

Motivational Profile: Understanding Academic Performance as a Criterion of Cost, Expectancy for Success and Task Value

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Using a descriptive study design, this research determined how task effort cost, emotion cost, loss of valued alternatives, outside effort cost, social cost, economic cost and sunk cost along with expectancy for success and task value formed a criterion related profile associated with higher academic performance. It used the survey method to gather data from a total of 226 college students enrolled in a high-stake math class. Findings revealed three significant criterion related factors, namely expectancy for success, task value and sunk cost. This motivation profile indicated a high score in expectancy for success, an even higher score in task value and a low score in sunk cost, $B = .43$, $t(224) = 7.22$, $p < .001$. Relationships for the first two confirmed the hypothesized direction while the last one illustrated an inverse connection. Results are discussed in light of the expectancy-value-cost theory and existing studies. This research has implications on the nuances of the construct of cost, on pedagogic relevance, and on school and counseling psychology.

Keywords: expectancy-value theory, success expectancy, task values, cost variables, academic performance

Students who are genuinely interested in school and who believe they can succeed also invest effort to perform well. Still, with the many things that students juggle, academic demands can become overwhelming. Understandably, when students are overwhelmed by the demands, they may appraise these demands negatively. These negative appraisals can be in terms of the number of requirements that students would have to do, other activities and responsibilities that could take time away from these requirements, the effort that students

have already devoted to their classes, the sacrifices they have to make to complete their work, and the emotions they feel toward their requirements. Such appraisals can affect students' performance and are evident in scenarios involving undergraduates who drop out of their classes in the middle of the semester, and among those who stay in the class but who withdraw from participating in their classwork - putting in minimal effort on their performance.

From a motivational perspective, the above scenes can be explained by components of the expectancy-value theory, such as expectancy beliefs and task values (Eccles, 1983; Eccles, 2009; Eccles & Wigfield, 2002). The theory indicates that students' expectancy beliefs and task values can expound changes in school outcomes such that if they are higher, school outcomes are better, and if they are lower, school outcomes are worse. Lowered valuing occurs when cost, or the negative appraisals mentioned earlier, (Flake, Barron, Hulleman, McCoach, & Welsh, 2015) is present. Following the said line of thinking, perhaps undergraduates who drop out of their classes, or those who do not perform well, have also realized that they no longer value their classes and that they won't succeed in them anyway. Thus, they may ask themselves "why bother doing well?" Current studies on EVT that have established cost as a construct that can produce decreases in academic outcomes (e.g. Yurt, 2015) may hint at this possibility.

Considering the direction of findings of current studies, there is likelihood that higher perceptions of cost can lead to lesser valuing, and lesser expectations of success. Thus, students with this motivational profile perform less.

However, the above explanation, although drawn from the theory cannot clearly capture profiles of students who find themselves with the same negative appraisals but who keep on valuing their academic tasks and who believe that they can still succeed despite their perceptions of how costly their academic tasks can be. As such, these students continue to have good academic performance. Examples of students who find themselves in

similar circumstances include those who are enrolled in difficult academic tracks, those who have to juggle work responsibilities while also studying and those who persist until they achieve good class standing even when faced with drawbacks like failure.

How, then, do the three EVT components function in such situations? It appears that cost, no matter how high it is, does not always reduce value thereby affecting outcomes. This description informs the current researcher of the possibility that instead of lessening value, cost may actually have another function and can bring about certain effects, which do not always have to be negative. Such can be understood using a modified version of the expectancy-value theory, referred to as expectancy-value-cost theory (EVCT) (Barron & Hulleman, 2015), which highlights cost as a stand alone component that has its own influence on school outcomes and can add to the effects of expectancy and task value, rather than exerting influence only on value.

Guided by literature and theory, the current study assumes that students who have high expectancy for success and who value tasks will have good performance. When students encounter difficulty in a specific math task for example, if they think they can overcome this difficulty and they value the task, then their performance will remain positive. This shows how the two variables bring about good performance.

