Vol.7 No.1 (2024)

Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : http://journals.sfu.ca/jalt/index.php/jalt/index

Development and validation of an instrument to measure expectancy for success and subjective task value constructs in the context of higher education

Wan Hoong Wong[A]

Elaine Chapman[B]

A Singapore Institute of Management, Singapore

B University of Western Australia, Perth, Australia

Keywords

Expectancy for success;
Expectancy Value Theory;
higher education;
instrument development;
subjective task value.

Correspondence

wongwanhoong@gmail.com [A]

Article Info

Received 11 January 2024
Received in revised form 24 February 2024
Accepted 25 February 2024
Available online 5 March 2024

DOI: https://doi.org/10.37074/jalt.2024.7.1.20

Abstract

Given the relevance of the Expectancy Value Theory in the context of higher education, the aim of this study was to develop and validate an instrument to measure the constructs within this framework at the higher education level. Undergraduate students (n = 565) from one of the largest private higher education institutions in Singapore were surveyed online using two versions (a 20-item and a 16-item version) of the *Expectancies and Values in Higher Education Instrument* (EVHEI). Exploratory factor analyses using a subsample of the cohort yielded two alternative versions of the instrument (a five-factor and a four-factor version). Both were subsequently validated using confirmatory factor analysis on data from the other subsample. The study results suggest that the EVHEI holds considerable promise for measuring motivation-related constructs at the higher education level.

Introduction

Motivation has long been regarded by many scholars and practitioners as a critical contributor to academic success at the college or higher education (HE) level (Lai, 2011). After reviewing both the psychological and the educational literature, Robbins et al. (2004) concluded that there is strong evidence that motivational constructs are linked consistently to college performance. The importance of motivation in educational outcomes has been emphasised to the extent that some researchers believe it would be untenable to draw inferences or make conclusions about educational outcomes without taking motivation into account. Similarly, Heckman (2007) stated that any evaluation of a human capital intervention would be seriously biased if motivation (alongside social adaptability) were excluded from the assessment due to an overemphasis on cognitive skills.

Numerous motivational theories, such as Bandura's (1997) self-efficacy theory (Doménech-Betoret et al., 2017), Deci and Ryan's self-determination theory (SDT) (Gagné & Deci, 2005), Weiner's attribution theory (Zhou & Urhahne, 2013), Covington's self-worth theory (van der Putten, 2017), and the expectancy-value theory of Eccles and her colleagues (Doménech-Betoret et al., 2017) have been proposed to operationalise the construct of motivation, particularly within education contexts. Educationists continue to draw from these popular theories to gain insights into how motivation relates to various other academic outcomes. Attribution theory, for instance, has been identified by Demetriou and Schmitz-Schiborski (2011) as the most widely applied motivation theory in the study of retention rates for undergraduate students.

In relation to HE, the role of motivation can be found in various theoretical or conceptual frameworks developed to explain students' academic achievement in their chosen courses of study. Motivation is included as an explicit component in the theoretical models of factors that influence academic performance by Allen (1999), Credé and Kuncel (2008), and Kusurkar et al. (2013). In the frameworks presented by Terenzini and Reason (2005) and Tinto and Pusser (2006), motivation is included as one of the student precollege characteristics that are associated most strongly with the persistence exhibited by HE students in their courses of study. The significance of motivation in explaining the academic success of HE students has also been tested in empirical research. For instance, motivation has been reported as a significant predictor of academic performance in HE students by Credé and Kuncel (2008), Griffin et al. (2012) and Morrow and Ackermann (2012).

The Expectancy-Value Theory of achievement motivation

Research studies often use different motivational constructs underpinned by different motivation theories to examine the link between motivation and academic performance. One of the most important motivational frameworks within the literature on relationships between motivation and academic performance is the Expectancy-Value Theory (EVT) of Eccles and colleagues. This framework poses that motivation beliefs relate to two key constructs, namely: (1) students' beliefs about how well they can perform certain tasks and (2) the values that the students attach to these tasks (Wigfield & Eccles, 2000). Steinmayr and Spinath (2009) argued that EVT was one of the "three most prominent" theories in the study of links between motivation and school achievement, a view that has been echoed in subsequent works (e.g., Gorges & Göke, 2015; Robbins et al., 2004).

On theoretical grounds, the EVT model is closely related to Bandura's (1997) concept of self-efficacy (Wigfield & Eccles, 2000; Wigfield et al., 2009). According to Wigfield and Eccles (2000), the expectancy construct in EVT is similar to the expectancy construct in Bandura's theory (which relates to task-specific expectancies), though not the outcome expectancy construct within the theory. It is important, however, to note that this similarity does not imply that self-efficacy and expectancies for success are indistinguishable. Wigfield et al. (2009) cautioned that while the constructs of ability beliefs, expectancies for success, and self-efficacy share similarities in their definitions, they are also distinct in important ways.

Measuring the constructs within the expectancy-value framework

In the development of the EVT model, Eccles, Wigfield and their colleagues have included items to measure expectancies for success (EFS) and subjective task values (STVs), the two key constructs in the EVT framework (Wigfield & Eccles, 2000). The items developed by this research group have two specific features in common. First, all are related to a specific domain (mathematics). Second, they all target a specific group of learners (children). Perhaps due to these specificities, not all studies have used the original items developed by Eccles (1983). While their items have been used by Jones et al. (2010), other studies have measured expectancies for success and subjective task value either using items adapted from instruments previously developed by others (Bong, 2001; Chirinos, 2017; Dietrich et al., 2017; Doménech-Betoret et al., 2017; VanZile-Tamsen, 2001), or have created 'bespoke' measures specifically for use in their own studies (Battle & Wigfield, 2003; Gorges & Göke, 2015; Gorges & Kandler, 2012).

Table 1 provides a broad overview of how empirical studies within the literature have adapted and measured the constructs within the EVT framework. The table also demonstrates how the expectancies for success construct are measured typically in empirical studies. As indicated, numerous studies have used self-efficacy to operationalise the construct of expectancies of success in this body of work (e.g., Bong, 2001; Chirinos, 2017; Gorges & Göke, 2015; VanZile-Tamsen, 2001). Not all studies, however, treat self-efficacy and expectancies for success as similar constructs. For example, Doménech-Betoret et al. (2017) and Jones et al. (2005) included both constructs in their studies, measured separately with different sets of items.

Table 1. Measurement of the EVT constructs in past studies.

Study	EVT construct	Constructs developed for the purpose of the study	Construct measurement
Battle and Wigfield (2003)	Task value	Interest, attainment value, utility value and cost	Measured using items adapted from Eccles et al. (1983) and items created by the authors.
Bong (2001)	Expectancy for success	Self-efficacy for self-regulated learning, self-efficacy for academic achievement, content-specific self-efficacy and problem-specific self-efficacy	Measured using items taken directly or adapted from other studies (Zimmerman et al. (1992), Roeser et al. (1996) and Pintrinch and De Groot (1990)) and items created by the author.
	Task value	Perceived value of the course	Measured using three questions created by the author.
Chirinos (2017)	Expectancy for success	Mathematics self-efficacy	Measured using the 8-item scale from the 2012 PISA Student Questionnaire (mathematics self-efficacy)
	Task value	Task interest value and task utility value	Measured using 8-item scale from the 2012 PISA Student Questionnaire (intrinsic and instrumental motivation)
Dietrich et al. (2017)	Expectancy for success	Situational expectancies (expectations of success and competence beliefs)	Measured using two items adapted from Wigfield and Eccles (2000) and Schneider et al. (2015)
	Task value	Situational task values (intrinsic value, utility value for future job, personal importance, effort cost, emotional cost and opportunity cost)	Measured using seven items adapted from Gaspard at el. (2015)
Doménech-Betoret et al. (2017)	Expectancy for success	Cost expectancy, achievement expectancy and process expectancy	Measured using 13 items adapted from Doménech (2006, 2012, 2013) and Doménech-Betoret et al. (2014) (ten items for the three constructs of expectancy of success and three items for the task value constructs)
	Task value	Subject value	
Study	EVT's construct	Constructs developed for the purpose of the study	Construct measurement
Jones et al. (2010)	Expectancy for success	Expectancy for success in engineering	Measured using 2-item scale adapted from Eccles and Wigfield (1995)
	Task value	Engineering intrinsic value, engineering attainment value and engineering extrinsic utility value	Measured using 3 scales with total of 7 items adapted from Eccles and Wigfield (1995)
Gorges and Göke (2015)	Expectancy for success	Task-specific (novel academic tasks) self-efficacy	Measured using three items created by the authors
Gorges and Kandler (2012)	Expectancy for success	Current expectation of success	Measured using nine items created by the authors
	Task value	Current value	Measured using nine items created by the authors
VanZile-Tamsen (2001)	Expectancy for success	Expectancy of success	Measured using items from Motivated Strategies for Learning Questionnaires (MSLQ) which relate to self-efficacy and attributions of success and failure.
	Task value	Task value	Measured using items from Motivated Strategies for Learning Questionnaires (MSLQ) which relate to intrinsic goal orientation and task value.

