Development of the college-attendance value scale for second-year students in Taiwan

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Abstract

Purpose – The purpose of this paper is twofold: to develop the college-attendance value scale (CAVS) in the Taiwan context to understand undergraduates' reasons for or benefits from college education, and to examine how the value relates to additional motivational goals, academic performance, and expected terminal degree.

Design/methodology/approach – Data analyses involved sophomores ($n = 729$) who completed a learning-experience survey that included CAVS of the personal value and collective value subscales, expected terminal degree, Achievement Goal Questionnaire, and cumulative grade point average (CGPA). Construct validity evidence was substantiated by the results of exploratory factor analysis ($n = 364$) for two-factor identification, and by the results of confirmatory factor analysis ($n = 365$) for a good model-fit.

Findings – The interrelations between variables in regression analysis supported the predictive validity; achievement goals were predictors of CGPA, while personal value was a sole predictor of expected terminal degree. Findings suggest that CAVS is a predictive measure for Taiwanese undergraduates' academic performance and choices.

Practical implications – In terms of policy implications, college students' values of college attendance should not only be regularly investigated by institutional research, but should be widely applied by university students, educators and administrators to facilitate the optimal learning development for each undergraduate.

Originality/value – The study develops a short but effective scale of college-attendance value for the Taiwanese students who usually attend college after graduating from high school. The CAVS is useful in manifesting the students' major reasons for pursuing college education.

Keywords Achievement, Personal value, College-attendance value scale (CAVS), Collective value, Expected terminal degree

Paper type Research paper

1. Introduction

College students' learning experience has been increasingly considered a key part of institutional research (IR) which is mainly focused on evaluating institutional effectiveness in terms of learning success (Hossler *et al.*, 2001; Kelly *et al.*, 2016; Kuh *et al.*, 2006; Volkwein, 2011; Wu, 2016). In an attempt to better reflect institutional effectiveness, IR may address multiple variables such as learning values, engagement, outcomes, student's characteristics, campus environment, teacher-student interaction, and more (Hossler *et al.*, 2001; Kelly *et al.*, 2016; Kuh *et al.*, 2006; Volkwein, 2011; Wu, 2016). While these variables appear to be broad-gauged, student learning experience is arguably the core of college education, and thus always plays a

critical role in charting the path to learning success (Kuh *et al.*, 2006; Whitt *et al.*, 2008). The learning experience is usually measured by a variety of variables, such as academic values or expectations, readiness for college education, learning attitudes, engagement, achievements, and completion of college study. Thus, these factors make it possible to unveil the learning process and outcomes occurring in varying structured or unstructured curricula, real-life tasks, and social events that college students attend (Hossler *et al.*, 2001; Kuh, 2005; Kuh *et al.*, 2006; Lin *et al.*, 2014). With these learning-experience indicators, IR is more likely to reveal the common learning experience for the majority of college students, and to signal directions of institutional improvement. Among these indicators, the value and goal variables (e.g. values of college education and goals of academic achievement) are found to be predictive of success in college study (Chen and Lu, 2015; Kember *et al.*, 2008).

In fact, value of education has been found to be relatively effective in terms of elaborating on why one emanates motivation to attend schooling, to attain achievement, and to express expectations of engaging in further education (Betz, 1993; Battle and Wigfield, 2003; Eccles *et al.*, 1983; Eccles, 1987, 2009; Jones *et al.*, 2010; Kember *et al.*, 2008). There are two values, collective value (e.g. peer influence, career concern) and personal value (e.g. knowledge development, self-exploration), that are critical for success in schooling (Battle and Wigfield, 2003; Eccles, 2009; Liem *et al.*, 2012). These two values serve as active antecedents for academic achievements and related choices regarding further education (Battle and Wigfield, 2003; Eccles, 2009).

Despite this great functionality, these two values have yet to be adequately applied to undergraduates' evaluation of their college attendance. It is not uncommon for undergraduates to experience fluctuations in their college-attendance value throughout their college studies (Kember *et al.*, 2008). Applying these two values of college attendance may yield interesting insights into how value fluctuations relate to undergraduates' striving for higher achievement, and their arrival at the choice of graduate studies or a job. In this sense, it is of great necessity for college administrators to learn about the values undergraduates hold (e.g. the college-attendance values of why they attend college), and then to tailor college-learning experiences to the needs of undergraduates, which may constitute evidence for the relative institutional effectiveness in terms of the students' success (Kelly *et al.*, 2016). This study aims to examine undergraduates' reasons for attending college by developing the college-attendance value scale (CAVS). In particular, the study addresses two research questions:

RQ1. Can the CAVS measures undergraduates' personal and collective values of attending college?

RQ2. Are the undergraduates' college-attendance values related to their achievement goals, academic performance, and expected terminal degree?

1.1 IR for higher quality higher education
In higher education, there has been a growing volume of IR that is often designed to examine the evidence for institutional effectiveness and related factors (Kelly *et al.*, 2016; Volkwein, 2011; Wu, 2016). IR can be briefly defined as a series of actions that will hopefully lead to evidence-based decisions on enhancing the learning experience and institutional effectiveness (Kelly *et al.*, 2016; Volkwein, 2011; Wu, 2016). For instance, IR may include systemic data collection and analysis of learning input, experience, outcomes, data interpretation, and policy making, which may help university administrators make informed decisions as well as launch major initiatives for institutional improvement (Kelly *et al.*, 2016; Volkwein, 2011; Wu, 2016). To make the institutional improvement more relevant to student learning experiences, IR should comprise a wider range of data, such as students' grade point average, and survey results on learning attitudes, values, and satisfaction. By exploiting the potential of these measures, IR should examine learning

values as well as achievements to reveal the relative institutional effectiveness of promoting the optimal learning of each college student, since learning values (sometimes operationalized as motives or motivational beliefs) have been recognized as a key antecedent for the desired learning process and outcomes of students at all levels in both eastern (Kember *et al.*, 2008; Liem *et al.*, 2012) and western (Battle and Wigfield, 2003; Eccles, 1987, 2009; Eccles *et al.*, 1983) societies.