What if cost were included in the picture? Would students still perform? Current relevant literatures (e.g. Jiang, Rosenzweig, & Gaspard, 2018) indicating that high scores in cost can

lead to maladaptive outcomes such as avoidance behavior imply the possibility that students who have high cost scores may not perform as well as those with low cost scores. But is this always true in reality? Will high cost scores always lead to lower performance or will it only lead to lower performance if value and expectancy are also low? Realistically, there is possibility that even when students have high scores in cost, so long as task valuing and expectancy are high, they would still perform well. The way these EVCT components work together can be seen among those who believe that extra work in class can increase chances of success and who would approach their teacher to ask for extra work. Scenarios such as the aforementioned provide support to the plausibility of the foregoing scenarios suggesting a motivational profile of students different from what is usually expected.

Bearing the above in mind, the way that cost, together with expectancy and task value, would predict academic performance of students could then be used to describe students' motivational profile outside of what is originally forwarded in EVT. Despite being plausible, a review of empirical studies shows that this has not been extensively examined, warranting further investigation on it.

In addition, research interest in cost was not always as strong as it is now and it was often ignored in past studies providing scholars a restricted understanding of its function. This is surprising because EVT is one of the largest and well-explored motivational theories available in psychology (Feather, 1988). Furthermore, the rise of EVCT as a modified version of EVT calls for more

studies that would test the model. Hence, to contribute to the scientific conversations surrounding EVCT and academic performance, the current study is focused on establishing an understanding of academic performance through a framework that emphasizes cost as adding to the predictive utility of expectancy and task value. Likewise, the study is centered on describing characteristics of students who can be considered under this motivational profile.

Method

Participants

Through purposive sampling, 226 college students (153 male, 65 female, 7 LGBT, 1 no gender indicated) who were enrolled in a high stake math class, specifically in Calculus 2 were selected. Participants belonged to degree programs in mechanical engineering (n=63), civil engineering (n=65), electrical engineering (n=39) and electronics and communications engineering (n=59). Their age ranged from 17 to 35 (M=19.05, SD=1.59). Consent was obtained from the participants prior to collecting data from them.

Instruments

Cost. Perceptions of cost were measured using a questionnaire that was researcher made. Items referred to 7 cost dimensions that currently exist in literature. Four of these dimensions are based on Flake et al. (2015), specifically task effort cost or the appraisal of required effort as too great (e.g., *Memorizing many formulas in my math class is too effortful*), loss of valued alternatives or sacrifices made (e.g., *I sacrifice too much of my time for my*

hobbies in order to make room for studying math), emotion cost or negative feelings toward an academic task (*e.g., I am always afraid of failing my math major exams*), and outside effort cost or the appraisal of the effort put into having to juggle with demands of the task in question and other tasks. (*e.g., I spend too much time answering assignments on other subjects that I no longer have the time to study for my math quizzes*). The other three are based on Wigfield, Rosenzweig, & Eccles (2017). There's sunk cost or "one's evaluation of how much effort one already has put into an activity, and given that, whether it makes sense to continue or quit" (Wigfield et al., p.123) (*e.g., I have a gut feeling that I am going to fail my math class at the end of the term but I am still doing my best to pass the subject because I have already worked too hard on it*), social cost or one's evaluation of how a task can impact his social standing with others whom he considers as important (*e.g., I feel too pressured by my whole family to get high grades in my math class*) and economic cost which refers to the amount of money it would take to complete tasks such as when students evaluate how much money they have to spend on worksheets, textbooks and other resources for their classes (*e.g., I have to allocate too much of my allowance to buy books for my math class*) (Wang & Degol, 2013; Wigfield, et al., 2017).

Items were responded to using a 7-point rating scale. A rating of 1 indicated that the person completely disagreed with the item while a rating of 7 indicated that person completely agreed with the item. Ratings from 2 to 6 did not have corresponding descriptions. Factors or dimensions had separate rather than composite scores in order to present a

more detailed picture of the construct. There were 28 items on task effort cost ($\alpha=.92$), 6 on sunk cost ($\alpha=.83$), 6 on social cost ($\alpha=.83$), 20 on emotional cost ($\alpha=.85$), 5 on economic cost ($\alpha=.81$), 7 on loss of valued alternatives ($\alpha=.84$), and 9 on outside effort cost ($\alpha=.78$). With Cronbach's alphas ranging between .78 to .92, the items were internally consistent.

