

Achievement goals model validation: Is the 2X2 better than the Trichotomous?

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ABSTRACT

Achievement motivation evolved fast in the educational field. In this development, the trichotomous and the 2X2 models received myriad attention from the educational specialist. However, there is a debate about which is better between the two models. This study aimed to intercede this debate and argue that the study's duration should be accounted for in the validation. Approach goals should dominate new students' achievement goals, and old students' achievement goals will show the balance of approach and avoidance goals. For these reasons, this study gathers the data from 350 new students and 203 old students. Confirmatory factor analysis reveals that the trichotomous is the best model for new student segments. While for the old student segment, the 2X2 model shows its efficacy. Therefore, for the new students' segment, achievement goals consist of mastery-approach, performance-approach, and performance-avoidance goals. For the old students, besides those three-goal orientations, mastery-avoidance goals are also included. As expected, the independent sample t-test shows that new students have higher mastery-approach and performance-approach goals than old students have. Self-efficacy is more influential in the new than old student segments, as shown by simple linear regression. This study is still stuck to a single cross-sectional design. Further research can utilize longitudinal research with segmental-based analysis and pay attention to gender, major, social class, or other potential moderation variables.

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1. INTRODUCTION

There are many theories of motivation. Initially, the researchers tried to develop a general theory of motivation [1]. However, in their development, motivation theories did not move to a more unified but more diverse perspective. The differences in researchers' academic background, in which the motivation theories developed, are the main factors that caused this problem emerged [1, 2].

Motivation theories are divided into two big categories. They are, first, the main theories such as Maslow's Hierarchy of Need Theory, Hull's Drive Theory, and Rotter's Social Learning Theory. Second, the temporary theories such as self-efficacy, intrinsic and extrinsic motivations, need for achievement, and achievement motivation [1]. Achievement motivation is derived from the expectancy-value belief theory [1]. This basic theory underlines that motivation is generated by expectancy that by performing a specific behavior, one can generate expected outcomes or avoid unexpected outcomes [3, 4]. Individuals' choice,

persistence, and motivation to perform the task are influenced by the belief about how well they will do the job and how important the outcomes are [4-6].

The expectancy-value belief theory gave birth to Atkinson's achievement theory [1], which defines achievement in terms of comparing one's performances and others' performances on certain standard activities. More specifically, the intention to pursue achievement-related goals (Ts) is determined by the need for achievement or motive for success (Ms), success probability achieves goals (Ps), and success incentive value (Is). Mathematically, the relationship between Ts and its determinants is expressed in (1):

$$Ts = Ms \times Ps \times Is \quad (1)$$

The Ms represents a personality character (i.e., striving for success trait) that is relatively stable and enduring. Ps is the subjective judgment of an individual about the probability of success in achieving goals. As a probability, the value of Ps ranges from 0 (no probability at all) to 1 (a definite possibility). The perceived difficulty of the task can approximate this variable. Incentive (Is) as the affect labeled as "pride of accomplishment" of the task. 'Is' is the opposite of the Ps. It means that the more difficult it is to achieve success (the lower the Ps), the higher the incentive (the Is) of achieving success [3].

With future-oriented thinking, people can predict the desired and undesired outcomes of their behavior [7, 8]. When an individual wants to get or avoid them, the desired or undesired outcomes become goals [7]. In approach motivation, people direct their motivational factors (emotions, cognitions, and actions) to achieve desired outcomes. In avoidance motivation, those motivational factors are directed away from aversive situations or undesired outcomes [9]. When the outcomes are uncertain, people are involved in behavioral trying and driving force that impels them to such behavior, called motivation of trying [10].

A behavioral outcome can be produced by skill-related or chance-related factors [11]. In skill-related factors, the results are determined by one's ability. The higher the ability, the higher the expectancy is. Prior success or failure will influence the ability perception. In chance-related situations, such as the flip of a coin, expectancy remains the same regardless of whether the subject is successful or failed in prior experience.

Initially, achievement motivation deals with the behaviors in which the skill-related factors produce excellent performance. In other words, achievement motivation is viewed as relevant only for high-ability or self-efficacy [3, 12]. Self-efficacy is one's belief that he or she can perform a task [5]. It determines the feeling, thinking, and motivation [5, 6]. People with strong self-efficacy are more confident to accept and perform tasks. They also tend to set up higher goals and have higher motivation. They are more receptive to difficult tasks because they perceive it as something to be mastered instead of avoiding it as a threat [5, 6].