However, Kelly *et al.* (2016) point out that Asian cultures and practices often leave the survey results (e.g. surveys on students' attitudes, values, or perceived competence) unresponsive to students' needs or less transparent to the public, which may hinder the potential collaboration between industry, university, and other education stakeholders. To address this less transparent disadvantage, university administrators should better disseminate the information gained from IR, such as students' demographics, values of college education, and learning process and products (Kelly *et al.*, 2016). Among these variables, college-attendance value, denoting the reasons for and benefits of receiving a college education, as a key predictor of learning and achievement, may be a good start for the IR implications.

1.2 The conceptual framework of college-attendance value

1.2.1 Value of higher education. Value of higher education is worth considering because it serves as a key antecedent for completing undergraduate or graduate degrees that often allows for the pursuit of a professional career (Betz, 1993) or the accumulation of human capital (Schultz, 1982). A number of studies have addressed this issue using the framework of the expectancy-value theory, and found that value beliefs are predictive of intention or choice to take higher education courses (Battle and Wigfield, 2003; Eccles *et al.*, 1983; Eccles, 1987; Jones *et al.*, 2010). Particularly focusing on graduate education, Battle and Wigfield (2003) targeted college women in the USA, and developed the valuing of education scale (VOE) which subsumes four values of graduate education, including intrinsic value of interest, attainment value of self-achievement, utility value of job and practical concerns, and cost of time and effort. VOE was found to be predictive of intention to engage in graduate education, with two prominent predictors, intrinsic-attainment value out of personal criteria, and utility value out of social or practical criteria (Battle and Wigfield, 2003).

While intrinsic-attainment value and utility value of graduate-program attendance have been found to be predictive of intention to engage in graduate education (Battle and Wigfield, 2003), social value remains less addressed (e.g. the value mainly shaped by family and peer influence). Social influence often plays a key role in affecting one's education-related choices from the perspective of the expectancy-value theory (Battle and Wigfield, 2003; Eccles *et al.*, 1983; Eccles, 1987). This study attempts to fill in this gap by addressing the social influence denoting how key socializers (e.g. parents, teachers, and peers) affect the individual's perceived importance of a task (Bernardo, 2008; Eccles, 2009). Particularly in eastern societies, social influence has been recognized as a key factor in determining one's schooling pursuit and academic performance, which often constitutes social motive or value for learning (Bernardo, 2008; Chen and Lu, 2015; Liem *et al.*, 2012). Thus, this study addresses both the intrinsic-attainment value and social value when conceptualizing undergraduates' college-attendance value in Taiwan.

1.2.2 Collective value and personal value in relation to achievement goals. The expectancy-value theory has long been recognized as quite effective in terms of predicting individuals' achievement and future choices in education research (Battle and Wigfield, 2003; Eccles *et al.*, 1983; Eccles, 1987). Recently, Eccles (2009) proposed integrating her expectancy-value theory with the identity-development theory (Oyserman *et al.*, 2002). Eccles (2009) specifies two identities. Personal identity reflects an identity making individuals unique, while collective identity reflects a social role of the intended pursuit (e.g. gender role). In particular, collective identity may drive one to learn or develop over time in pursuit of

meeting social expectations or norms of one's development. These two identities are highly interactive but not identical with each other, making them distinguishable (Eccles, 2009).

These two identities are dynamically fluid in terms of content, salience, and relevance across contexts, through subjective interpretations, and over time (Eccles, 2009). Contents refer to one's achievement-related tasks or choices, while salience and relevance refer to the perceived importance of tasks and choices in the development of intended identities. Moreover, contents, salience, and relevance of the collective and personal identities are subject to three elements. The first is the social and psychological experiences that individuals accumulate in opting for varying tasks. Notably, these choice experiences exert reciprocal influences among each other over time (Eccles, 2009). For example, one's choices today will become one's past experiences of choices tomorrow. These past experiences often affect future choices. The second element is the individual's agency in interpreting those experiences to enact or threaten specific personal or collective identities. Individuals usually interpret the importance of these experiences according to the extent to which they foster development of their intended identities. Third, the co-construction of the identities involves not only individuals, but also the key socializers (e.g. family and peers) with whom individuals interact across contexts (Eccles, 2009). Interacting with key socializers, individuals tend to gradually internalize particular social norms, such as social-role systems, conventional activities, and ideal characteristics into their value systems. In summary, collective and personal identities are dynamically constructed over time, through subjective interpretation, and across contexts. This dynamic nature of identity-based motivation was adopted by the study.

These values are largely observable by achievement-related beliefs, such as achievement goals, expectancy and value of achievement-related choices (Eccles *et al.*, 1983; Eccles, 1987). In academic settings, Eccles (2009) elaborated that achievement goals and expectancy for achievement are more related to achievements, while task values are more related to intention or choices regarding one's job or further education. The study targeted task value for graduate choices.

Instead of using Eccles' (2009) terms of collective and personal identities, the present study specified the terms as collective value and personal value for a direct denotation of college-attendance value. This value reflects undergraduates' continuing interpretation of how relevant prior choice of college attendance is to their short-term or long-term goals. Usually, this interpretation is highly susceptible to ongoing college studies that constantly offer social or psychological experiences to shape the value (Kember *et al.*, 2008). Adopting Eccles' (2009) logic, this value hypothetically affects undergraduates' future choice, such as intention to continue with graduate education or to get a job.

Similar to Eccles' expectancy-value theory, the achievement motive theory also stresses the importance of one's collective and personal values to one's academic achievement, and proposes two major motives, the social-oriented motive (e.g. parents' or teachers' expectations) and the individual-oriented motive (e.g. personal expectations) (Diseth and Kobbeltvedt, 2010; Liem *et al.*, 2012). In fact, studies on the achievement motive theory specified that motive functions as an indirect antecedent of academic achievement, usually through a powerful mediator, achievement goals (i.e. performance-approach/-avoidance goals) (Bernardo, 2008; Diseth and Kobbeltvedt, 2010; Liem *et al.*, 2012). Furthermore, social-oriented motive has been found to be more related to performance-approach and performance-avoidance goals, while individual-oriented motive has been found to be more related to mastery-approach and performance-approach goals (Liem *et al.*, 2012). Following this logic, the study hypothesized that the college-attendance value is positively related to achievement goals, and that performance-approach goals are predictive of academic achievement. University administration should first learn students' college-attendance value which is highly related to the subsequent learning process and outcomes, and then monitor

and evaluate the learning process and outcome, which greatly signals directions for the curriculum and instruction innovation university wide.