Expectancy for success beliefs and task values. These were measured using items from the study of Trautwein, Marsh, Nagengast, Lüdtke, Nagy and Jonkmann (2012). There were four items on expectancy beliefs and 10 items on tasks values, *i.e.*, 3 for attainment, 5 for intrinsic/interest and 2 for utility. For the purpose of the current study, the original 4-point response format was changed to a 7-point scale with 1 indicating completely disagree and 7 indicating completely agree. Ratings from 2 to 6 did not have equivalent anchors or descriptions. A global score for the task values was also used since theory indicates that value could have a global score. Cronbach's alphas for expectancy and task values were .73 and .92 respectively signifying acceptable to good internal consistencies.

Academic performance. This was measured using participants' final percentage grade in the high stake math class that they were enrolled in at the time of data collection.

Data Analysis

Participants' scores were cleaned and inspected for missing data. To answer the research problem of whether student profile based on their scores was a predictor of their academic performance,

criterion-related profile analysis was done. The goal of criterion-related profile analysis (CRPA) was to determine if a pattern in the predictors related to higher values of the outcome (Culpepper, 2008).

The first step of CRPA was multiple regression analysis for modeling of the variables, thus establishing if cost, expectancy for success and task values could predict higher academic performance. The second step included obtaining the slope coefficients from the initial multiple regression analysis since these slope coefficients were the basis for subsequent analysis (Culpepper, 2008). For the third step, syntax was used to reorganize the multiple regression model in order to obtain the level component and predictor pattern or profile pattern. These new variables were then analyzed as the new independent variables in two regression analysis. The former regression entered the profile pattern as a predictor of academic performance. A significant p-value for this meant that the particular arrangement of scores in the profile pattern significantly explained higher academic performance, thus the resulting pattern was identified as the criterion-related profile (Davison & Davenport, 2002). In the latter multiple regression, both the pattern, which was now called the criterion-related pattern and the level component, which referred to the "mean of the predictor scores" (Davison & Davenport, 2002), were entered in the model as predictors. This was an important step as it allowed the researcher to see if pattern, more than level, accounted for more variance in the outcome, which in turn meant that individual participants whose predictor

profile matched the criterion-related profile also had higher grades.

In addition, to test whether or not the configuration of a specific participant's predictor profile matched the configuration of the criterion-related profile, the covariance between these two was checked. A positive covariance value meant that the participant matched the profile and likely had higher academic performance. A negative covariance value meant that the participant did not match the profile and likely had lower academic performance.

Results

As presented in table 1, participants' scores on the predictors are above midpoint except for economic cost and outside effort cost. Thus, in terms of expectancy for success, participants believed that they could succeed in class and had the ability to do so. In terms of task value, participants were interested in calculus 2, personally believed it was important for them and believed it was useful for their future life.

Descriptive statistics also indicate that for the participants, task effort cost, sunk cost, emotion cost, loss of valued alternatives and social cost are more salient compared to the other two. Participants perceived their calculus 2 class as requiring overwhelming time and energy for studying as well as an excessive amount of sacrifice in terms of other things that they also valued such as spending time with friends, engaging in hobbies and having fun as shown by their mean scores in these dimensions of cost.

Table 1

Descriptive Statistics and Correlations of the Key Variables

Variables	M	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1 AP	66.75	8.85	-	.30*	.29*	-.19*	-.32*	-.06	-.16*	-.08	-.06	-.10
2 Ex	4.32	0.93		-	.33*	-.34*	-.33*	-.19*	-.30*	-.15*	-.10	-.12*
3 Val	5.41	.077			-	-.07	-.10	.01	-.06	.03	.07	.01
4 TE	5.08	0.91				-	.57*	.36*	.59*	.29*	.48*	.36*
5 Sun	5.84	1.12					-	.32*	.53*	.11*	.36*	.16*
6 Soc	4.92	1.42						-	.63*	.18*	.36*	.27*
7 Emo	4.54	0.79							-	.28*	.50*	.34*
8 Econ	2.78	1.34								-	.40*	.23*
9 LOVA	4.57	1.28									-	.26*
10 OE	3.93	1.19										-