Expectancy-Value Theory and academic performance in higher education

As noted, the EVT model focuses on the ability beliefs and subjective task values of children and adolescents (Wigfield & Eccles, 2000). A number of studies have reported significant relationships between the components of the EVT model (i.e. expectancies for success and subjective task values) and academic performance in this population. For example, Wigfield and Eccles (2000) reported ability beliefs and expectancies for success in children to be one of the strongest predictors of grades in mathematics. Chirinos (2017) reported that efficacy beliefs among Latino high school students predicted their academic behaviours and performance in mathematics. Similarly, Steinmayr and Spinath (2009) found that ability self-perceptions and values (alongside other motivational constructs) contributed to the prediction of school achievement in 11th- and 12th-grade students. Reviews by Chirinos (2017), Wigfield and Eccles (2000) and Wigfield et al. (2009) also highlighted numerous other empirical studies that demonstrated the relevance of the EVT model in explaining the academic performance outcomes of children and adolescents.

Research applying the EVT model in studies with adult learners, such as students in HE, are much fewer than studies with younger learners such as children or adolescents (Gorges, 2015; Gorges & Kandler, 2012). There is, however, some empirical evidence to support the claim that the EVT model can also be relevant to adult learners. For instance, through a meta-analysis of 109 studies, Robbins et al. (2004) concluded that academic self-efficacy (which was linked to the EVT construct of expectancies) was the best predictor of GPAs in college students. Chirinos (2017) and Wigfield et al. (2009) also reviewed and cited a few studies that applied the EVT framework in exploring the academic performance of HE students. Bong's (2001) and Chirinos' (2017) studies, for example, found that components of the EVT model were able to predict, to a moderate extent, academic performance in HE settings.

The relevance of the EVT model in the context of adult learners is not limited to academic performance. Expectancies for success and/or subjective task values are also found to be significantly related to other variables in HE such as enrolment intentions (Bong, 2001), career aspirations (Battle & Wigfield, 2003; Jones et al., 2010), use of self-regulated strategies (VanZile-Tamsen, 2001), levels of motivation to use new learning opportunities (Gorges & Kandler, 2012) and the degree of effort that students expend on their studies (Dietrich et al., 2017).

In addition, it is important to consider the different dimensions of subjective task values in discussing the relevance of EVT in the context of HE. Unlike expectancies for success, which are conceptualised as a unidimensional construct, subjective task values comprise four different dimensions – attainment value, utility value, intrinsic value and cost (Wigfield & Eccles, 2000). From the literature, however, it appears that the role of cost as a constituent component of STV is ambiguous. While cost is associated with the effort to accomplish an activity in the EVT framework (Wigfield & Eccles, 2000), Gorges (2015) argued that cost should be a separate construct.

In the same vein, Barron and Hulleman (2015) proposed that cost should be treated as a distinct motivational construct from expectancies and values, and thus established their Expectancy-Value-Cost model. This is unsurprising, given the lack of empirical support for the cost construct as theorised in the original EVT framework. In discussing the framework, Wigfield and Eccles (2000) pointed out that most of their empirical work in relation to the framework had been mainly focused on the other three task values and not cost.

Evidence supporting the notion that cost may be a separate motivational construct altogether was reported in a study of 155 German university students (Dietrich et al., 2017). In this study, the relationship between expectancies, task values and student effort was examined. The authors reported that the fit of the measurement model was superior with cost treated as a separate construct from the expectancies and subjective task values constructs.

Rationale and aims of the present research

While the EVT model has thus far been applied predominantly at the primary and secondary levels, previous research has confirmed its potential utility in predicting academic behaviours and outcomes at the HE level. Despite this, a generic instrument to measure the expectancy-value constructs in the context of HE success is not yet available. While instruments measuring the EVT constructs have been published, most of these are intended for use with younger learners. These instruments will not be applicable in the context of HE, because in students at this higher level, the elements of both task values and cost would need to be operationalised in a very different way, though that of expectancies may be more similar (Sogunro, 2015; Yoo & Huang, 2013).

Instruments suitable for measuring the EVT constructs at the HE level are limited. Furthermore, items in the existing instruments that have been developed for use at this level have referenced outcomes such as learning effort (Dietrich et al., 2017), novel academic tasks (Gorges & Göke, 2015), career plans (Jones et al., 2010) and students' self-regulated strategy use (VanZile-Tamsen, 2001), rather than academic success. These instruments have also measured expectancies for success as self-efficacy, despite the fact that the two constructs are conceptually distinct (Wigfield et al., 2009).

Further to the above points, the instruments developed thus far to measure the EVT constructs in the context of HE have typically focused on selected elements of the model. Two studies, for instance, focused only on developing and validating items related to the STV dimensions of the EVT model. In a study conducted on a group of post-undergraduate students from six institutions in the United States (Brunhaver et al., 2017), a 15-item instrument to measure the STV components of the EVT model was developed. The exploratory factor analyses (EFAs) and confirmatory factor analyses (CFAs) indicated a three-factor solution, which corresponded to the elements of attainment value, intrinsic value and cost. In another study conducted on a group of students from a public university in the United States (Flake et al., 2015), a 19-item instrument to measure the cost component of the STV construct was developed. The EFA and CFA conducted indicated a four-factor solution, which corresponded to the EVT elements of task effort cost, outside effort cost, costs associated with the loss of valued alternatives, and emotional cost.

In view of the relevance of the EVT constructs in the context of HE, the aim of the present study was to develop a stand-alone instrument to measure the EFS and different dimensions of the STV constructs within the EVT model, with specific reference to academic success in HE. Unlike most existing instruments, the instrument in this study related to academic success in a broader sense, rather than within a specific domain. This was done to ensure the general utility of the instrument across academic HE contexts. The authors were of the view that, in the context of HE, the key concern of learners is not generally about their performance in a specific domain area, but about their performance in a more general sense. As a result, the items in the instrument developed all referred to the respondents' ability to complete and graduate from their chosen HE programmes.

Method

Participants and settings

Participants were students from one of the largest private HE institutions in Singapore, which offered 14 international undergraduate degree programmes taught by an institution from the United Kingdom. For the purpose of this study, the students were invited to participate in an online survey. In total, 565 of the students responded and completed the survey. Of this sample, 219 (38.76%) of the participants were males and 346 (61.24%) were females. The ages of the respondents ranged from 17 to 30 years (mean age 22.05 years, *SD*=2.08). In terms of nationality, 397 (70.27%) were students from Singapore, 107 (18.94%) were from other Southeast Asian countries, 57 (10.09%) were from other Asian countries, and 4 (0.71%) were from countries outside of Asia.