To recapitulate, this study sought to investigate undergraduates' reasons for or values of attending college, mainly using the two subscales, the collective value (e.g. of peer's or parent's influence and job-seeking term), and personal value (e.g. of knowledge exploration and development of in-depth thinking). Moreover, these two values were hypothesized as an antecedent for academic achievement and expected terminal graduate degree, under the framework of Eccles' (2009) recent expectancy-value theory.

1.3 Purpose of the study
The aim of the study was twofold: to develop the CAVS in the Taiwan context for an understanding of undergraduates' reasons for or benefits of college education; to examine the degree to which college students' college-attendance values relate to their additional motivational goals, academic performance, and expected terminal degree. This development involved a procedure including analyses of construct validity within CAVS (convergent and discriminant validity), and predictive validity of CAVS (regressing CAVS on academic achievement and expected terminal degree).

2. Method
2.1 Context of the study
The participants in the study were 731 sophomores from a national university that was ranked in the top three in Taiwan for educating intellectuals and publishing research in the STEM fields of science, technology, engineering, and mathematics. In order to understand undergraduates' learning experiences and find directions for institutional improvement, a school-wide survey was conducted.

The survey targeted sophomores for three reasons. First, sophomores are at a transitional stage of advancing from freshmen to juniors, which means their learning engagement and achievement may undergo changes, such as having better or worse learning experiences in their second year of study (Loughlin *et al.*, 2013; Maunder *et al.*, 2012; Tobolowsky, 2008). These changes are arguably important to the ongoing development of most undergraduates. The change in a better direction often enables undergraduates to have more desired learning outcomes throughout their college studies (including holding more personal values or intrinsic motivation to learn), and to make more appropriate choices in their second year of study or after graduation (Loughlin *et al.*, 2013; Tobolowsky, 2008). Thus, there is a growing need to investigate the sophomores' learning experiences (e.g. learning values and beliefs, engagement, and achievement) (Maunder *et al.*, 2012; Tobolowsky, 2008). Second, sophomores are more familiar with their college life; they may make more reflective appraisals of the college environment and the effectiveness of the institution, according to their college studies, as compared to freshmen. Such familiarity would make this investigation more likely to reflect the extent to which the university is effective in providing good learning experiences and a suitable environment for fostering undergraduates' learning and promoting undergraduates' positive values for college attendance (Loughlin *et al.*, 2013). Third, there is a Taiwan Higher Education database (Chen, 2007) which mainly focuses on the college-learning experiences of freshmen and juniors in Taiwan. Yet, the learning experience of sophomores remains less addressed in the higher education field (Maunder *et al.*, 2012; Tobolowsky, 2008), as well as in the institutional practices in Taiwan (Chen, 2007).

With a focus on sophomores, this study addressed college-attendance value that mainly constitutes reasons for college attendance, and the interrelations between college attendance, achievement goals (Elliot and McGregor, 2001), academic performance, and expected terminal degree (i.e. master's or doctoral degree).

2.2 Sample of the study

In this survey, all sophomores ($n = 1,541$; 66.06 percent male ($n = 1,018$), 33.94 percent female ($n = 523$)) were invited to participate. The returned 731 questionnaires were processed to screen out the incomplete questionnaires. Thus, two questionnaires were excluded from the analyses, giving a final sample of 729 (response rate: 47.31 percent of 1,541). The participants' average age was 20.44 years (SD $= 0.72$). A total of 39.72 percent of the participants were female ($n = 287$), and 60.6 percent were male ($n = 442$). The participants came from seven colleges of the university as follows: 12.9 percent from the science college, 22.4 percent from engineering, 19.8 percent from electrical engineering and computer science, 12.4 percent from humanities and social sciences, 7.5 percent from life science, 10.4 percent from nuclear science, and 14.5 percent from technology management. Although a common estimate of sampling data is to include sampling weight by the variables of interest (e.g. gender and field), sampling weight often involves great complexity, such as weight variables being arbitrary in nature (Winship and Radbill, 1994). Thus, we did not include sampling weight in the subsequent analysis; however, this limits the possible generalizations of the study findings to the wider context.

In the year of the study, the undergraduate population was 6,189 students of whom 65.6 percent were male students, and 34.4 percent female. The population undergraduates came from seven colleges: 14.9 percent from the science college, 24.3 percent from engineering, 18.0 percent from electrical engineering and computer science, 11.9 percent from humanities and social sciences, 5.9 percent from life science, 10.8 percent from nuclear science, and 13.8 percent from technology management. Thus, the results of the demographic data (i.e. gender and college) suggest that the ratios of the sampled participants closely corresponded to those of the entire undergraduate population, making the study results relatively representative.

2.3 Measures

Below are the details of the measures of the CAVS, Achievement Goal Questionnaire (AGQ), cumulative grade point average (CGPA), and expected terminal degree.

2.3.1 CAVS. Designing CAVS involved four phases: adopting theories, collecting items from the database, consulting experts, and piloting on students.

2.3.2 Construction of CAVS. CAVS subsumed two constructs, personal value and collective value. Personal value denotes individualized interests, needs, reasons, or benefits of learning that help individuals perceive the importance of learning to personal development or goal pursuit in a long term. Collective value denotes social interests, needs, reasons, or benefits of individuals' learning that help them perceive the importance of learning for conformity to social norms or expectations. The construction of CAVS adopted the framework of the expectancy-value theory, with a focus on collective value and personal value (Eccles, 2009). Using this framework, potential items were drafted. Since these items were written in the participants' native language (Chinese), no translation was needed. Then, the CAVS draft was given to three experts who were researchers in educational measurement, educational psychology, and psychology. These experts commented on the relevance of the items to undergraduates' value of college attendance, and possible problems with item wording and interpretation. Lastly, the CAVS draft was administered to a focus group of three students from the targeted population. The focus group commented on the extent to which the items adequately reflected their college-attendance value, and whether they interpreted the items in a manner corresponding to that of the item development. With these comments, possible problems in wording and interpretation were resolved, which provided preliminary content validity evidence for the eight items of CAVS.