Note. * $p < .05$; AP=Academic Performance, Ex=Expectancy for Success, Val=Task Value, TE=Task Effort, Sun=Sunk Cost, Soc=Social Cost, Emo=Emotion Cost, Econ=Economic Cost, LOVA=Loss of

Participants perceived calculus 2 as emotionally costly because it triggered negative feelings like anxiety and fear and frustration. Participants also believed they were pressured by other people to get a good grade in the class, indicating high social cost among them. In terms of their actual invested effort, participant had high sunk cost perceptions and believed that they had already invested too much time and too much energy into their class and despite this, they still did their best to pass it.

Participants did not perceive the amount of money that they spent on calculus 2 as too much. Nor did they perceive the effort they put into activities and tasks beyond calculus 2 as overwhelming, i.e. demands of other tasks such as those in other classes did not interfere with their calculus 2 tasks.

Academic performance is significantly positively correlated with expectancy for success and task value. This means that participants who have higher scores in the two variables are the ones who have higher grades. However, academic performance is negatively correlated with all types of cost. Among the cost and academic performance correlations, only those with task effort, sunk cost and emotion cost are significant. This means that participants who have lower scores on the three cost dimensions are also the ones who have higher grades. Among the predictors, expectancy for success was significantly correlated with all variables except for loss of valued alternatives while task value is not correlated with any type of cost. All types of cost are positively correlated with one another and their correlations range from weak to moderate signifying that they are distinct from one another.

Table 2

Results of Multiple Regression for Academic Performance

Predictors	<i>B</i>	<i>SEB</i>	β	<i>T</i>	<i>sr</i>	<i>p</i>
Expectancy for Success	1.35	.67	.14	2.01	.12	.04*
Task Value	2.44	.74	.21	3.27	.19	.00*
Task Effort Cost	.36	.84	.03	.42	.02	.67
Sunk Cost	-2.37	.63	-.30	-3.76	-.22	.00*
Social Cost	.21	.49	.03	.43	.02	.66
Emotion Cost	.31	1.09	.02	.28	.01	.77
Economic Cost	-.42	.45	-.06	-.93	-.05	.35
Loss of Valued Alternatives	.32	.53	.04	.60	.03	.54
Outside Effort Cost	-.51	.49	-.07	-1.03	-.06	.30

Note. * $p < .05$; $F(9,216) = 5.958$; Adjusted $R^2 = .166$

To answer whether participants' scores in the predictor variables created a profile pattern and whether this profile pattern was associated with higher performance, the researcher had to first carry out a multiple regression analysis as this was the first step in the process of criterion-related profile analysis. Consistent with theory and literature, results of regression indicate that academic performance can be positively regressed from expectancy for success and task value.

Corresponding to the hypothesized relationship, students who believed that

they could succeed in the class obtained higher grades at the end of the semester. Similarly, those who placed higher value on calculus 2 also had higher final percentages. On the other hand, lower sunk cost scores predicted higher performance meaning the students who perceived that the effort they had invested was not too much were the ones who also performed better in class. Among the three predictors, sunk cost accounted for greater contribution to academic performance, followed by task value and expectancy for success.

Table 3

Results of Criterion-Related Profile Analysis for Academic Performance with only Pattern of Scores as Predictor

Predictor	<i>B</i>	<i>SEB</i>	<i>B</i>	<i>t</i>	<i>p</i>
Pattern (COVp)	8.04	1.11	.43	7.22	.000*

Note. * $p < .01$; $F(1,224) = 52.201$; Adjusted $R^2 = .185$

From the multiple regression results, the slope coefficients, or the standardized betas were used to create the criterion-related profile and subsequently analyzed. Results of criterion-related

profile analysis (Table 3) also show that higher academic performance can really be explained by a profile pattern and this pattern is composed of three key factors, namely higher scores in task value and

expectancy for success and lower scores in sunk cost. Such criterion pattern suggests that students who match this profile tend to perform better in their Calculus 2 class, regardless of their scores in the other factors.