Nichol [13] accordingly said that individuals aim to demonstrate high achievement to show off their ability. In the same way, Ames baptized the purposes of achievement behavior as an achievement goal. It consists of a mastery goal that represents the development of an ability and performance goals that reflect a willingness to demonstrate ability. Both have the approach sense [14] and are covered by the so-called dichotomous model [9]. The concept of achievement goals has become the icon of achievement motivation [15]. However, although correlated, both have a different understanding. Achievement motivation is a driving force by which emotions, competences, cognition, and behavior are energized and directed to achieve achievement goals [9, 13, 16]. Achievement goal is a competence-based purpose that guides achievement behavior [13, 16]. Achievement goal orientation is a relatively stable tendency toward which an individual is more attracted [16-18].

In its operationalization, scientists reuse the approach and avoidance valences of motivation. With this new approach, in addition to the Ames's mastery and performance goals [19], Elliot and Harackiewicz [20] introduced the third goal called performance-avoidance goals, and build a trichotomous model that consists of three goal orientations. First, mastery goals are purposed to develop competence or skill used to master the task. Second, performance-approach goals, activating by the willingness to show off one's performance or ability. Third, performance avoidance-goals, driven by the willingness to avoid the status of being looser or viewed as incompetent. High self-efficacy people should own the first two goals, and the third goal generally related to low efficacy people [20]. There are vast numbers of studies that confirm this model [17].

In 2001, Elliot and McGregor [18] added the fourth dimension called mastery avoidance, a goal through which an individual avoids failure to master a skill or competence. The new model has two focuses (mastery and performance) and two valences (approach and avoidance). It is called as the 2x2 model. In detail, this model consists of a mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance goals. Many studies confirmed the validity of this model [15].

The question is, which is the better one, the trichotomous model or the 2X2 model? There is no unified answer to this question. Some researchers proved that the 2X2 model is valid and reliable [15, 21]. However, it may not be easy to conceptualize the mastery-avoidance goal [22]. This category is less adaptive and tends to be detrimental [23]. Moreover, generating hypotheses about the relationship between mastery-

avoidance goals and performance is challenging [24]. Therefore, the trichotomous model is the primary choice in many studies [25].

This study aims to solve this scientific dispute and emphasizes that students' expectancy and self-efficacy should be accounted for in the validation. As stated before, mastery-approach and performance-approach goals owned by high self-efficacy people [13, 19, 20], and mastery-avoidance and performance-avoidance goals correlate with low self-efficacy [26]. Therefore, the 2X2 model should be evident in a lower self-efficacy segment, and the trichotomous model should be relevant in the higher self-efficacy people.

The previous studies uncovered that new students have higher expectations than old students do [17, 27], and many of them express unrealistic expectations [28]. For the same student, a longitudinal research design reveals that the students' expectations in the first week are higher than their perceived experience at the end of year one [27]. The expectation is determined by self-efficacy [3, 5]. Therefore, new students' higher expectation should be caused by their higher self-efficacy and expectations. Logically, for the new student segment, the dichotomous model is more relevant. However, a previous study uncovered that self-efficacy can also correlate positively with performance-avoidance goals, especially if the sense of loss to others is vulnerable to self-esteem [29]. Consequently, performance-avoidance goals should be involved, and the trichotomous model is more relevant for the new students.

With their experience, the old students set up more reasonable achievement goals. They potentially set up mastery and performance goals with approach and avoidance directions, as found in the previous study that involved their kind [15]. Therefore, we can expect that the 2X2 model of achievement goals has a higher chance of being valid in the old students segment. In sum, the objectives of this study are, first, to study, which is the most suitable model of achievement goals for new and old students. Second, to compare the level of goal orientations found as valid in the new and old student segments. Third, to investigate the influence of self-efficacy on achievement goals element simultaneously found as valid in the two segments to check the models' structural validity. There is a rare discussion about these issues; therefore, the findings related to them are the original contributions of this study.

2. RESEARCH METHOD

2.1. Sample of new students

This study was conducted in a business college located in North Jakarta, the capital of Indonesia. There were two considerations for the choice of this business school as the research site. First, new students face a relatively soft selection process to get into college. There were many alternatives available to the new students for the same category of educational services. Therefore, they should have made deep considerations before choosing it. Second, as a brand, this college's name gave no halo effect on new students' perceptions. Consequently, the choice should be based on rational considerations of its educational service attributes, features, and anticipated outcomes of their choice.

The authors invited the students that participated in the Study Orientation and Campus Introduction in the final week of August 2019. As many 350 respondents, out of 521 new students (response rate is 67.18%), were involved voluntarily in the study. They consisted of 198 males (56.6%) and 152 females (43.4%). The age average was 18.29 years and the median was 18 years.