2.3.3 Two subscales of CAVS. The two subscales are collective value and personal value. Collective value (five items) referred to the college-attendance reasons stemming from social criteria (e.g. peer influence, job-seeking term). Personal value (three items) referred to the

college-attendance reasons stemming from individual criteria (e.g. development of in-depth thinking, knowledge exploration).

These eight items were assessed by a four-point Likert-type response ranging from point 4 (strongly agree) to point 1 (strongly disagree). Moreover, these items were asked using the item-stem: what are your reasons for attending college? All the items in the two subscales were totaled. A high score corresponds to a high degree of endorsement of CAVS.

2.3.4 Expected terminal degree. Participants' expected degree was probed with response of bachelor, master's, and doctoral degrees. The participants should check one of the responses. For coding of the responses, the bachelor response was categorized as 0 and the master's and doctoral degrees as 1, which distinguished the expectation of engaging in graduate education from no expectation.

2.3.5 AGQ. The AGQ manifesting a 2 by 2 framework of achievement goals was adopted (Elliot and McGregor, 2001). This framework subsumed four subconstructs, namely, mastery approach, mastery avoidance, performance approach, and performance avoidance; each subconstruct was measured by three items, totaling 12 items. These items of achievement goals were assessed by a four-point Likert-type response. Similar to CAVS, the responses ranged from point 4 (strongly agree) to point 1 (strongly disagree). For scoring, all the items in the four subscales were totaled. A high score corresponds to a high degree of endorsement of the achievement goals. The internal consistency of this scale was supported by previous studies (mastery-approach goals, mastery-avoidance goals, performance-approach goals, and performance-avoidance goals, with Cronbach's αs of 0.84, 0.88, 0.92, and 0.94, respectively) (Elliot and Murayama, 2008).

2.3.6 CGPA. Permission was obtained from the university for a match between the value scores and the participants' CGPA for four semesters (720 participants due to some missing cases), which enabled a subsequent analysis of CGPA, and the CAVS and AGQ scores.

2.4 Procedure

The eight-item college-attendance motive scale was administered in a university-wide online survey. The survey was a built-in feature in the university academic information system, which encouraged all the sophomores in the university to participate. The participants filled in the demographic and questionnaire items after reading a letter explaining the survey purposes. After completing the survey, the participants were eligible for an incentive raffle that gave a few prizes of popular electronic devices, including an iPad, a transformer, an iPod, and USB flash drives.

2.4.1 Analytical procedure. Data analysis included descriptive statistics, reliability analyses, correlation analysis, and exploratory factor analysis (EFA) using SPSS Version 20, while confirmatory factor analysis (CFA) was performed using LISREL 8.8 (Joreskog and Sorbom, 1996). CFA was tested by maximum likelihood estimation and evaluated by the fit indices of χ^2 (low values at a non-significant level), normed χ^2 (ranging from 1 to 3), RMSEA (less than 0.08 with confidence interval reported), CFI (equal to or larger than 0.95 on the 0-1 scale), NNFI (equal to or larger than 0.95 on the 0-1 scale) (Hair *et al.*, 2010; Kline, 2011). Because these nested models were compared, the χ^2 value was evaluated (Hair *et al.*, 2010; Kline, 2011).

3. Results

3.1 Descriptive statistics

Item analyses on the eight items were conducted using the descriptive statistics of mean, standard deviation, skewness, kurtosis, and reliability analysis (see Table I). The skewness and kurtosis of the items in terms of the converted z-scores were all below ±1.96, and provided little evidence of significant deviations from normal distribution, enabling use of the maximum likelihood estimation in the following CFA.

	Mean	SD	Skewness	Kurtosis	Corrected item-total correlation	Cronbach's α if item deleted
Item 1. Family expectation	3.11	0.72	−0.73	0.90	0.61	0.78
Item 2. Peer influence	2.99	0.77	−0.61	0.31	0.69	0.75
Item 3. Social trend	3.25	0.76	−0.98	0.97	0.72	0.75
Item 4. Job-seeking term	3.31	0.72	−1.01	1.17	0.61	0.78
Item 0. Expansion of social networking	2.96	0.76	−0.45	0.01	0.42	0.83
Collective value Cronbach's $\alpha = 0.82$						
Item 5. Knowledge exploration	3.25	0.66	−0.81	1.50	0.76	0.84
Item 6. Development of in-depth thinking	3.22	0.67	−0.59	0.57	0.82	0.79
Item 7. Self-exploration and self-actualization	3.28	0.68	−0.81	1.07	0.73	0.87
Personal value Cronbach's $\alpha = 0.88$						

Notes: $n = 729$. SD, standard deviation

For reliability analysis, correlated item-total correlation and Cronbach's α if item deleted were computed. Overall, the eight items were calculated by their corresponding subscale, collective value and personal value. Results showed that Item 0 (development of social networking) has a weaker function. That is, Item 0 had a lower value in the corrected item-total correlation (0.42; a suggested value is around 0.50, Hair *et al.*, 2010) and a higher value of Cronbach's α if item deleted (0.83) (suggested value is lower than the scale reliability, i.e. 0.82, Hair *et al.*, 2010), indicating that the item was less consistent with the other items in the subscale.

For the factor analysis, the participants were randomly divided into Sample 1 ($n = 364$) and Sample 2 ($n = 365$). Sample 1 served as the calibration sample for the EFA by the extraction method of principal component analysis (PCA). Sample 2 served as the validation sample for the CFA.

3.2 EFA results
First, using the calibration sample ($n = 364$), CAVS with a two-factor model was examined by PCA with a promax rotation. The Kaiser-Meyer-Olkin statistic of 0.77 revealed that the sample size was adequate for the procedure. Factor extraction was determined by eigenvalues greater than 1 and the leveling-off point on the scree plot. The results showed a two-factor solution, accounting for 66.68 percent of the total variance (eigenvalues of 3.38 and 1.95, respectively).