The final part of the analysis was to establish the amount of variance in the outcome explained by the pattern component and by the level component (Table 4).

Table 4

Results of Criterion-Related Profile Analysis for Academic Performance with Both Level and Pattern as Predictors

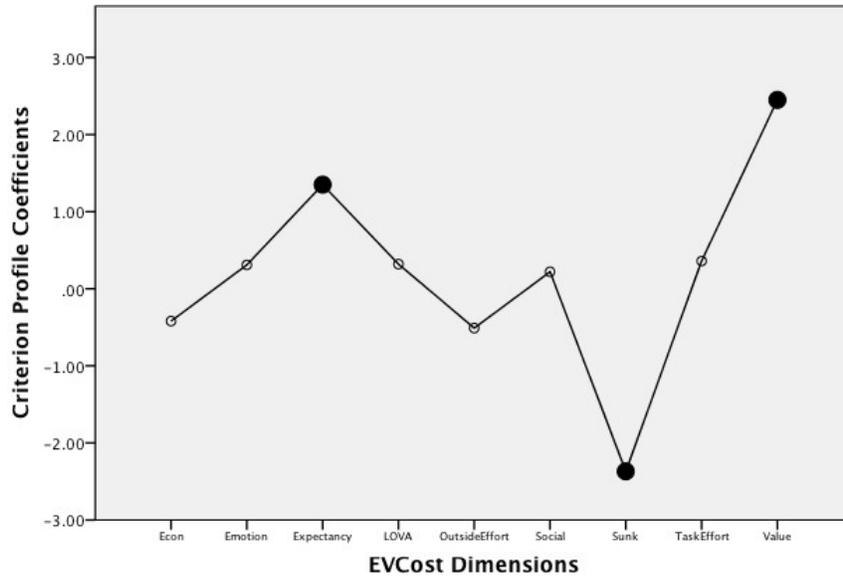
Predictors	B	SEB	B	t	Sr	P
Level	1.699	1.025	.112	1.657	.099	.099
Pattern (COVp)	9.000	1.250	.486	7.201	.432	.000*

Note. * $p < .01$; $F(2,223) = 27.682$; Adjusted $R^2 = .192$

Between level component, and pattern, level component did not predict higher grades among the participants at $p > .05$. However, pattern accounted for 18.67% of participants' grades at $p < .001$. This finding indicates that rather than simply having higher scores in the predictor variables, a motivational pattern that involves a more positive perception of one's invested effort and i.e. lower sunk cost, and a more positive perception of one's possible success in the class and the extent of valuation one has for a specific class, can help determine if the person also achieves more.

criterion profile of the students. As can be seen from the graph, students may still be able to perform well regardless of their perceptions of how costly their class is with respect to social cost, emotion cost, task effort, outside effort, loss of valued alternatives and economic cost. What really matters most for their performance is their perception of their invested effort as significantly not too heavy, their expectancy for success to be significantly higher and their valuing of their class as significantly highest. Thus, students whose motivation profiles approximate the criterion profile, particularly its key aspects, i.e. expectancy for success, task value and sunk cost, likely have higher grades.

Corresponding to the results of the statistical analysis, figure 1 illustrates the



Note. Filled in dots represent slope coefficients that are statistically significant while non-filled in dots represent slope coefficients that are not significant.

Figure 1

Criterion-Related Expectancy-Value-Cost Profile

As further illustration of the criterion-related profile, figure 2 portrays the predictor profiles of two participants taken from the large group. The illustration shows that participant 187’s predictor profile closely matches the criterion-related profile as shown by a positive covariance ($Covp_{187}=.54$). Next to participant 187 is the predictor profile of participant 65, which has a negative covariance value ($Covp_{65}=-1.33$), thereby indicating that it is opposite of the criterion-related profile.

