journal of Personality: 10*, 337-352.
- Boden, C.J. 2005. *An exploratory study of the relationship between epistemological beliefs and self-directed learning readiness*. Unpublished doctoral dissertation, Kansas State University.
- Brookfield, S. (2000). Adult cognition as a dimension of lifelong learning. In J. Field and M. Leicester (Eds.), *Lifelong learning: Education across the lifespan* (pp. 89-101). New York: Routledge and Falmer.
- Brownlee, J., Purdie, N., and G. Boulton-Lewis. 2001. Changing epistemological beliefs in pre-service teacher education students. *Teaching in Higher Education: 6*, 247-268.
- Candy, P. 1991. *Self-Direction for Lifelong Learning: A Comprehensive Guide to Theory and Practice*. San Francisco: Jossey-Bass.
- Candy, P., Crebert, G. and J. O'Leary. 1994. *Developing lifelong learners through undergraduate education*. NBEET. Canberra: AGPS
- Cano, F. 2005. Epistemological beliefs and approaches to learning: Their change through secondary school and their influence on academic performance. *British Journal of Educational Psychology: 75*, 203-221.
- Cavallo, A., Rozman, M., Blickenstaff, J., and N. Walker. 2003. Learning, reasoning, motivation and epistemological beliefs. *Journal of College Science Teaching: 33*, 18-23.
- Cattell, R. B. 1965. *The scientific analysis of personality*. Harmondsworth, England: Penguin Books.
- Cervero, R.M. 1985. Continuing professional education and behavior change: A model for research and evaluation. *Journal of Continuing Education in Nursing: 16*, 85-88.

- \_\_\_\_\_. 2000. Trends and issues in continuing professional education. *New Directions for Adult and Continuing Education: 86*, 3-12.
- Cummings, R. 1998. *How should we assess and report student generic attributes?* Paper presented at the 7th Annual Teaching and Learning Forum, The University of Western Australia, Nedlands.
- Desimone, L.M., Porter, A.C., Garet, M.S., Suk Yoon, K., and B.F. Birman. 2002. Effects of professional development on teachers' instruction: Results from a three-year longitudinal study. *Educational Evaluation and Policy Analysis: 24*, 81-112.
- Entwistle, N.J. and P. Ramsden. 1983. *Understanding Student Learning*. London: Croom Helm.
- Farsides, T., and R. Woodfield. 2003. Individual differences and undergraduate academic success: the roles of personality, intelligence, and application. *Personality and Individual Differences, 34*: 1225-1243.
- Firmin, S., and C. Miller. 2005. *Facilitating the development of lifelong learners through e-communication tools*. Paper presented at ASCILITE 2005 Conference, 4-7 December, Brisbane, Queensland
- Ford, N. 1986. Psychological determinants of information needs: A small-scale study of higher education students. *Journal of Librarianship: 1*, 47-61.
- Gill, M. G., Ashton, P. T., and J. Algina. 2004. Changing preservice teachers' epistemological beliefs about teaching and learning in mathematics: An intervention study. *Contemporary Educational Psychology: 29*, 164-185.
- Goldberg, L. R. 1999. A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. In *Personality Psychology in*

- Europe Vol. 7*, ed I. Mervielde, I. Deary, F. De Fruyt, and F. Ostendorf , 7-28. Tilburg, The Netherlands: Tilburg University Press.
- Gorand, S., Rees, G., Fevre, R., and J. Furlong. 1998. Learning trajectories: Travelling towards a learning society? *International Journal of Lifelong Education: 17*, 400-410.
- Gunzburger, L.K. (2007). Can lifelong learners be identified during the selection process for professional schools? *Mobius: A Journal for Continuing Education Professionals in Health Sciences, 7*, 49-546..
- Hanson, A. L., and J.E. DeMuth. 1992. A study of pharmacists' behavior as lifelong learners. *American Journal of Pharmaceutical Education: 56*, 335-343.
- Harris, J.A. 2004. Measured intelligence, achievement, openness to experience, and creativity. *Personality and Individual Differences: 36*, 913-929.
- Hativa, N., and M. Marincovich. eds. 1995. *Disciplinary differences in teaching and learning: implications for practice*. San Francisco: Jossey-Bass.
- Heinström, J. 2000. The impact of personality and approaches to learning on information behaviour. *Information Research: 5*, 1-9.
- Higher Education Council. 1992. *Achieving Quality*. Canberra: Australian Government Printing Service.
- Hofer, B.K. 2001. Personal epistemology research: Implications for learning and instruction. *Educational Psychology Review: 13*, 353-382.
- \_\_\_\_\_. (2004). Exploring the dimensions of personal epistemology in differing classroom contexts: Student interpretations during the first year of college. *Contemporary Educational Psychology, 29*, 129–163.
- Ingersoll, G.L., Kirsch, J., Merk, S., and J.Lightfoot. 2000. Relationship of Organizational Culture and Readiness for Change to Employee Commitment to the Organization. *Journal of Nursing Administration: 30*, 11-20.