In evaluating factor loadings, a cutoff of 0.45 was adopted to reveal a significant association between the item and its corresponding factor. Table II shows that the factor loadings of most items ranged from 0.73 to 0.93. However, Item 0 double-loaded on both factors (0.35 and 0.43 on collective value and personal value, respectively), once again revealing that Item 0 appeared less effective in reflecting a single construct. Also, each loading of Item 0 was lower than 0.45, failing to explain at least 20 percent of the shared variance between the item and the factor. Notably, Item 0 showed poorer performance in the reliability analysis as well. Item 0 was then deleted in subsequent analysis to ensure that all items in CAVS effectively reflected the designated single factor.

After the deletion, EFA was recomputed on the remaining seven items. The Kaiser-Meyer-Olkin statistic was 0.74, indicating that the sample size was adequate, and the total variance explained was 71.91 percent of the total variance (eigenvalues of 3.08 and 1.95, respectively).

Item/Factor	1st EFA		2nd EFA	
	1	2	1	2
2. Family influence	0.85	−0.03	0.85	−0.02
3. Social trend	0.84	0.00	0.85	0.02
1. Family expectation	0.80	−0.12	0.80	−0.11
4. Job-seeking term	0.73	0.12	0.73	0.12
6. Development of in-depth thinking	−0.05	0.93	−0.02	0.92
5. Knowledge exploration	−0.02	0.88	0.02	0.89
7. Self-exploration and self-actualization	−0.03	0.87	0.00	0.87
0. Expansion of social networking	0.35	0.43		
Note: EFA, exploratory factor analysis				

Table II.
Results of exploratory factor analysis (rotated matrix)

The factor loading ranged from 0.73 to 0.92 (see Table II). Since these seven items all loaded on the designated factors, the naming of these two factors follows our hypothetical framework. Items 1-4 were named "collective value," while Items 5-7 were named "personal value."

3.3 CFA results

Second, the seven items in the second EFA were further validated by a CFA on the validation sample ($n = 365$). The hypothetical CFA model subsumed two factors, collective value and personal value.

3.3.1 Model testing. Table III shows the fit indices of the three competing models tested in the two phases. First, the proposed two-factor model (Model 2) was tested against the one-factor model (Model 1) serving as a null hypothesis. Model 1 had a rather poor fit ($\chi^2 = 623.60$ (14), $p < 0.05$, normed $\chi^2 = 44.54$, RMSEA $= 0.35$, CFI $= 0.53$, and NNFI $= 0.30$), justifying the rejection of the one-factor model. This rejection provides discriminant validity evidence of the two-factor model. Likewise, Model 2 was tested. From Model 1 to Model 2, there was a decrease of 535.95 at an expense of one degree of freedom, indicating a significant improvement in the χ^2 value (a drop of less than 5.00 is considered as showing little improvement in fit) (Byrne, 1989; Gagne *et al.*, 1995). However, as shown in the fit indices, Model 2 did not adequately explain the data. Model modification was conducted by modification indices from the LISREL program.

Second, Model 2 was tested against Model 3, which further specified the two-factor model by an error covariance. Model 3 showed a good fit ($\chi^2 = 23.37$ (12), $p < 0.05$, normed $\chi^2 = 1.95$, RMSEA $= 0.05$, CFI $= 0.99$, and NNFI $= 0.98$). From Model 2 to Model 3, there was a decrease of 64.28 at an expense of one degree of freedom, indicating another significant improvement in fit (Byrne, 1989; Gagne *et al.*, 1995). Model 3 was therefore accepted as the final model.

Model	χ^2 (df)	Normed χ^2	$\Delta\chi^2$ (df)	RMSEA	CFI	NNFI
Model 1 1-factor (null)	623.60 (14)	44.54		0.35 (0.33-0.37)	0.53	0.30
Model 2 2-factor	87.65 (13)	6.74	535.95 (1)* $p < 0.05$	0.13 (0.11-0.15)	0.94	0.91
Model 3 2-factor with 1 error cov.	23.37 (12)	1.95	64.28 (1)* $p < 0.05$	0.05 (0.016-0.081)	0.99	0.98
Suggested value	Smaller, the better	< 3.00		< 0.08	> 0.95	> 0.95

Table III.
Model-fit indices

Notes: $n = 365$. χ^2, χ^2 indices; $\Delta\chi^2$(df), $\Delta\chi^2$ indices; error cov., error covariance. Model 3 had a better fit with the data, as shown by the indices of RMSEA, CFI, and NNFI

Notably, in Model 3, an additional parameter of error covariance was estimated between Items 3 and 4 in the collective value subscale, which may be justified. This parameter often reflects non-random measurement error that is attributable to method effect on item measures of the same subscale (Byrne, 1989; Gagne *et al.*, 1995), accounting for minor covariance not captured by the hypothesized model. Model 3 with an error covariance appeared justifiable.

3.3.2 Construct validity evidence. Construct validity evidence is of great importance to ensure that a set of indicators adequately reflects the theoretical latent constructs that the indicators were designed to measure (Hair *et al.*, 2010; Kline, 2011). Specifically in CFA, Kline (2011) stated that construct validity is often evaluated by convergent validity and discriminant validity which evaluate measures against each other, rather than against an external criterion. Here, convergent validity evidence was collected from the factor loading, composite reliability, and average variance extracted (AVE) estimate (Hair *et al.*, 2010; Kline, 2011). Discriminant validity evidence was collected by comparing AVE estimates with the square of the correlation between the latent constructs (Farrell, 2010).

3.3.3 Convergent validity. Table IV presents convergent validity evidence of Model 3, including standardized factor loadings, composite reliability, and AVE. First, except for Item 4 (0.52), all other items had a loading higher than the 0.60 cutoff (Hair *et al.*, 2010). All residuals ranged from 0.17 to 0.73. Second, composite reliability values were 0.80 and 0.88 higher than the 0.70 cutoff, while the AVE estimates were 0.51 and 0.71 higher than the 0.50 cutoff (Hair *et al.*, 2010). These statistics provide convergent validity evidence for CAVS.