Instrument development

Based on the EVT model developed by Eccles, Wigfield and their colleagues (Wigfield & Eccles, 2000), the Expectancies and Values in Higher Education Instrument (EVHEI) developed in this study comprised two scales – the Expectancy for Success (EFS) scale and Subjective Task Value (STV) scale. These two scales were intended to measure the two key constructs of *expectancies for success* and *subjective task values*, in the context of achieving academic success in HE. The EFS component included no subscales and comprised four items. The STV component, on the other hand, was designed to incorporate four subscales: *Attainment Value* (AV), *Utility Value* (UV), *Intrinsic Value* (IV) and *Cost* (CST). Each subscale comprised four items. Thus, 20 items were created, each of which was presented in the form of a 7-point bipolar statement rating scale. Respondents were required to select a point on the scale which best described their own position with respect to the two polar statements. For each item, scores ranged from 1 to 7. The item statements corresponding to the EFS and STV scales in the EVHEI are shown in Table 2.

Given the ambiguous role of cost as an integral component of the STV, two alternative versions of the EVHEI were developed and validated. Version 1 comprised all 20 items measuring the EFS, AV, UV, IV and CTS subscales; while Version 2 comprised only 16 items, measuring the EFS, AV, UV and IV subscales (i.e., with the four cost or CST items excluded).

Table 2. Item statements in the Expectancy-Value for Higher Education Instrument (EVHEI).

Scale	Subscale	Item Label	Bipolar Item Statement (Lowest score = 1 vs. Highest score = 7)	
Expectancy for Success	Nil	EFS1	Score = 1	I feel it is very unlikely that I will be able to do well in the courses I am currently taking.
			Score = 7	I have complete confidence that I can do well in the courses I am currently taking.
		EFS2	Score = 1	I am very doubtful that I can progress to the next academic year.
			Score = 7	I have no doubts at all that I can progress to the next academic year.
		EFS3	Score = 1	I am very doubtful that I can pass all the courses I am currently taking.
			Score = 7	I have no doubts at all that I can pass all the courses I am currently taking.
		EFS4	Score = 1	I am very uncertain of whether I can graduate from this programme.
			Score = 7	I am very certain that I can graduate from this programme.
Subjective Task Value	Attainment Value (AV)	AV1	Score = 1	It is not at all important for me to do well in my studies.
			Score = 7	It is extremely important for me to do well in my studies.
		AV2	Score = 1	It is not at all important for me to obtain university-level education.
			Score = 7	It is extremely important for me to obtain university-level education.
		AV3	Score = 1	It is not at all important for me to learn the knowledge and skills from the courses I am taking.
			Score = 7	It is extremely important for me to learn the knowledge and skills from the courses I am taking.
		AV4	Score = 1	It is not at all important for me to graduate from this BSc undergraduate programme.
			Score = 7	It is extremely important for me to graduate from this BSc undergraduate degree programme.
	Utility Value (UV)	UV1	Score = 1	Getting a higher salary is not at all the reason why I undertook the programme.
			Score = 7	Getting a higher salary is an extremely important reason why I have undertaken this programme.
		UV2	Score = 1	Securing a better future career prospect is not at all a reason why I undertook the programme.
			Score = 7	Securing a better future career prospect is an extremely important reason why I undertook the programme.
		UV3	Score = 1	Having a more successful life is an extremely important reason why I undertook the programme. [Note: Success can be material or non-material oriented]
			Score = 7	Having a more successful life is not at all a reason why I undertook the programme. [Note: Success can be material or non-material oriented]
		UV4	Score = 1	Getting recognition from society is not at all a reason why I undertook the programme.
			Score = 7	Getting recognition from society is an extremely important reason why I undertook the programme
Scale	Subscale	Item Label	Bipolar Item Statement (Lowest score = 1 vs. Highest score = 7)	
Subjective Task Value	Intrinsic Value (IV)	IV1	Score = 1	Undertaking this programme has nothing to do with my own enjoyment.
			Score = 7	I am undertaking this programme largely for my own enjoyment.
		IV2	Score = 1	Getting personal satisfaction is not at all a reason why I undertook the programme.
			Score = 7	Getting personal satisfaction is an extremely important reason why I undertook the programme.
		IV3	Score = 1	Getting a sense of achievement is not at all a reason why I undertook the programme.
			Score = 7	Getting a sense of achievement is an extremely important reason why I undertook the programme.
		IV4	Score = 1	Becoming more knowledgeable is not at all a reason why I undertook the programme.
			Score = 7	Becoming more knowledgeable is an extremely important reason why I undertook the programme.
	Cost (CST)	CST1	Score = 1	There is nothing to give up at all for me to undertake this programme.
			Score = 7	I give up a great deal of my life by undertaking this programme.
		CST2	Score = 1	I absolutely have no other better things to do if I don't attend classes.
			Score = 7	I definitely have other better things to do if I don't attend classes.
		CST3	Score = 1	There is no change at all in my stress level since I took up this programme.
			Score = 7	My stress level has increased tremendously since I took up this programme.
		CST4	Score = 1	My mental energy remains the same after attending a 3-hour lecture.
			Score = 7	My mental energy has drained completely after attending a 3-hour lecture.

Procedure

The questionnaire survey was administered online through the Qualtrics platform. Students were invited via e-mail to participate in the survey on a voluntary basis at the beginning of the 2018-2019 academic year. The purpose of the survey, the time required to answer the survey, the confidential nature of the survey, and data protection assurances were also included in the e-mail. Participants were required to consent using a radio button before they proceeded with the online survey. Following the initial invitation, two e-mail reminders were sent to increase the participation rate.

Prior to the actual survey, a pilot study was conducted with a small group of students (*n* = 14). The purpose of this step was to assess the clarity of the instructions, the suitability and clarity of the questions, and the time required to complete the online version of the survey. Written feedback was obtained from the participants. Results showed that the instructions and questions were clear and appropriate and that the indicated time of 15 minutes to complete the survey was reasonable. Given that no major issues were identified in this pilot study, only minor amendments were made to the questionnaire to improve it before the final launch.

Data analysis using exploratory factor analysis and confirmatory factor analysis

Both EFAs and CFAs were conducted to evaluate and validate the internal structure of the two EVHEI versions. The sample was first randomly split (using a random number generator) into two approximately equal-sized subsamples. Based on this random split approach, Subsample 1 included 265 observations and Subsample 2 included 300 observations. The factor analyses were then conducted in two stages, with EFA first performed using Subsample 1 followed by CFAs using Subsample 2. In each stage, the subsample was used to evaluate both versions of the instrument (the full 20-item version and the 16-item version, which excluded the cost dimension).

The rationale for using EFAs in conjunction with CFAs in testing newly created items has been provided by Brown (2006), Fabrigar and Wegener (2011), Osborne (2014), Post and Walma van Der Molen (2019) and Yong and Pearce (2011). Although the EVHEI was intended to measure the two key constructs, as defined by the established EVT model, its items were newly created. In addition, the context involved (i.e. academic success in HE) was new. Therefore, EFAs were first conducted to provide a preliminary assessment of the underlying factor structure of the newly created items. This was then followed by CFAs to confirm the factor structures derived from the EFAs. Such an approach is commonly adopted in instrument validation studies (Jansen et al., 2017; Post & Walma van Der Molen, 2019). For the purpose of this study, the EFAs were conducted using SPSS V24, while the CFAs were conducted using LISREL V10.20.

Results

Preliminary data screening analyses indicated several missing responses and the presence of outliers, which were subsequently removed from the dataset. This resulted in 246 cases being retained for Subsample 1 and 277 cases being retained for Subsample 2. Checks for normality, linearity, the presence of multicollinearity and factorability were also conducted on the two datasets. No apparent violations of these requirements were found (see Table 3). Descriptive statistics for all of the EVHEI's 20 items by subsample are provided in Table 4.