- Kember, D., Leung, D.Y.P, and R.S.F. Ma. 2007. Characterising learning environment capable of nurturing generic capabilities in higher education. *Research in Higher Education: 48*, 609-631.
- Kitchener, K. S., and P.M. King. 1981. Reflective judgment: Concepts of justification and their relationship to age and education. *Journal of Applied Developmental Psychology: 2*, 89-116.
- Knapper, C. and A. J. Cropley. 2000. *Lifelong learning in higher education*. London: Kogan Page.
- Kolb, D.A. 1984. *Experiential learning: Experience as the source of development*. Upper Saddle River, NJ: Prentice Hall.
- Kriegel, R., and D. Brandt. 1996. *Sacred cows make the best burgers*. Sydney: Harper Business.
- Leonard, D.J. 1994. Factors perceived to facilitate and impede learning in the workplace. *Journal of Nursing Staff Development: 19*, 81-86.
- Lepine, J.A., Colquitt, J.A., and A. Erez. 2000. Adaptability to changing task contexts: Effects of general cognitive ability, conscientiousness, and openness to experience. *Personnel Psychology: 53*, 563–593.
- Livneh, C. (1988). Characteristics of lifelong learners in the human service professions. *Adult Education Quarterly, 38*, 149-159.
- Livneh, C., and H. Livneh. 1999. Continuing professional education among educators: Predictors of participation in learning activities. *Adult Education Quarterly: 49*, 91-106.

- London, M., and E.M. Mone. 1999. Continuous learning. In *The changing nature of performance: Implications for staffing, motivation and development*. eds. D.R. Ilgen and E.D. Pulakos. 119-153. San Francisco: Jossey-Bass.
- Marra, R., Campese, K., and T. Litzinger. 1999. *Lifelong learning: A preliminary look at the literature in view of EC 2000*. Paper presented at the 29<sup>th</sup> ASEE/IEEE Frontiers in Education Conference, November 10-13, San Juan, Puerto Rico.
- Mone, M.A. 1994. Comparative validity of two measures of self-efficacy in predicting academic goals and performance. *Educational and Psychological Measurement: 54*, 516-529.
- Nussbaum, E.M., and L.D. Bendixen. 2003. Approaching and avoiding arguments: The role of epistemological beliefs, need for cognition, and extraverted personality traits. *Contemporary Educational Psychology: 28*, 573–595.
- Oddi, L. F. 1986. Development and validation of an instrument to identify self-directed continuing learners. *Adult Education Quarterly: 36*, 97-107.
- Oddi, L. F. 1990. Construct validation of the Oddi Continuing Learning Inventory. *Adult Education Quarterly: 40*, 139-145.
- Pajares, F. 1997. *Current directions in self-efficacy research*. In *Advances in motivation and achievement Vol. 10*. eds. M. Maehr and P.R. Pintrich. 1-49. Greenwich, CT: JAI Press.
- Pajares, F. 2002. Gender and perceived self-efficacy in self-regulated learning. *Theory Into Practice: 41*, 116-125.

- Paulsen, M.B., K.A. Feldman. 2005. The conditional and interaction effects of epistemological beliefs on the self-regulated learning of college students: Motivational strategies. *Research in Higher Education: 46*, 731-768.
- \_\_\_\_\_. 2007. The conditional and interaction effects of epistemological beliefs on the self-regulated learning of college students: Cognitive and Behavioral strategies. *Research in Higher Education: 48*, 353-401.
- Perry, W.G., Jr. 1970. *Forms of Intellectual and Ethical Development in the College Years: A Scheme*. New York: Holt, Rinehart, and Winston.
- Pintrich, P. R. 2002. Future challenges and directions for theory and research on personal epistemology. In *Personal epistemology: The psychology of beliefs about knowledge and knowing*. eds. B. K. Hofer and P. R. Pintrich. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Pintrich, P.R. and E.V. DeGroot. 1990. Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology: 82*, 33-40.
- Pintrich, P. R., Smith, D. A. F., Garcia, T., and W. J. McKeachie. 1993. Reliability and predictive validity of the motivated strategies for learning questionnaire (MSLQ). *Educational and Psychological Measurement: 53*, 801–803.
- Prochaska, J. O., Redding, C. A., and K. Evers. 1997. The transtheoretical model of change. In *Health behavior and health education: Theory, research, and practice*. eds. K. Glanz, F. M. Lewis and B. K. Rimer, 60–84. San Francisco: Jossey-Bass.