3.3.4 Discriminant validity. Discriminant validity evidence was examined by comparing AVE estimates with the square of the correlation between the theoretical latent constructs (Farrell, 2010). In Table IV, below the diagonal was the correlation of the two constructs (0.22) (ϕ estimate in the LISREL output), while above the diagonal was the square of the correlation. As can be seen, the square of the correlation (0.05) is much lower than the two AVEs (0.51 and 0.71, respectively), providing discriminant validity evidence for CAVS (Farrell, 2010).

3.4 Predictive validity evidence
To evaluate the predictive validity evidence of CAVS, a few analyses of Pearson product-moment correlation, multiple regression, and logistic regression were performed.

Subscale/Item	CFA	
	Factor loading	Residual
Convergent validity evidence		
Collective value		
Item 1. Family expectation	0.72*	0.49*
Item 2. Peer influence	0.90*	0.19*
Item 3. Social trend	0.67*	0.55*
Item 4. Job-seeking term	0.52*	0.73*
Composite reliability	0.80	
Personal value		
Item 5. Knowledge exploration	0.83*	0.31*
Item 6. Development of in-depth thinking	0.91*	0.17*
Item 7. Self-exploration and self-actualization	0.78*	0.40*
Composite reliability	0.88	
Discriminant validity evidence		
Collective value	0.51	0.05
Personal value	0.22	0.71

Notes: $n = 365$. CFA, confirmatory factor analysis. *$p < 0.05$

Table IV.
Evidence of
convergent validity
and discriminant
validity

First, Table V shows the correlation analysis results. Overall, CAVS showed a medium correlation with AGQ ($r = 0.39$), a small correlation with CGPA ($r = 0.10$), and a small correlation with expected degree ($r = 0.17$) (Cohen, 1988). As expected, if undergraduates highly endorsed college-attendance value, they tended to highly endorse AGQ, to outperform academically, and to expect to continue with a graduate degree.

On the subscale, collective value had small correlations with AGQ (r ranging from 0.14 to 0.29) but neither with CGPA nor expected degree, while personal value correlated with all of the measures (r ranging from 0.08 to 0.47). First with higher endorsement of collective value, the participants tended to highly endorse achievement goals, particularly the performance-approach and performance-avoidance goals ($r = 0.22$, 0.29), consistent with previous studies (Elliot and McGregor, 2001; Elliot and Murayama, 2008). However, they would not necessarily have higher academic performance or greater expectations to take a graduate degree, consistent with previous studies (Liem *et al.*, 2012). Second with higher endorsement of personal value, the participants tended to highly endorse achievement goals, particularly the mastery-approach and mastery-avoidance goals ($r = 0.47$, 0.44), consistent with previous studies (Elliot and McGregor, 2001; Elliot and Murayama, 2008). Also consistently, they tended to outperform academically (Liem *et al.*, 2012), and to hold higher expectations of taking a graduate degree (Battle and Wigfield, 2003).

Second, a multiple regression analysis was performed, with CGPA as the criterion and CAVS and AGQ as predictors. The results in Table VI reveal two effective predictors of CGPA: performance-approach goal ($\beta = 0.28$, standard error (SE) of $B = 0.49$; $t = 5.88$, $p < 0.000$) and performance-avoidance goal ($\beta = -0.13$, SE of $B = 0.45$; $t = -2.91$, $p < 0.000$). None of personal value, collective value, or the mastery-approach and mastery-avoidance goals were predictive, consistent with previous studies (Bernardo, 2008; Liem *et al.*, 2012).

Third, a logistic regression analysis was performed, with expected terminal degree as the criterion, and CGPA, CAVS, and AGQ as predictors. The results in Table VII show that the expected terminal degree can be predicted by personal value ($B = 0.87$, SE of $B = 0.21$, Wald $\chi^2 = 17.09$, $p < 0.000$) but not the other variables, which is partly consistent with previous studies (Battle and Wigfield, 2003; Eccles, 2009).

These findings of predictive validity and the cross-group analysis indicate three points. First, the CAVS can measure sophomores' personal and collective values of attending college. Second, generally, the inter-correlations of the variables suggest that if undergraduates have higher college-attendance value, they tend to also have higher achievement goals, to

	CAVS	CV	PV	AGQ	MAp	MAv	PAp	PAv	CGPA	ETD
CAVS	1									
CV	0.850**	1								
PV	0.705**	0.225**	1							
AGQ	0.390**	0.266**	0.362**	1						
MAp	0.354**	0.141**	0.465**	0.762**	1					
MAv	0.344**	0.149**	0.435**	0.796**	0.715**	1				
PAp	0.280**	0.224**	0.217**	0.831**	0.513**	0.477**	1			
PAv	0.256**	0.292**	0.079**	0.733**	0.248**	0.392**	0.548**	1		
CGPA	0.095*	0.040	0.123**	0.274**	0.266**	0.231**	0.295**	0.076*	1	
ETD	0.171**	0.055	0.242**	0.181**	0.195**	0.166**	0.144**	0.075*	0.096*	1

Table V.
Pearson correlations among CAVS, AGQ, academic performance, and expected terminal degree

Notes: $n = 720$. CAVS, college-attendance value scale; CV, collective value; PV, personal value; AGQ, Achievement Goal Questionnaire; MAp, mastery approach; MAv, mastery avoidance; PAp, performance approach; PAv, performance avoidance; CGPA, cumulative general point average; ETD, expected terminal degree. *$p < 0.05$; **$p < 0.001$

outperform academically, and to expect a post-graduate-program terminal degree. Third, the two values were not predictive of academic achievement, but personal value was predictive of expected terminal degree.