Table 3. Preliminary examination of the data prior to the factor analyses.

	Subsample 1 for EFA (n = 265)	Subsample 2 for CFA (n = 300)
Removal of missing responses and multivariate outliers identified using Mahalanobis distance	Four cases with missing responses (1.5%), with no systematic pattern. These cases were removed (see Tabachnick & Fidell, 2013).	Three cases with missing responses (1%), with no systematic pattern. These cases were removed.
	15 cases (5.7%) considered outliners with χ^2 statistic less than the critical value at 0.001 significance level. These cases were removed.	20 cases (6.7%) considered outliers with χ^2 statistic less than the critical value at 0.001 significance level. These cases were removed.
	A total 246 cases were retained after the removal with case to ratio 15:1 (recommended 10:1; see Yong and Pearce (2013)).	A total of 277 cases were retained after the removal with case to ratio 17:1.
Assumption testing		
1. Normality	All the items demonstrated some level of skew based on skewness and kurtosis coefficients, Kolmogorov-Smirnov and Shapiro-Wilk tests. This violation should not compromise the outcomes of the EFA and CFA analyses.	
2. Linearity	Visual examination of bivariate scatter plot revealed no non-linear relationships.	
3. Multicollinearity	Examination of correlation matrix revealed all the correlation coefficients were well below 0.90, a recommended guideline (see Tabachnick & Fidell, 2013; Yong & Pearce, 2011). This indicates no serious problem of multicollinearity.	
4. Factorability (EFA only)	The Kaiser-Meyer-Olkin sampling adequacy measure of 0.88 is well above the recommended value of above 0.50 (see Yong & Pearce, 2013) or above 0.60 (see Tabachnick & Fidell, 2013). Bartlett's test was significant with p-value < 0.001. This indicates that EFA was a tenable analysis approach to be used with this dataset.	

Table 4. Descriptive statistics for Subsample 1 (EFA) and Subsample 2 (CFA).

Item	Subsample 1 (n = 246)	Subsample 2 (n = 277)
	M (SD)	M (SD)
EFS1	4.87 (1.22)	4.87 (1.27)
EFS2	5.37 (1.34)	5.31 (1.49)
EFS3	5.22 (1.40)	5.25 (1.48)
EFS4	5.63 (1.43)	5.55 (1.63)
AV1	6.23 (1.13)	6.22 (1.13)
AV2	6.28 (1.18)	6.33 (1.11)
AV3	6.24 (1.10)	6.11 (1.13)
AV4	6.37 (1.14)	6.38 (1.06)
UV1	5.31 (1.35)	5.24 (1.48)
UV2	5.95 (1.23)	5.93 (1.25)
UV3	5.75 (1.35)	5.77 (1.28)
UV4	4.97 (1.59)	4.92 (1.67)
IV1	4.59 (1.46)	4.65 (1.60)
IV2	4.88 (1.44)	5.04 (1.47)
IV3	5.23 (1.42)	5.31 (1.45)
IV4	5.75 (1.24)	5.89 (1.09)
CST1	4.19 (1.45)	4.36 (1.67)
CST2	3.93 (1.57)	3.89 (1.68)
CST3	4.83 (1.41)	5.00 (1.49)
CST4	4.75 (1.45)	4.83 (1.51

Exploratory factor analysis

Given that the assumption of multivariate normality was violated, Principal Axis Factoring (PAF) was chosen as the method of extraction instead of Maximum Likelihood (ML). The principal factor method is regarded to be a more suitable method of extraction when the assumption of multivariate normality has not been met (Fabrigar et al., 1999; Osborne, 2014; Yong & Pearce, 2013). The factors were then rotated to approximate simple structure using an oblique rotation method (Direct Oblimin), given the likelihood that these would be correlated (Osborne, 2014; Tabachnick & Fidell, 2013; Yong & Pearce, 2013). For example, in the EVT model, the constructs of expectancies for success and subjective task values are both deemed to be influenced by goals and self-schemata (Wigfield & Eccles, 2000).

The initial EFAs were conducted both with all 20 items of the instrument included (Version 1) and with the cost items removed (i.e., 16 items - CST1 to CST4 excluded – Version 2). Using Kaiser's criterion, the EFAs indicated five distinct factors for Version 1 and four distinct factors for Version 2. Table 5 provides an overview of the EFA conducted for the two versions.

Table 5. Comparative EFAs for the two instrument versions (n = 246).

	Version 1	Version 2
Dimensions considered	EFS, AV, UV, IV and CST	EFS, AV, UV and IV
Number of items	20	16
Number of factors extracted	5	4
Proportion of the item variation accounted for by the factors extracted	73.98%	80.11%
Range of extracted communalities	.14 – .92	.52 – .92

Table 6 presents the factor loadings for Versions 1 and 2 of the EVHEI. In determining the factor structure of an instrument, Matsunaga (2010) regarded .40 as the lowest acceptable loading. This cutoff was adopted by Battle and Wigfield (2003) in assessing the factor structure of the EVT task value construct in college women's value orientations.

Based on a cutoff threshold of .40, the pattern matrices in Table 6 show a clear factor structure for both versions of the instrument. In both, no item was cross-loaded notably onto two or more factors, and items clustered together as expected based on the EVT constructs. In Version 1, the 20 items loaded on five factors with EFS1 to EFS4; AV1 to AV4; UV1 to UV4; IV1 to IV4; and CST1 to CST4 loaded unambiguously onto five separate factors. The loading of CST2 was, however, somewhat lower than .40, suggesting that this particular item was more weakly associated with others in the cost factor. In Version 2, the 16 items loaded on four factors with EFS1 to EFS4; AV1 to AV4; UV1 to UV4; and IV1 to IV4 loaded unambiguously on four separate factors.

Overall, the factor structures obtained were consistent with the theoretical framework of the EVT. As expected, the results also indicated that the factors were moderately correlated, with correlation coefficients in the range of .01 to .50 for Version 1, and .21 to .53 for Version 2.

Table 6. Factor loading of items in the EVHEI for Versions 1 and 2 (n = 246).