Discussion

As expected, the criterion-profile of the participants, which is composed of significant high scores in expectancy for success and task value and significant low scores in sunk cost, related to higher academic achievement. Those who perceived themselves as having the ability to succeed because they are good in math also performed better in calculus 2. Those who viewed themselves as having little innate capacity to succeed also received lower grades at the end of the term.

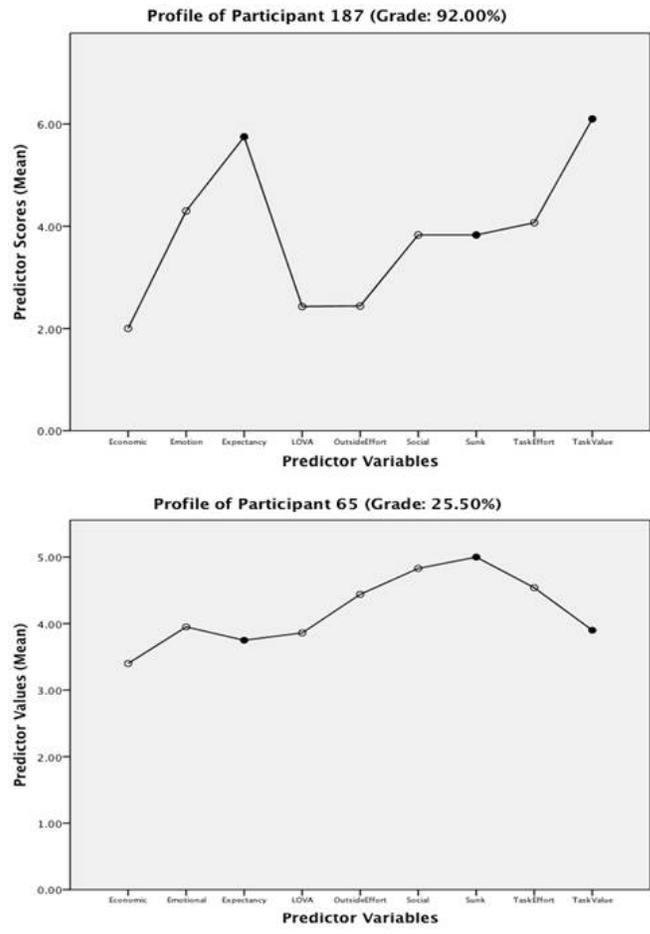


Figure 2

Predictor Profiles of Two Sample Participants

Similar to other studies (e.g. Canning & Harackiewicz, 2015), these results represent the conceptualized relationship of the two factors in the expectancy-value theory (Eccles & Wigfield, 1995) and are consistent with the hypothesis.

Furthermore, higher task value scores in the criterion-related profile predicted academic performance among the participants reflecting what is replete in literature on task value and achievement related behaviors (Gu & Zhang, 2016; Hulleman Durik, Schweigert, & Harackiewicz, 2008; Xiang, McBride, Guan & Solmon, 2003). This means that

students who are interested in calculus 2 and who value the class and who wish to attain in the class also perform better. Also, task values go with expectancy for success and this is seen in the quantitative criterion-related profile.

Moreover, criterion-related profile analysis revealed lower sunk cost scores as a significant contributor to higher academic performance, implying that those individuals who evaluated their invested effort as heavy were also the ones who had lower grades. As such it is possible that students who perceived themselves as not having the necessary

capacity to succeed, likely also perceived lower chances of succeeding, making them feel that their invested effort was incredibly heavy due to their lack of giftedness in the domain.