4. Conclusion

College-attendance values or expectations of undergraduates have gained increasing attention for stakeholders in higher education because they are more likely to drive the subsequent learning engagement and outcomes, and aspirations for further studies of undergraduates (Battle and Wigfield, 2003; Chen and Lu, 2015; Kuh *et al.*, 2006; Whitt *et al.*, 2008). In this study, we developed a CAVS. The results have two major implications. First, the two-factor model of college-attendance value can manifest Taiwanese undergraduates' reasons for or benefits of pursuing college education, particularly by seven-item measures. This CAVS development is thus more likely to be replicated and contextualized to other universities that also stress the importance of learning and utilizing college-attendance values for optimal learning. Second, the CAVS should be used for tracing the learning path along which individuals with higher education values are motivated to aim for and then perhaps achieve the desired learning outcomes. Such investigation would thus advance our understanding of undergraduates' more positive learning experiences, and perhaps they will be more willing to and capable of achieving higher academic performances, and have greater expectations of pursuing graduate studies. This understanding should be appropriately applied to evaluate the institutional effectiveness in terms of the learning success of each college student, and signaling the directions of institutional improvement, particularly through the lenses of institutional researchers (Kelly *et al.*, 2016; Kuh *et al.*, 2006; Volkwein, 2011; Wu, 2016).

	B	SE(B)	β	$t(B)$	p
CV	−0.10	0.44	−0.01	−0.23	0.82
PV	−0.09	0.48	−0.01	−0.19	0.85
MAp	1.26	0.67	0.10	1.88	0.06
MAv	1.04	0.70	0.08	1.48	0.14
PAp	2.86	0.49	0.28	5.88	0.00**
PAv	−1.31	0.45	−0.13	−2.91	0.00**

Notes: $n = 720$, $R^2 = 0.12$. B, unstandardized coefficients, SE(B), standard error associated with unstandardized coefficients, β, beta; $t(B)$, t-value; p, p-value; CV, collective value; PV, personal value; AGQ, Achievement Goal Questionnaire; MAp, mastery approach; MAv, mastery avoidance; PAp, performance approach; PAv, performance avoidance. **$p < 0.001$

Table VI.
Results of a multiple regression analysis on cumulative grade point average

	B	SE(B)	p	Odds ratio	95% CI	Wald
CV	−0.08	0.20	0.68	0.92	[0.63, 1.14]	0.17
PV	0.87	0.21	0.00	2.39	[1.58, 3.60]	17.09
MAp	0.34	0.30	0.26	1.41	[0.78, 2.55]	1.28
MAv	−0.12	0.32	0.71	0.89	[0.48, 1.66]	0.14
PAp	0.23	0.23	0.31	1.26	[0.81, 1.98]	1.04
PAv	0.05	0.22	0.81	1.05	[0.69, 1.60]	0.06
CGPA	0.01	0.02	0.40	1.01	[0.98, 1.05]	0.70

Notes: $n = 720$, Nagelkerke $R^2 = 0.11$. B, unstandardized coefficients, SE(B), standard error associated with unstandardized coefficients; p, p-value; CI, the confidence interval for odds ratio; Wald, the Wald χ^2 value

Table VII.
Results of a logistic regression analysis on expected terminal degree

4.1 Construct validity of CAVS

CAVS was supported by the preliminary validity evidence, suggesting that the latent construct of college-attendance value can be manifested and measured by two subscales: collective value and personal value. The validity evidence for CAVS supports the generalizability of the expectancy-value theory to an Asian country (Battle and Wigfield, 2003; Eccles, 2009). CAVS serves as an effective measure for a contextualized capture of Taiwanese undergraduates' value of college attendance.

4.2 Predictive validity of CAVS

4.2.1 Value as a non-predictor of CGPA. Performance-approach and performance-avoidance goals are predictive of CGPA, while the two values and mastery-approach and mastery-avoidance goals were not predictive, consistent with previous studies (Bernardo, 2008; Eccles 1987, 2009; Elliot and Murayama, 2008). Task value (e.g. collective value and personal value) has been found to be less predictive of achievement (Eccles, 1987, 2009; Jones *et al.*, 2010). A possible explanation is that the task-value effect on achievement is greatly mediated by achievement goals. For instance, such a mediated effect of task value can be seen in Liem *et al.*'s (2012) study which demonstrated a motivated model of secondary school students' achievement in Singapore.

4.2.2 Value as a predictor of expected terminal degree. As expected, personal value is predictive of expected terminal degree, while collective value is not. This finding corresponds to Battle and Wigfield's (2003) study which found intrinsic-attainment value (the strongest predictor) and utility value to be predictive of undergraduates' intention to go to graduate school. Similarly, the study indicated that personal value is the sole predictor of expected terminal degree.

This difference in predictors may be partly attributed to what values are addressed. This study addressed undergraduates' college-attendance values, while Battle and Wigfield (2003) addressed undergraduates' graduate-education values. This wording nuance may contribute to the difference. Undergraduates' values of graduate education refer to their perceived reasons for receiving graduate education (Battle and Wigfield, 2003). This graduate-education value was found to be predictive of intention to pursue graduate education. In the study, undergraduate students' college-attendance values refer to an ongoing judgment of their prior choice of undergraduate education. Less surprisingly, collective value (e.g. job-seeking term) does not suffice in explaining our sophomore participants' expectations regarding a graduate degree. Interestingly, personal value relates to the expected terminal degree, consistent with Battle and Wigfield's (2003) finding that personal value was the strongest predictor of intention to pursue graduate education. Apparently, personal value triumphs over collective value. Personal value not only justifies our sophomores' prior choices of college attendance, but largely initiates their expectations of pursuing a graduate degree, even though gaining a graduate degree appears to be a choice to be made a few years ahead.

Of course, enrolling in graduate programs may not necessarily be the best choice for all undergraduates. However, graduate programs generally enable individuals to reach higher potential in educational terms, to accumulate their human capital (Schultz, 1982), and to have a more prosperous career (Betz, 1993; Battle and Wigfield, 2003). If stakeholders of higher education attempt to encourage more undergraduates to enroll in graduate programs, promoting higher personal value seems a promising direction. Such value promotion may be launched by offering college students enjoyable learning experiences (Eccles, 2009; Kember *et al.*, 2008).