Item	Communalities (h^2)	Version 1 (20 items)										Version 2 (16 items)							
		Pattern Matrix					Structure Matrix					Pattern Matrix				Structure Matrix			
		Factor					Factor					Factor				Factor			
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	1	2	3	4
EFS1	.68	**-.73**	.02	.42	.17	-.05	**-.80**	.22	.21	.45	-.06	**.76**	-.04	.02	.13	**.81**	.31	.20	.45
EFS2	.92	**-.92**	.13	.25	.02	-.01	**-.95**	.30	.23	.41	-.03	**.95**	.05	.00	-.03	**.96**	.39	.22	.40
EFS3	.90	**-.93**	.05	.20	.01	-.04	**-.95**	.21	.18	.37	-.06	**.99**	-.05	-.01	-.04	**.95**	.31	.17	.37
EFS4	.75	**-.82**	.11	.02	.05	.04	**-.86**	.27	.22	.40	.03	**.85**	.02	.01	.01	**.87**	.36	.21	.40
AV1	.72	-.14	**.78**	.05	.03	-.02	-.28	**.83**	.47	.38	-.04	.05	**.83**	-.00	.00	.37	**.85**	.45	.36
AV2	.80	-.07	**.81**	.13	.00	-.03	-.23	**.89**	.54	.37	-.04	-.02	**.87**	.07	-.02	.32	**.90**	.53	.35
AV3	.74	-.09	**.73**	.05	.17	.01	-.28	**.83**	.50	.48	-.01	.01	**.79**	.02	.14	.37	**.85**	.48	.46
AV4	.88	-.07	**.91**	.01	.01	.08	-.23	**.93**	.50	.38	.05	-.02	**.95**	-.02	-.01	.33	**.93**	.48	.35
UV1	.61	-.07	-.04	**.82**	-.11	.01	-.15	.34	**.77**	.20	.13	.08	-.04	**.81**	-.09	.20	.38	**.78**	.19
UV2	.75	-.06	.20	**.77**	-.09	.04	-.18	.56	**.85**	.28	.14	.05	.21	**.75**	-.09	.25	.60	**.85**	.26
UV3	.73	-.04	.16	**.75**	.01	-.02	-.18	.55	**.84**	.36	.09	.03	.18	**.73**	.01	.26	.59	**.83**	.34
UV4	.53	.10	-.11	**.69**	.22	.01	-.07	.30	**.70**	.39	.12	-.09	-.09	**.69**	.22	.12	.34	**.70**	.38
IV1	.52	-.6	.01	-.09	**.72**	.03	-.31	.23	.19	**.71**	.02	.06	.01	-.07	**.71**	.36	.28	.18	**.72**
IV2	.90	-.03	-.05	-.01	**.96**	-.02	-.37	.30	.32	**.95**	-.01	.03	-.03	.00	**.95**	.43	.36	.31	**.95**
IV3	.71	-.02	.05	.14	**.75**	.01	-.32	.40	.44	**.83**	.04	.01	.08	.14	**.73**	.39	.46	.43	**.82**
IV4	.66	-.11	.28	.10	**.55**	.02	-.39	.55	.46	**.74**	.03	.11	.30	.09	**.53**	.47	.60	.45	**.72**
CST1	.21	-.12	-.13	.06	.07	**.41**	-.12	-.07	.10	.09	**.42**	-	-	-	-	-	-	-	-
CST2	.14	-.10	-.14	-.06	-.09	**0.3**	-.03	-.20	-.11	-.12	**.29**	-	-	-	-	-	-	-	-
CST3	.54	.25	.23	.08	.03	**.64**	.21	.21	.25	.05	**.65**	-	-	-	-	-	-	-	-
CST4	.41	.11	.14	.01	.02	**.61**	.09	.11	.16	.04	**.61**	-	-	-	-	-	-	-	-

The internal consistency of the items was evaluated using Cronbach's α coefficients, as shown in Table 7. Ho (2014) suggested that a high internal consistency is attained when the Cronbach's α coefficient is greater than .80. While the Cronbach's α coefficients for EFS, AV, UV and IV scales were all above .80, the Cronbach's α coefficient for CST (.54) was noticeably lower than this threshold. This suggests that the internal consistency for the CST scale was weak, particularly in comparison to the other subscales. In light of this, the overall Cronbach's α coefficient for the 20-item instrument was lower with the four CST items included (.87) than for the overall Cronbach's α coefficient with the four CST items removed (.91).

Table 7. Cronbach's α of the EVHEI's items (n = 246).

Scale	Items	Cronbach's α
Expectancy for Success	EFS1, EFS2, EFS3 and EFS4	.94
Attainment Value	AV1, AV2, AV3 and AV4	.93
Utility Value	UV1, UV2, UV3 and UV4	.86
Intrinsic Value	IV1, IV2, IV3 and IV4	.88
Cost	CST1, CST2, CST3 and CST4	.54
Overall Scale with all the 20 items (Version 1)		.87
Overall Scale with 16 items (Version 2, with CST1 to CST4 excluded)		.91

Confirmatory factor analysis

Given that the normality assumption was not met in the data distributions, the input matrices for the CFAs were based on Spearman rank correlations, which can accommodate various data distortions, including problems with outliers and non-normality (Coughlan et al., 2007; de Winter et al., 2016). The path diagrams for Version 1 (five factors) and Version 2 (four factors) of the EVHEI and path coefficients from the CFA results are depicted in Figures 1 and 2, respectively. Table 8 provides goodness-of-fit indices used in evaluating the acceptability of the factor solutions for each version.

In general, CFI, NFI and NNFI values between .90 and .95 were deemed to indicate acceptable fit by Brown (2006), while Ab Hamid (2013) deemed value of .90 and above to indicate good fit for these measures. In the present study, comparative fit indices of CFI, NFI and NNFI ranging from .87 to .91 were obtained for the five-factor version, and from .91 to .94 for the four-factor version. While both versions approximated acceptable fit based on these indices, it can be noted that the four-factor version fared slightly better than did the five-factor version, suggesting that again, the fit of the model for Version 2 (i.e., without the four CST items) was superior.

As the χ^2 test can be affected by sample size (Brown, 2006; Mîndrilă, 2010), the ratio of χ^2 to degrees of freedom is typically recommended instead. Schreiber et al. (2006) and Mîndrilă (2010) recommended $\chi^2/df < 3$ as the cutoff. For both versions, the values of χ^2/df were below 3 (see Table 8), indicating that both attained acceptable fit based on this criterion. The RMSEA for both versions was also .08, which again suggests an acceptable level of fit based on the recommendations of Browne and Cudeck (1992), Schreiber et al. (2006) and Mîndrilă (2010).

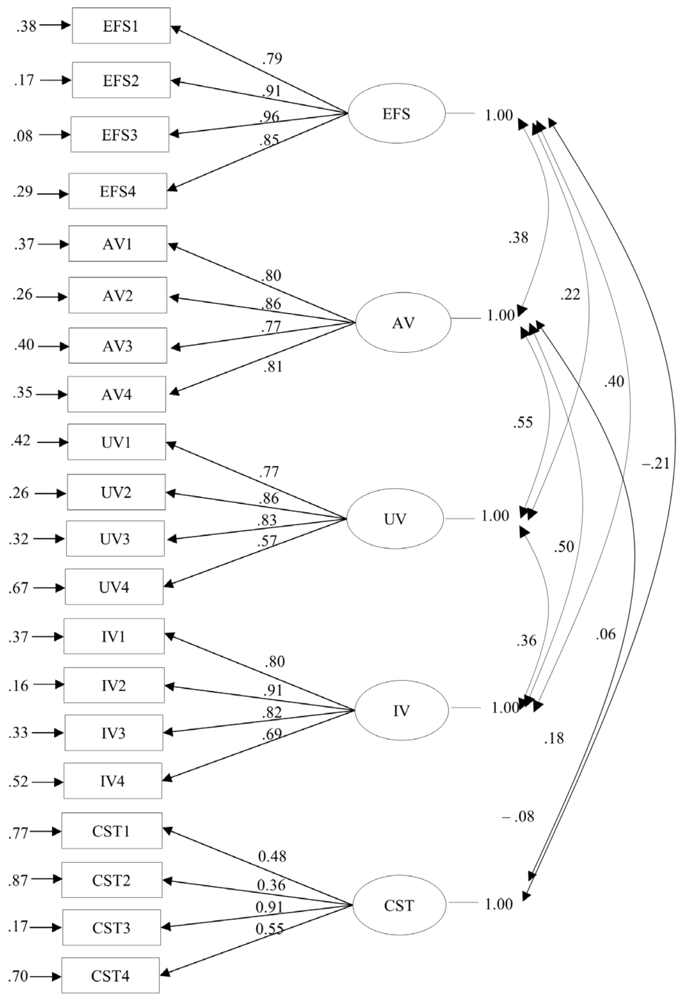

Figure 1. CFA results: Path diagram for Version 1 (Five-factor version).

Table 8. Fit indices for the One-factor, Two-factor, Four-factor and Five-Factor Models.