2.2. Sample of old students

The old students are defined as those who have gone through more than four semesters of standard eight-semester tuition. In line with this definition, with a convenience sampling method, the authors choose students enrolled in the Intermediate Management Accounting class, a subject taught in the 5-th semester, in the aforementioned business school. The study was conducted in the first week of November 2019 or two weeks before the mid-test. That was the proper time to avoid the intervening effect of the mid-test result on the respondents' responses. As many of 203 students were involved in the study voluntarily. They consist of 91 males (44.8%) and 112 females (55.2%) with an average age of 19.43.

2.3. Measurement

The Indonesian version of Eliot and Murayam's AGQ-R (achievement goal questionnaire-revised) [30] is used to measure dependent variables. This tool consists of 12 questions grouped into four achievement goal elements. The tool to measure self-efficacy is taken from Pintrich, *et al.* [31]. The original questions of the measures were translated into Bahasa Indonesia to fit them with local research contexts, and then re-translated to English. The authors evaluated the similarity of the original and re-translated version of measurements. The Indonesian version is finally used after an English teacher ensured that original and re-translated versions of measurements were the same. The responses are recorded using seven levels of Likert-type scale, ranging from 1 (strongly disagree) to 7 (strongly agree).

2.4. Data collection method

The data were collected using an online questionnaire linked with an internet link and shared to targeted respondents via Whatsapp. The respondents could fill out questionnaires anytime during the data collection period. To reduce position bias, the order of the questions was randomized. In the introduction part of the questionnaire, the author is informed that their participation was voluntary. There was no reward for their participation. However, they were also guaranteed that their participation should not affect their fate during their campus study. The respondents were listed unanimously to make them feel free to fill the questionnaires.

2.5. Data analysis method

We utilize confirmatory factor analysis (CFA) using LISREL 8.8 as the analysis tool to validate the achievement goals models. With the maximum likelihood approach, this method extracts only the common variance shared among a construct's predetermined variables. To be categorized as valid, each variable should at least have factor loading (FL) of 0.5, the average variance extracted is at least 0.6, and the composite reliability should be 0.6 or higher. Besides, the instrument should have a Cronbach alpha reliability of 0.7 or above [32].

To compare the achievement goals, we use an independent sample t-test because the two segments involved in the comparison are independent. The achievement goal orientations and self-efficacy found as valid in the two segments are the test objects. The point of comparison is that the two groups mean differences. Since the new student segment is expected to have higher achievement goals and self-efficacy than the old student segment, the decision about mean difference is made under one-tailed significance with error rate or alpha being 0.05 or lower. The influence of self-efficacy on achievement goals is investigated using simple linear regression. To compare the influence under investigation between the two groups, we use a standardized coefficient, t-value, and adjusted determinant coefficient as the values to be compared [33].

3. RESULTS

3.1. Achievement goals validity

3.1.1. New students

The confirmatory factor analysis (CFA) with LISREL 8.8 is utilized to validate the 2X2 model. The first run of the program reveals that the data fail to confirm the validation of mastery-avoidance goals because of the low factor loading (MAV1=0.35, MAV2=0.07, MAV=0.67). We expect that the FL should be at least 0.5 as long as the average variance extracted >0.50 and the construct reliability >0.60 [32]. In other words, the data give no evidence to confirm the existence of mastery-avoidance goals. Three other achievement goals elements are valid and reliable, as shown in Table 1. Therefore, the study reveals that, in new student segments, the trichotomous model is relevant as expected.

Measurement model of LISREL used for this analysis has a fair-fit according to root mean square error of approximation (RMSEA)=0.083. However, most of other criteria indicate that the model is good-fit, as shown by goodness of fit index (GFI)=0.95, normed fit index (NFI)=0.98, Parsimony Normed Fit Index (PNFI)=0.65, non-normed fit index (NNFI)=0.97, comparative fit index (CFI)=0.98, root mean square residual (RMR)=0.022, Standardized RMR=0.035, incremental fit index (IFI), and Adjusted goodness of fit index (AGFI)=0.91.