Although sunk cost is a fairly new concept incorporated in the expectancy-value theory (Wigfield et al., 2017), the description of how sunk cost behaves among the participants is not new. In fact, the study of Nicholls (1978) indicated students' belief that when their peers have high abilities, the effort that is required from these peers in order for them to achieve a certain academic level is less than the effort required from those with low abilities. Still, the preceding description does not explain why individuals with higher sunk cost do not perform the way those with lower sunk cost do. If one were to consider how sunk cost behaves in organizational behavior and consumer psychology then those with higher sunk cost would put in more effort because they would not want to waste what they have already invested (Arkes & Blumer, 1985; Domeier, Sachse, & Schäfer, 2018). However, in the current study they possibly did not do this, as evidenced by their grades. A probable explanation to this still involves participants' ability, which again is relevant to their expectations for success, and their sunk cost perceptions. Nagy (2016) said that when low ability students increase their effort and they do not immediately see its results, they revert to their previous behaviors thereby affecting their performance. Thus, even when low-achieving participants may have might have decided to continue giving effort, there is no assurance that effort was consistent and that they did not revert to previous behaviors. This speculation,

based on the results, can be tested in future studies.

Ultimately, the current findings depict two things – one, a classic picture of expectancy for success and task value and a new perspective of cost and two, an expectancy-value-cost criterion-related profile and its impact on achievement related outcome that has not been extensively seen in previous literature. The bulk of the implications and recommendations discussed in this paper revolve around these.

First, sunk cost is a curious construct, given how it is the only cost variable that has a significant direct link to academic performance as presented in the profile. It raises questions then on what makes it the only significant cost dimension in the study when in past studies that did not include it other types of cost were predictors (e.g. Ball, Huang, Rikard, & Cotten, 2017; Jiang et al., 2018). How then does it interrelate with other cost variables? Since there is still scant literature on sunk cost as incorporated in the expectancy-value theory, the question remains unanswered. It is recommended for future studies to take this direction.

Second, a rather more important implication of the study is centered on the pattern of expectancy, task value and sunk cost, with an emphasis on the third component. On the one hand, it is important for students to believe that they can succeed academically even in the face of variable performance. On the other hand, it might be more important for students to be certain of how valuable the class is for them because this can serve as a strong motivational factor for them to invest the necessary effort even when they do not yet see positive returns.

After all, in the criterion-related profile, task value was very high. Ultimately though, it is the decision to invest effort and to continue investing effort that can lead students to succeed even when academic tasks might become difficult. However, when perception of sunk cost is too high, students might end up disengaging in class or withdrawing from it. Hence, it is imperative for students to not perceive their invested effort as too heavy so that they do not engage in counter productive behaviors. As straightforward as it may sound, pedagogically it brings challenges particularly for students who have low abilities because more often than not, they are the ones who have to invest immense effort (Nicholls, 1978) thus they are the ones who would likely have high sunk cost scores. In an academic environment that emphasizes good academic standing, low ability students may perceive themselves as being unable to cope consequently retracting their investment of effort. It would be beneficial for teachers and other school authorities to devise classroom instructions that do not put substantial and unnecessary emphasis on ability so that perceptions of sunk cost may also be lowered and actual investment of effort may be reinforced. Nagy (2016) said that such can be done when an incremental mindset rather than a fixed mindset is forwarded inside the classroom. This recommendation does not undermine task value and expectancy for success, and the proponents of this study acknowledge the pivotal role of these two specially because in the criterion-profile, academic performance was higher when expectancy for success was higher, even if only slightly, to other cost variables, and task value was highest among all of them. Thus, together with sunk cost

sensitive approaches to learning, they also have to be incorporated in the creation of classroom instructions.

Likewise, high sunk cost may have implications on students' school satisfaction and well being because it is relevant to actual behaviors invested and engaged in for the class. In the long run, it might have a bearing on student burnout and attrition rate. Such idea is reflected and forwarded in studies on the various demands that students face and the effects of these demands on them (Lin & Huang, 2014; Stubb, Pyhältö, & Lonka, 2012). How then can school authorities and school counselors help students with high sunk cost? When they create policies and intervention programs for students, they might want to take advantage of this information on the construct.

Finally, the results underscore the structure of cost as a highly nuanced construct given how the direction of the relationships between social cost, emotion cost, loss of valued alternative and task effort cost, and academic performance as presented in the criterion-related profile were incongruent to the direction of their relationships in the bivariate correlations. Thus current findings call for researchers to approach the construct of cost using other methods more sensitive to its nuances as they could further clarify the change in the relationship directions and how cost functions in said context.

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