Fit Index	Based on 20 items			Based on 16 items (CST items excluded)		
	One-factor Model	Two-factor Model	Model 1 (Five factors)	One-factor Model	Two-factor Model	Model 2 (Four-factors)
χ^2	$\chi^2(170)$ = 2,046.38 (p = .00)	χ^2 (169) = 1,303.45 (p = .00)	χ^2 (160) = 442.08 (p = .00)	χ^2 (104) = 1,691.89 (p = .00)	χ^2 (103) = 947.17 (p = .00)	χ^2 (98) = 272.16 (p = .00)
χ^2/df	12.04	7.71	2.76	16.27	9.20	2.78
Standardised Root Mean Residual (SRMR)	.15	.13	.07	.16	.12	.06
Root Mean Square Error of Approximation (RMSE	.20	.16	.08	.24	.17	.08
Comparative Fit Index (CFI)	.42	.65	.91	.46	.72	.94
Normed Fit Index (NFI)	.41	.62	.87	.45	.69	.91
Non-Normed Fit Index (NNFI)	.36	.61	.90	.38	.67	.93
Goodness-of-Fit Index (GFI)	.51	.64	.86	.51	.66	.89
Adjusted GFI (AGFI)	.40	.55	.82	.36	.55	.85
$\Delta\chi^2$ as compared to one-factor model	-	-	$\Delta\chi^2(10)$ = 1,604.30 (p < .01)	-	-	$\Delta\chi^2(6)$ = 1,419.73 (p < .01)
$\Delta\chi^2$ as compared to two-factor model	-	-	$\Delta\chi^2(9)$ = 861.37 (p < .01)	-	-	$\Delta\chi^2(5)$ = 675.01 (p < .01)

To further assess model adequacy, within both the 20-item and the 16-item versions of the instrument, one-factor and two-factor nested alternative models were also tested. In the case of the 20-item version, the five-factor model derived from the EFA was compared to a one-factor model (with all 20 items loaded on a single factor) and a two-factor model (with the EFS items loaded on one factor and the AV, UV, IV and CST items loaded on the other). The same comparison bases were used for the 16-item version, including a one-factor solution (with all 16 items loaded on a single factor)

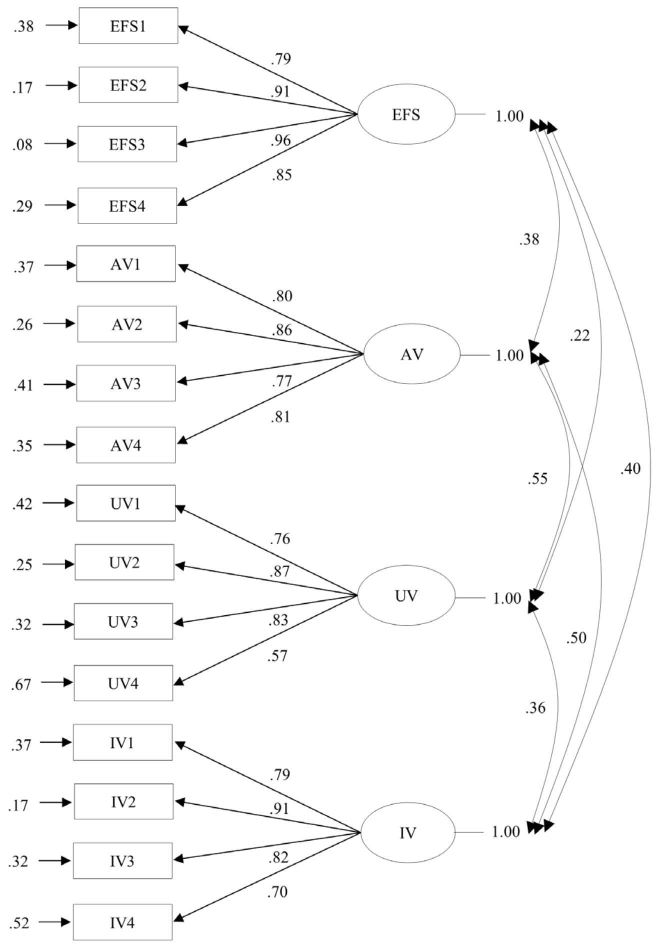

Figure 2. CFA results: Path diagram for Version 2 (Four-factor version).

and a two-factor solution (with the EFS items loaded on one factor and the AV, UV and IV items loaded on another). The change in $\chi 2$ comparing the EFA models for each version with their respective one- and two-factor models (see last two columns of Table 8) indicated that these models produced significant fit improvement over the one- and the two-factor solutions. Comparisons based on other fit indices (RMSEA, SRMS, CFI, NFI and NNFI) were consistent with this conclusion.

The internal consistency of the items was also evaluated using the CFA subsample using Cronbach's α coefficients (see Table 9). The Cronbach's α coefficients for the EFS, AV, UV and IV subscales were all above 0.80. Again, however, the Cronbach's α coefficient for the CST subscale was noticeably lower than this threshold (.67). This confirmed the relatively weak internal consistency of the CST subscale, which is confirmed further by the fact that the Cronbach's α coefficient for the overall scale with the four CST items (.85) was lower than for the 16-item version (.90).

Table 9. Cronbach's α of the EVHEI's items (n = 277).

Scale	Items	Cronbach's α
Expectancy for Success	EFS1, EFS2, EFS3 and EFS4	.93
Attainment Value	AV1, AV2, AV3 and AV4	.93
Utility Value	UV1, UV2, UV3 and UV4	.84
Intrinsic Value	IV1, IV2, IV3 and IV4	.88
Cost	CST1, CST2, CST3 and CST4	.67
Overall Scale with all the 20 items (Version 1)		.85
Overall Scale with 16 items (Version 2, with CST1 to CST4 excluded)		.90

Discussion

The main aim of this study was to develop a stand-alone instrument to measure two key constructs within the EVT framework – expectancies for success and subjective task values constructs – with specific reference to academic success in HE. EFAs and CFAs were conducted to evaluate both a 20-item version (EFS, AV, UI, IV and CST) and a 16-item version (EFS, AV, UI and IV) of the EVHEI, the latter excluding the construct of cost dimension. The ambiguous role of the cost dimension in other literature provided the rationale for the creation and evaluation of these two versions.

With 20 items created to measure the five constructs within the EVT framework (expectancies for success, attainment value, utility value, intrinsic value and cost), the EFA extracted five factors. Using a different dataset, the CFA subsequently validated the suitability of this five-factor structure of the 20-item version of the instrument. In the case of the 16-item version, the EFA extracted four factors, and the subsequent CFA validated this structure.

While acceptable fits were obtained for both versions, the 16-item version generally fared better in this respect, in both the EFAs and CFAs. For example, the four-factor version obtained higher NFI and NNFI indices than did the 20-item version. This was due in large part to the relatively low loadings for specific items within the cost (CST) factor, with corresponding reduced internal consistencies. This suggests some misalignment within the cost factor variable. This aligns with evidence from the literature, which generally underscores the ambiguity of cost as a component of the overall STV construct. Despite this, the fit indices obtained for the 20-item version all fell within or marginally below the acceptable range. Thus, the EVHEI can be used either as a 20- or as a 16-item version. Given the ambiguous role of cost in other papers, this would provide researchers with some flexibility in how they choose to measure the construct of STV in their own studies.

The authors pose that the EVHEI represents a vital development in furthering the potential use of the EVT model in HE. As noted by several authors in the field, the EVT constructs are defined somewhat broadly in theoretical definitions and are inherently linked to a wide array of factors (Wigfield et al., 2009). In light of this, it is unsurprising to find that vastly different measures have been used in different studies to measure the expectancy and task value constructs, as mooted earlier. With appropriate construct measurement using the EVHEI, more meaningful and precise investigations relating motivation and HE success can then be undertaken.

That said, the EVHEI may not suited for use in all contexts over time. In particular, the HE sector is currently in a state of flux, which also means that students and their motives for engaging in learning will also be so. As such, the kinds of factors which feed the expectancy and task value beliefs formed by students may shift over time. Other factors may also arise as relevant over such time.