Table 1. Achievement goals validity in new students' segment

Items	Instruments	FL	AVE	CR	CA
	Mastery approach				
1	My aim is to completely master the material presented in this class	0.78			
3	I am striving to understand the content of this course as thoroughly as possible	0.80	0.51	0.61	0.74
7	“My goal is to learn as much as possible	0.52			
	Performance approach				
2	I am striving to do well compared to other students	0.81			
4	My aim is to perform relatively well relatively to other students	0.82	0.69	0.82	0.87
8	My goal is to perform better than the other students	0.86			
	Performance avoidance				
6	My goal is to avoid performing poorly compared to other students	0.76			
10	I am striving to avoid performing worse than other students”	0.83	0.56	0.69	0.79
12	My aim is to avoid doing worse than other students	0.65			

Notes. FL=factor loading, AVE=average variance extracted, CR=construct reliability, CA=Cronbach alpha

3.1.2. Old students

The validation of Eliot and Murayam's [30] 2X2 AGQ-R measurement used the data from 203 students. Confirmatory factor analysis (CFA) with LISREL reveals that all achievement goals dimensions are valid, as shown by all validity indicators that exceed the minimal threshold (FL>0.50, AVE>0.60, CR>0.70), specified by Hair, *et al.* [32]. Cronbach alpha also indicates excellent reliability ($r_{11}>0.70$) of the instrument. Therefore, in the old student segments, the model of 2X2 is confirmed. The measurement model used for the CFA is good-fit as shown by RMSEA=0.078, incremental fit index (IFI)=0.98, non-normed fit index (NNFI)=0.96, comparative fit index (CFI)=0.98, relative fit index (RFI)=0.93, and normed fit index (NFI)=0.96.

3.2. Comparing the level of common achievement goals orientation

In this section, the author compares the level of achievement goals found as simultaneously valid in the new and old student segments. As we can see in Table 2, the new students has higher mastery-approach (mean difference=0.20, $t=2.37$, $\alpha=0.009$) and performance-approach goals (mean difference=0.37, $t=4.25$, $\alpha=0.000$), but the difference between both is not significant for performance-avoidance goals (mean difference=0.08, $t=1.03$, $\alpha=0.153$).

The results confirm previous studies [17, 27] that the new students are more optimistic than old students. The additional analysis supports this result. As shown in Table 3, the new students have higher self-efficacy than the old students (mean differences=0.33, $t=4.30$, $\alpha=0.000$). This result confirms that high self-efficacy people tend to set up higher goals [4, 5].

Table 2. Validity and reliability of achievement goals in old students segment

Items	Instruments	FL	AVE	CR	CA
	Mastery approach				
1	My aim is to completely master the material presented in this class	0.76			
3	I am striving to understand the content of this course as thoroughly as possible	0.99	0.79	0.92	0.82
7	My goal is to learn as much as possible	0.90			
	Mastery avoidance				
5	My aim is to avoid learning less than I possibly could	0.74			
9	My goal is to avoid learning less than it is possible to learn	0.74	0.58	0.81	0.75
11	I am striving to avoid an incomplete understanding of the course material	0.81			
	Performance approach				
2	I am striving to do well compared to other students	0.84			
4	My aim is to perform relatively well relative to other students	0.90	0.78	0.88	0.87
8	"My goal is to perform better than the other students	0.90			
	Performance avoidance				
6	My goal is to avoid performing poorly compared to other students	0.92			
10	I am striving to avoid performing worse than other students	0.86	0.77	0.91	0.78
12	My aim is to avoid doing worse than other students	0.85			

Notes. FL=factor loading, AVE=average variance extracted, CR=construct reliability, CA=Cronbach alpha

Table 3. The comparison of the level of achievement goals between new versus old student

Component	Group	Size	Grand mean	S.Dev	Mean difference	t-test for mean difference t	α (1-tailed)
Mastery-approach	New students	350	5.53	0.96	0.20	2.37	0.009
	Old students	203	5.33	0.98			
Performance-approach	New students	350	5.49	1.06	0.37	4.25	0.000
	Old students	203	5.12	0.94			
Performance-avoidance	New students	350	5.36	1.02	0.08	1.03	0.153
	Old students	203	5.27	0.88			
Self-efficacy	New students	350	5.30	0.86	0.33	4.30	0.000
	Old students	203	4.96	0.88			

3.3. The influence of self-efficacy on achievement goals

The simple regression is utilized to investigate the influence of self-efficacy on achievement goals. In both segments, the influence of self-efficacy on each achievement goal element is valid (p -value<0.000). This result confirms the trichotomous model's structural validity in new students and the 2X2 model in the old student segments. The criteria to measure an independent variable's determinant power to a dependent variable are t-value, correlation, and determinant coefficient, as suggested by Hair, *et al.* [32]. In terms of mastery-approach goals, the new student segment is higher than the old student segment according to the standardize coefficient (0.761 vs. 0.384), t-value (21.873 vs. 5.898), and adjusted determinant coefficient

(0.578 vs. 0.243). The same result is also found for performance-approach (β : 0.742 vs 0.409; t-value: 20.638 vs 6.347; adj. R²: 0.578 vs 0.243), and performance-avoidance (β : 0.742 vs 0.409; t-value: 20.638 vs 6.347; adj. R²: 0.390 vs 0.108) goals. Therefore, the influence of self-efficacy on mastery-approach, performance-approach, and performance-avoidance goals in the new student segment is stronger than in the old students' segment (Table 4).