- Qian, G., and D. Alvermann. 1995. Role of epistemological beliefs and learned helplessness in secondary school students' learning science concepts from text. *Journal of Educational Psychology*: 87, 282-292.
- Richardson, J.T.E. 1990. Reliability and replicability of the Approaches to Studying Questionnaire. *Studies in Higher Education*: 15, 155-168.
- Rogers, E.M. 1995. *Diffusion of innovations* (4<sup>th</sup> ed.). New York: The Free Press.
- Schommer, M. 1990. Effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology*: 82, 498-504.
- Schommer-Aikins, M., and R. Hutter. 2002. Epistemological beliefs and thinking about everyday controversial issues. *The Journal of Psychology*: 136, 5-29.
- Schraw, G., Bendixen, L. D., and M. E. Dunkle. 2002. Development and validation of the Epistemic Belief Inventory (EBI). In *Personal epistemology: The psychology of beliefs about knowledge and knowing*. eds. B. K. Hofer and P. R. Pintrich. 261-275, Mahwah, NJ: Erlbaum.
- Sherer, M., Maddux, J. E., Mercandante, B., Prentice-Dunn, S., Jacobs, B., and R. W. Rogers. 1982. The self-efficacy scale: Construction and validation. *Psychological Reports*: 51, 663-671.
- Smylie, M. 1988. The enhancement function of staff development: Organizational and psychological antecedents to individual teacher change. *American Educational Research Journal*: 25, 1-30.
- Tolhurst, D. 2007. The influence of learning environments on students' epistemological beliefs and learning outcomes. *Teaching in Higher Education*: 12, 219-233.
- University of South Australia. 2007. *Graduate qualities*. Retrieved on 12 November, 2007 from <http://www.unisanet.unisa.edu.au/gradquals/>

University of Melbourne. 2007. *Attributes of the Melbourne graduate*. Retrieved on 12 November, 2007 from <http://www.unimelb.edu.au/about/attributes.html>

Valanides, N., and C. Angeli. 2005. Effects of instruction on changes in epistemological beliefs. *Contemporary Educational Psychology*: 30, 314-330.

Table 1.

*Descriptive statistics for individual measures (N = 110).*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 LLL	<i>0.89</i>															
2 EB-Certain	-0.48	<i>0.68</i>														
3 EB -Simple	-0.25	0.56	<i>0.61</i>													
4 EB -Innate	-0.31	0.56	0.42	<i>0.59</i>												
5 O-Imagine	0.28	-0.46	-0.30	-0.24	<i>0.76</i>											
6 O-Artistic	0.48	-0.25	-0.28	-0.25	0.46	<i>0.74</i>										
7 O-Emotion	0.22	-0.24	-0.24	-0.12	0.41	0.51	<i>0.78</i>									
8 O-Adventure	0.41	-0.29	-0.38	-0.19	0.27	0.40	0.14	<i>0.78</i>								
9 O-Intellect	0.60	-0.49	-0.30	-0.30	0.47	0.51	0.17	0.32	<i>0.71</i>							
10 CR-Coping	0.41	-0.06	-0.08	-0.09	0.03	0.14	-0.14	0.33	0.30	<i>0.73</i>						
11 CR-Pessimism	-0.46	0.28	0.26	0.17	-0.16	-0.36	-0.18	-0.36	-0.28	-0.26	<i>0.77</i>					
12 CR-Familiarity	0.04	-0.03	0.07	0.03	0.14	0.00	0.14	-0.16	0.09	-0.08	0.06	<i>0.70</i>				
13 CR-Ambiguity	-0.06	0.16	0.23	0.07	-0.06	-0.04	0.01	-0.34	-0.12	-0.02	0.33	0.26	<i>0.61</i>			
14 Self-Efficacy	0.56	-0.41	-0.34	-0.35	0.11	0.22	0.05	0.42	0.45	0.48	-0.60	-0.01	-0.30	<i>0.88</i>		
15 AL-Meaning	0.52	-0.20	-0.03	-0.09	0.22	0.26	0.10	0.31	0.37	0.35	-0.14	0.04	0.06	0.37	<i>0.68</i>	
16 AL-Reproduce	-0.25	0.14	0.23	0.10	0.06	-0.09	0.11	-0.28	-0.39	-0.32	0.37	0.39	0.38	-0.46	-0.19	<i>0.69</i>
17 Age	0.12	-0.21	-0.14	-0.07	-0.08	0.04	0.13	-0.03	-0.03	0.00	0.01	-0.29	0.05	0.14	0.19	-0.07
<i>Mean</i>	<i>5.55</i>	<i>2.46</i>	<i>2.93</i>	<i>2.67</i>	<i>3.29</i>	<i>3.42</i>	<i>3.72</i>	<i>3.42</i>	<i>3.17</i>	<i>3.89</i>	<i>3.42</i>	<i>4.07</i>	<i>4.05</i>	<i>9.23</i>	<i>57.13</i>	<i>49.78</i>
<i>SD</i>	<i>.59</i>	<i>.56</i>	<i>.47</i>	<i>.69</i>	<i>.54</i>	<i>.59</i>	<i>.62</i>	<i>.60</i>	<i>.54</i>	<i>.68</i>	<i>.96</i>	<i>.77</i>	<i>.80</i>	<i>.98</i>	<i>5.82</i>	<i>6.81</i>