With the acceleration of e-learning in HE, which has changed not only the way that students learn and perform academic tasks but also how their performance is assessed, students are now being given greater autonomy in learning, allowing them to decide not only where learning can take place, but also the pace in which it occurs (Jansen et al., 2017). It is possible that such shifts will also change the most relevant constructs for estimating the level of motivation that students will have in their studies. In such an event, however, the EVHEI could be used as a base framework for developing subsequent instruments. That is, the items can be modified in minor ways to suit different contexts.

There are other aspects that can be taken into consideration for the future development of the instrument. As the participants involved in this study were sampled from a specific institution and had very specific attributes in common (e.g., all were full-time students enrolled in undergraduate programmes offered by a Singapore university), their profiles could also be seen as relatively homogenous. The EVHEI, therefore, would need to be validated further using participants with different profiles to assess the generality of its psychometric properties across populations and contexts.

Although the two versions of the EVHEI instrument provide flexibility in measuring the cost dimension of EVT, this does not imply that the authors themselves consider the cost factor to have an insignificant role in the measurement of motivation. Rather, it is possible that cost should be treated as an independent motivational construct within the EVT model, in line with the Expectancy-Value-Cost model discussed earlier. Such theoretical discussion falls beyond the scope of the current paper. The dual versions of the EVHEI, however, provide researchers with the flexibility to choose whether and how to incorporate cost in the measurement of subjective task values in EVT, depending on the contexts in which they operate.

References

Ab Hamid, M. R., Mustafa, Z., Suradi, N. R. M., Idris, F., & Abdullah, M. (2013). Value-based performance excellence measurement for higher education institution: Instrument validation. *Quality & Quantity, 47*(6), 3019–3030. https://doi.org/10.1007/s11135-012-9699-y

Allen, D. (1999). Desire to finish college: An empirical link between motivation and persistence. *Research in Higher Education, 40*(4), 461–485. https://doi.org/10.1023/A:1018740226006

Bandura, A. (1997). *Self-efficacy: The exercise of control.* W. H. Freeman. https://doi.org/10.1037/10522-094

Barron, K. E., & Hulleman, C. S. (2015). Expectancy-value-cost model of motivation. In J. D. Wright (Ed.), *International encyclopedia of the social & behavioral sciences* (2nd ed., Vol. 8, pp. 503–509). Oxford: Elsevier. http://dx.doi.org/10.1016/B978-0-08-097086-8.26099-6

Battle, A., & Wigfield, A. (2003). College women's value orientations toward family, career, and graduate school. *Journal of Vocational Behavior, 62*(1), 56–75. https://doi.org/10.1016/S0001-8791(02)00037-4

Bong, M. (2001). Role of self-efficacy and task-value in predicting college students' course performance and future enrollment intentions. *Contemporary Educational Psychology, 26*(4), 553–570. https://doi.org/10.1006/ceps.2000.1048

Brown, T. (2006). *Confirmatory factor analysis for applied research* (1st Ed.). Guilford Publications. https://www.guilford.com/books/Confirmatory-Factor-Analysis-for-Applied-Research/Timothy-Brown/9781462515363

Browne, M., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods & Research, 21*(2), 230–258. https://doi.org/10.1177/0049124192021002005

Brunhaver, S.R., Carrico, C., Matusovich, H. M., Sama, M., Abhyankar, R., Streveler, R. A., & Sheppard, S. (2017). Measuring students' subjective task values related to the post-undergraduate career search [Paper presentation]. *2017 ASEE (American Society for Engineering Education) Annual Conference & Exposition, Columbus, Ohio.* https://www.semanticscholar.org/paper/Measuring-students'-subjective-task-values-related-Brunhaver-Carrico/1b5dcc2c42071054726bba54996e0dfac062ad9e

Chirinos, D. S. (2017). *Examining dimensions of expectancy-value theory as predictors of U.S. Latino high school students' academic behaviors and mathematics performance* (Order No. 10277657). ProQuest Dissertations & Theses Global. https://www.researchgate.net/publication/319130449_Examining_dimensions_of_expectancy-value_theory_as_predictors_of_us_latino_high_school_students'_academic_behaviors_and_mathematics_performance

Coughlan, J., Shale, E., & Dyson, R. (2007). *The effect of different inputs to factor analysis: An example using service quality in UK branch banking.* https://arrow.tudublin.ie/cgi/viewcontent.cgi?article=1001&context=buschmarcon

Credé, M., & Kuncel, N. R. (2008). Study habits, skills and attitudes: The third pillar supporting collegiate academic performance. *Perspectives on Psychological Science, 3*(6), 425–453. https://doi.org/10.1111/j.1745-6924.2008.00089.x

de Winter, J. C. F., Gosling, S. D., & Potter, J. (2016). Comparing the Pearson and Spearman correlation coefficients across distributions and sample sizes: A tutorial using simulations and empirical data. *Psychological Methods, 21*(3), 273–290. https://doi.org/10.1037/met0000079

Demetriou, C., & Schmitz-Schiborski, A. (2011). Integration, motivation, strengths and optimism: Retention theories, past, present and future. In R. Hayes (Ed.), *Proceedings of the 7th national symposium on student retention, 2011, Charleston* (pp. 300–312). Norman, OK: The University of Oklahoma. https://www.researchgate.net/publication/364309350_Integration_Motivation_Strengths_and_Optimism_Retention_Theories_Past_Present_and_Future_Integration_Motivation_Strengths_and_Optimism_Retention_Theories_Past_Present_and_Future

Dietrich, J., Viljaranta, J., Moeller, J., & Kracke, B. (2017). Situational expectancies and task values: Associations with students' effort. *Learning and Instruction, 47*, 53–64. https://doi.org/10.1016/j.learninstruc.2016.10.009

Doménech-Betoret., F. (2006). Testing an instructional model in a university educational setting from the student's perspective. *Learning and Instruction, 16*(5), 450-466. https://doi.org/https://doi.org/10.1016/j.learninstruc.2006.09.005

Doménech F. (2012). Psicología Educativa: Su Aplicación al Contexto de la Clase [*Educational Psychology: its Application in the Classroom Context], 13.* Castellón: Publicaciones de la Universitat Jaume I. Col·lecció Psique.

Doménech F. (2013). An instructional model for guiding reflection and research in the classroom: The educational situation quality model. *Electronic Journal of Research in Educational Psychology, 11*, 239–260.

Doménech-Betoret, F., Abellán-Roselló, L., & Gómez-Artiga, A. (2017). Self-efficacy, satisfaction, and academic achievement: The mediator role of students' expectancy-value beliefs. *Frontiers in Psychology, 8*, 1–12. https://doi.org/10.3389/fpsyg.2017.01193

Eccles, J. S. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), *Achievement and achievement motives.* San Francisco: Freeman.