Table 4. The influence of self-efficacy on achievement goals in new and old students segments

Independent variable	Dependent variable	New students (N=350)				Old students (N=203)			
		β	t-value	$\alpha^{\#}$	Adj. R ²	β	t-value	$\alpha^{\#}$	Adj. R ²
Self-efficacy	Mastery-approach	0.761	21.873	0.000	0.578	0.384	5.898	0.000	0.243
	Performance-approach	0.742	20.638	0.000	0.550	0.409	6.347	0.000	0.163
	Performance-avoidance	0.626	14.996	0.000	0.390	0.336	5.050	0.000	0.108

Notes. β =Standardized coefficient, $\#$ =1-tailed, * α <0.05.

4. DISCUSSION

This study reveals that the trichotomous model is valid for the new student segment, while the 2X2 model is valid for the old student segment. The absence of mastery-avoidance goals elements indicates that new students common high achievement motivation and generally have no consideration about the risk of failure in carrying the task. They demonstrated common care in mastering the task and satisfying ego goals by showing off their performance [34]. Three related findings support this notion. First, mastery-approach and performance-approach goals of the new students are higher than those of the old segments. These results are underlined by the new student segment's higher self-efficacy, as found in previous studies [17, 27]. Second, new students have higher self-efficacy than the old one's segment. Third, the influence of self-efficacy on achievement goals is more robust in the new students' segment than the old students' segment.

Goals orientation is a dynamic concept [35]. The success and failure in previous task accomplishment [10, 35, 36], as well as the experienced situation in the classrooms [37, 38], are used to redefine future goal orientations and intention. The old students have generally experienced the success and failure in their study. The experiences are related to two points. First, concerning achievement goals setting, the role of real efficacy increased, and the role of self-efficacy decreased as shown by its lower influence on achievement goals elements. Second, the experiences enable the old students to refine their achievement goals and think about the possibility of failure to master the teaching materials. This cognition gave birth to the mastery-avoidance goals and confirms the validity of the 2X2 model. On the other hand, with their high expectation, the new students tend to avoid thinking about the failure of mastering a task [28]. That is why the trichotomous is more suitable for them, as found in this study.

The high expression of performance-approach goals among new students is vulnerable to negative emotions. In a performance comparison term, success is a limited commodity. Being a loser has a higher possibility than being a winner. Only a few students can achieve the position as the winners, and most are end up as losers [34]. This negative emotion explains why so many students left their university or college, especially in the small and private ones, in the early years of their study in Indonesia [39].

On the other hand, mastery-approach goals can hinder students' burn-out. When facing difficult situations, students who pursue task goals view a problematic situation as a challenge, hold more optimistic orientation, maintain positive affect, and implement problem-solving strategies [34]. Mastery approach goals were positively associated with well-being [22], and well-being positively influences loyalty [22]. Therefore, by continuously maintaining mastery-approach goals, an educational institution can maintain students' loyalty.

5. CONCLUSION

The Trichotomous model is valid for the new student segment, and the 2X2 model is valid for the old student segment. For the new students, achievement goals consist of mastery-approach, performance-approach, and performance-avoidance goals. For the old student segment, besides those mentioned three goals, the fourth goal, i.e., mastery-avoidance goals, is obvious. The new student segment has a higher mastery-approach, and performance-approach goals than the old student segment has. Both segments have the same level of performance-avoidance goals. The new student segment has higher self-efficacy than the old student segment has. The influence of self-efficacy on mastery-approach, mastery-avoidance, and performance-avoidance goals is higher in the new student segment than in the old student segment.

This research employed different sample size for the new and old student segments. With this approach, we can conclude the difference of self-efficacy influence on achievement goals between the two segments only judgmentally. To make a statistical decision about the difference in self-efficacy influence on

achievement goals, the sample size between the two compared groups must be the same. Further research can consider this requirement.

This study used a single cross-sectional design in which the data are collected only once at a particular point of time from two different populations. The potential differences between the two populations' characteristics reduce the confidence level of the conclusion. Further research can utilize a longitudinal research design to enable data collection of the same populations at two or more different time points. This design enables a more accurate comparison of the variables under investigation in a before and after context. We use aggregate analysis in this study, in which we compared the two groups on an aggregate base and made no segmental comparison that may generate more detailed results. Further research can consider this issue and the involvement of gender, major, social class, or other potential moderating variables.

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