This perspective is elaborated below (Kember *et al.*, 2008). First, personal value is highly interactive with collective value, according to Eccles' (2009) theoretical proposal and

Kember *et al.*'s (2008) qualitative findings on undergraduates in Hong Kong. For instance, individuals may enter college mainly with collective values (i.e. career) at the outset. Throughout their college studies, they may gradually develop their personal value of college attendance by acquiring disciplinary knowledge and enjoying knowledge acquisition in its own right (Kember *et al.*, 2008). This study found that development of personal value will contribute to greater expectations of pursuing a graduate degree. Second, development of personal value and collective value usually occurs over time, through subjective interpretations, and within a certain context (Eccles, 2009). Specifically, personal value of college attendance can be viewed as a function of curriculum choice, learning experiences, and college environment (Kember *et al.*, 2008). In this sense, if individuals are satisfied with their curriculum choice and learning, and with the college environment, they tend to assign higher personal value, which in turn contributes to greater expectations of pursuing a graduate degree. Thus, personal value, as an effective predictor of expected terminal degree, may serve as a key criterion for IR. IR often attempts to use evidence-based data to reveal the learning experiences of most college students, to predict the seniors' choices after graduation (e.g. finding a job or entering graduate school), and then perhaps to signal directions for innovation in the curriculum and instruction at the institution.

4.3 Implications

In terms of its implication, CAVS may benefit undergraduates and university administrator and educators, particularly for personal value being adaptive for more academic-pursuit choices (e.g. higher expected terminal degree). On one hand, undergraduates should learn the importance and the current state of their personal value, and then actively enhance it. For instance, undergraduates should take a proactive role in relating their college education to their intrinsic reasons and needs for continuing development, such as the need for intellectual development, the drive for personal actualization, or even perpetuating curiosity regarding the world (Kember *et al.*, 2008; Loughlin *et al.*, 2013).

On the other hand, university administrators and educators should examine and then ensure that the learning experience enables each student to increase their personal value of attending college. For instance, the learning experience should empower college students to autonomously explore and reflect upon their personal needs and pursuits in their college education. Such personalized reflection has been found to be conducive to a boost in undergraduates' personal value (Chen and Lu, 2015; Kember *et al.*, 2008; Loughlin *et al.*, 2013), since undergraduates are learning to actively make sense of college education, mainly by connecting it to their personal needs, curiosity, or reasons to learn.

In terms of the policy implications, university administrators should recognize, measure, and apply the undergraduates' college-attendance value in question for better institutional effectiveness at present or in the future. First of all, university administrators should make the undergraduates' college-attendance values important and salient to both college students and educators institution wide, such as by administering the scale contextualized to the undergraduates in question, and by circulating the scale responses institution wide. Notably, university administration should make possible tracking of undergraduates' values by continuing to administer value scales (e.g. collective value and personal value) and disseminating the scale responses, so as to better capture fluctuations in these values throughout the students' college life, and to apply these fluctuations for improvement in the learning experiences of most students (e.g. motivating strategies, goal-setting support for stimulating and maintaining higher values of college education, etc.).

Second, university administrators should encourage wider application of the value responses to improvement in learning experiences and innovation in curriculum and instruction design. Taking the learning goals in college education for instance, undergraduates

should be aware of and then be able to relate college education to their individual goals or pursuits in life, while college educators should greatly accommodate undergraduates' needs to achieve their individual goals in their college education.

Third, using the value responses for planning the future learning experience of undergraduates, university administrators and educators should offer corresponding preparation. For individuals holding higher collective value of college attendance and greater intentions to get a job, university administrators should offer job preparation, such as pre-service training on professional and interpersonal skills. University administrators and educators should try to equip individuals with sufficient skills for pursuing their intended career (Lin *et al.*, 2014). For individuals holding higher personal value and greater expectations of graduate education, universities should offer graduate-education preparation, such as advancing the disciplinary knowledge essential for graduate education, and sharpening skills of conducting disciplinary research. These university preparations may be effective in aiding undergraduates to better achieve their varying goals in life. Once more undergraduates successfully attain their goals, the preparations can be deemed supportive of the institutional effectiveness in terms of the learning success of college students in their college studies or over the course of their lives, corresponding to the IR implications stated in previous studies (Kelly *et al.*, 2016; Kuh *et al.*, 2006; Volkwein, 2011; Wu, 2016).

In a nutshell, with a clearer understanding of undergraduates' values of college attending, undergraduates themselves can better achieve their desired learning outcomes, college educators can thus plan both formal and informal curricula to better facilitate students' learning development, and university administrators can improve the learning environment for more optimal development of each student (Kuh *et al.*, 2008; Lin *et al.*, 2014). In this sense, college-attendance value should be included as evidence of college students' learning experience that can indicate the learning effectiveness at present and the improvement directions for the future, corresponding to the common implications of the IR (Hossler *et al.*, 2001; Kelly *et al.*, 2016; Kuh *et al.*, 2006; Volkwein, 2011; Wu, 2016). Once university administrators can better estimate and then apply the students' college-attendance value to interpretations of learning outcomes, they are more likely to better facilitate the development of each student, which subsequently constitutes evidence for institutional effectiveness in terms of promoting the learning success of each college student (Kelly *et al.*, 2016; Volkwein, 2011).

4.4 Limitations

Two major study limitations warrant attention, namely, the sampling and the contextualized college-attendance value. First, in this study, we computed and interpreted the sampled data on the basis of a 47.31 percent response rate to the university-wide sophomore survey, rather than computing the data by sampling weight. While sampling weight is seen as a dependent variable in regression model analysis, it often involves great complexity (Winship and Radbill, 1994), such as how many variables should be included as the sampling weight, and the extent to which the weighted computations are similar to those of the entire population. This concern prevented us from computing by the sampling weight. Such a limitation in the sampling will thus require some caution in the generalization of the study findings.

Second, the college-attendance value is contextualized into a research-oriented university that is renowned for the STEM fields in Taiwan, and thus should not be over-generalized worldwide. Future studies are highly encouraged to adopt this lens of contextualized value, and thus are more likely to be capable of effectively describing the learning paths of college students (such as from the college-attendance value, via achievement goals, to academic performance, in turn making choices for jobs or post-graduate programs after graduation). Also, when using the value to explain the learning path, it is critical to note the collectivistic culture or individualistic culture background (e.g. serving as antecedents of education values) from which students come. Therefore, future studies on the contextualized

college-attendance values, specifically against the culture backdrop, will shed new light on the relative effectiveness of education value or additional motivational beliefs in terms of channeling students' energy appropriately to the more desired learning paths, across diverse universities worldwide.

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