Fabrigar, L., & Wegener, D. (2011). *Exploratory factor analysis* [Adobe Digital Editions]. ProQuest Ebook Central. https://academic.oup.com/book/41736

Fabrigar, L., Wegener, D., Maccallum, R., Strahan, E. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods, 4*(3), 272–299. https://doi.org/10.1037/1082-989X.4.3.272

Flake, J., Barron, K., Hulleman, C., McCoach, B., & Welsh, M. (2015). Measuring cost: The forgotten component of expectancy-value theory. *Contemporary Educational Psychology, 41*, 232–244. https://doi.org/10.1016/j.cedpsych.2015.03.002

Gagné, M., & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational Behavior, 26*(4), 331–362. https://doi.org/10.1002/job.322

Gaspard, H., Dicke, A. -L., Flunger, B., Schreier, B., Häfner, I., Trautwein, U., & Nagengast, B. (2015). More value through greater differentiation: Gender differences in value beliefs about math. *Journal of Educational Psychology, 107*(3), 663–677. https://doi.org/10.1037/edu0000003

Gorges, J. (2015). Out of school, out of mind? An expectancy-value analysis of adult learners' motivation. *Journal of Cognitive Education and Psychology, 14*(2), 263–264. https://www.proquest.com/docview/1685862469?sourcetype=Scholarly%20Journals

Gorges, J., & Göke, T. (2015). How do I know what I can do? Anticipating expectancy of success regarding novel academic tasks. *British Journal of Educational Psychology, 85*, 75–90. https://doi.org/10.1111/bjep.12064

Gorges, J., & Kandler, C. (2012). Adults' learning motivation: Expectancy of success, value, and the role of affective memories. *Learning and Individual Differences, 22*(5), 610–617. https://doi.org/10.1016/j.lindif.2011.09.016

Griffin, R., MacKewn, A., Moser, E., & VanVuren, K. W. (2012). Do learning and study skills affect academic performance? An empirical investigation. *Contemporary Issues in Education Research, 5*(2), 109–116. https://doi.org/10.19030/cier.v5i2.6928

Heckman, J. (2007). *Importance of early childhood development: Invest in the very young. Encyclopedia on early childhood development* (2nd ed.). http://www.child-encyclopedia.com/importance-early-childhood-development/according-experts/invest-very-young

Ho, R. (2014). *Handbook of univariate and multivariate data analysis with IBM SPSS* (2nd ed.). Taylor and Francis. https://doi.org/10.1201/b15605

Jansen, R., van Leeuwen, A., Janssen, J., Kester, L., & Kalz, M. (2017). Validation of the self-regulated online learning questionnaire. *Journal of Computing in Higher Education, 29*(1), 6–27. https://doi.org/10.1007/s12528-016-9125-x

Jones, B. D., Paretti, M. C., Hein, S. F., & Knott, T. W. (2010). An analysis of motivation constructs with first-year engineering students: Relationships among expectancies, values, achievement, and career plans. *Journal of Engineering Education, 99*(4), 319–336. https://doi.org/10.1002/j.2168-9830.2010.tb01066.x

Kusurkar, R. A., Ten Cate, T. J., Vos, C. M. P., Westers, P., & Croiset, G. (2013). How motivation affects academic performance: A structural equation modelling analysis. *Advances in Health Sciences Education, 18*(1), 57–69. http://dx.doi.org/ 10.1007/s10459-012-9354-3

Lai, E. R. (2011). *Motivation: A literature review research report*. https://viciongroup.info/assets/files/25.-Motivacin.unarevisindeliteraturaInglsautorEmilyR.Lai.pdf

Matsunaga, M. (2010). How to factor-analyze your data right: Do's, dont's, and how-to's. *International Journal of Psychological Research, 3*(1), 97–110. https://www.semanticscholar.org/paper/How-to-factor-analyze-your-data-right%3A-do%E2%80%99s%2C-and-Matsunaga/1535fea223fabfe05a226b2d76a4b40524710f97

Mîndrilă, D. (2010). Maximum likelihood (ML) and diagonally weighted least squares (DWLS) estimation procedures: A comparison of estimation bias with ordinal and multivariate non-normal data. *International Journal of Digital Society (IJDS), 1*, 60–66. https://doi.org/10.20533/ijds.2040.2570.2010.0010

Morrow, J. A., & Ackermann, M. E. (2012). Intention to persist and retention of first-year students: The importance of motivation and sense of belonging. *College Student Journal, 46*(3), 483–491. https://psycnet.apa.org/record/2012-24487-003

Osborne, J. W. (2014). *Best practices in exploratory factor analysis*. CreatreSpace Independent Publishing. https://www.researchgate.net/publication/265248967_Best_Practices_in_Exploratory_Factor_Analysis

Post, T., & Walma van Der Molen, J. H. (2019). Development and validation of a questionnaire to measure primary school children's images of and attitudes towards curiosity (The CIAC questionnaire). *Motivation and Emotion, 43*(1), 159–178. https://doi.org/10.1007/s11031-018-9728-9

Robbins, S. B., Lauver, K., Le, H., Davis, D., & Langley, R. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin, 130*(2), 261–288. https://doi.org/10.1037/0033-2909.130.2.261

Roeser, R. W., Midgley, C., & Urdan, T. C. (1996). Perceptions of the school psychological environment and early adolescents' psychological and behavioral functioning in school: The mediating role of goals and belonging. *Journal of Educational Psychology, 88*(3), 408–422. https://doi.org/10.1037/0022-0663.88.3.408

Schneider, B., Krajcik, J., Lavonen, J., Salmela-Aro, K., Broda, M., Spicer, J., Bruner, J., Moeller, J., Linnansaari, J., Juuti, K., & Viljaranta, J. (2016). Investigating optimal learning moments in U.S. and Finnish science classes. *Journal of Research in Science Teaching, 53,* 400-421. https://doi.org/10.1002/tea.21306

Schreiber, J., Nora, A., Stage, F., Barlow, E., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of Educational Research, 99*(6), 323–338. https://doi.org/10.3200/JOER.99.6.323-338

Sogunro, O. A. (2015). Motivating factors for adult learners in higher education. *International Journal of Higher Education, 4*(1), 22–37. https://doi.org/10.5430/ijhe.v4n1p22

Steinmayr, R., & Spinath, B. (2009). The importance of motivation as a predictor of school achievement. *Learning and Individual Differences, 19,* 80–90. https://doi.org/10.1016/j.lindif.2008.05.004

Tabachnick, B., & Fidell, L. (2013). *Using multivariate statistics* (6th ed.). Pearson Education.

Terenzini, P. T., & Reason, R. D. (2005, November). Parsing the first year of college: A conceptual framework for studying college impact [Paper presentation]. *The annual meeting of the association for the study of higher education,* Philadelphia, PA. https://docplayer.net/15292255-Parsing-the-first-year-of-college-a-conceptual-framework-for-studying-college-impacts.html

Tinto, V., & Pusser, B. (2006, November). Moving from theory to action: Building a model of institutional action for student success [Paper presentation]. *The national symposium on postsecondary student success,* Washington, DC. https://nces.ed.gov/npec/pdf/Tinto_Pusser_Report.pdf

van der Putten, S. A. (2017). Are motivational theories too general to be applied in education? *SFU Ed Review Special Issue 2017*, 1–12. https://journals.lib.sfu.ca/index.php/sfuer/article/download/311/174/

VanZile-Tamsen, C. (2001). The predictive power of expectancy of success and task value for college students' self-regulated strategy use. *Journal of College Student Development, 42*(3), 233–241. https://www.researchgate.net/publication/234573795_The_Predictive_Power_of_Expectancy_of_Success_and_Task_Value_for_College_Students'_Self-Regulated_Strategy_Use

Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. *Contemporary Educational Psychology, 25*, 68–81. https://doi.org/10.1006/ceps.1999.1015

Wigfield, A., Tonks, S., & Klauda, S. L. (2009). Expectancy-value theory. In K. R. Wentzel, & D. B. Miele (Eds.), *Handbook of motivation in school* (pp. 55–75). https://psycnet.apa.org/record/2009-24219-004

Yong, A. G., & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology, 9*(2), 79–94. https://doaj.org/article/2687c98d82474a6d8ccac214e7f31288

Yoo, S., & Huang, W. (2013). Engaging online adult learners in higher education: Motivational factors impacted by gender, age, and prior experiences. *Journal of Continuing Higher Education, 61*(3), 151–164. https://doi.org/10.1080/07377363.2013.836823

Zhou, J., & Urhahne, D. (2013). Teacher judgment, student motivation, and the mediating effect of attributions. *European Journal of Psychology of Education, 28*(2), 275–295. https://doi.org/10.1007/s10212-012-0114-9

Zimmermann, B. J., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American Educational Research Journal, 29*(3). https://doi.org/10.3102/00028312029003663