Note. LLL = Lifelong learning; EB = Epistemological beliefs; O = Openness to experience; CR = Change readiness; AL = Approaches to learning. Correlations < 0.19 are significant,  $p < .05$ ; < 0.25,  $p < .01$ .

Table 2.

*Factor structure and item loadings for Lifelong Learning Scale.*

<i>Items (abbreviated)</i>	<i>1</i>	<i>2</i>
Knowledge is changing	0.50	
Learning is important for achieving specific goals	0.52	
Learning is important for developing as a person	0.74	
Examine the evidence to decide if a conclusion is justified	0.57	
Curious, inquisitive person	0.58	0.34
Motivated to achieve, determined to do well	0.49	
Enjoy the process of learning	0.65	
Usually have lots of questions	0.58	
Communicate ideas and information clearly in oral form	0.64	
Open to new experiences, ideas, information and insights	0.61	
Ability to use different media to retrieve and process information	0.52	
Advance career	0.70	
Keeping updated and competent in profession	0.58	
Learn throughout life	0.64	
Other's ideas often spark interest or new ideas in me	0.51	
Identify when I need to learn something		0.56
Aware of the ways I prefer to learn		0.61
Ability to critically evaluate information		0.61
Gathering, analysing, organising information		0.62
Generating possible solutions to problems		0.63
Aware of progress when learning something new	0.34	0.54
Understand information in variety of forms		0.57
Don't like doing something in a different way		-0.51
Communicate ideas and information clearly in written form	0.46	0.37
Enough information to help solve a problem or achieve a goal	0.47	0.44
Use information to inform decision-making	0.43	0.57
Cope with changes in workplace or career		0.40
Need others for motivation to achieve goals		-0.41

Note. Item loadings less than .30 are not shown.

Table 3.

*Summary of hierarchical regression analysis for predicting lifelong learning.*

	R	R <sup>2</sup> (Adj)	R <sup>2</sup> Ch	F Ch	df	B	SE B	β	sr
Step 1	0.77	0.59 (0.55)		13.04	10, 89				
Step 2	0.79	0.63 (0.58)	0.036	2.80	3, 86				
O-Imagine						-0.17	0.10	-0.15	0.01
O-Artistic						0.16	0.10	0.16	0.01
O-Emotion						0.04	0.08	0.05	0.01
O-Adventure						0.05	0.08	0.05	0.01
O-Intellect						<i>0.30</i>	<i>0.11</i>	<i>0.27</i>	<i>0.03</i>
CR-Coping						0.13	0.07	0.15	0.01
CR-Pessimism						<i>-0.11</i>	<i>0.06</i>	<i>-0.18</i>	<i>0.01</i>
Self-Efficacy						0.05	0.07	0.08	0.01
AL-Meaning						<i>0.03</i>	<i>0.01</i>	<i>0.25</i>	<i>0.04</i>
AL-Reproduce						0.01	0.01	0.10	0.01
EB -Innate						-0.01	0.07	-0.01	0.01
EB-Certain						<i>-0.28</i>	<i>0.11</i>	<i>-0.27</i>	<i>0.03</i>
EB -Simple						0.11	0.11	0.09	0.01

Note. Figures in italics are significant.