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Groups holding multiple achievement goals in the math classroom: Profile stability and cognitive and affective outcomes

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ABSTRACT

By using the 2 × 2 achievement goal framework, this study assessed the math achievement goal profiles of 488 Taiwanese students from Grades 7 to 8. In the first year, three math achievement goal profiles were identified using latent profile analysis: *maladaptive*, *indifferent*, and *success-oriented*. A slightly different profile, *avoidant-but-adapting*, was found in the second year in addition to the indifferent and success-oriented profiles. Success-oriented students showed the most adaptive pattern of motivation, with high approach orientations, while maladaptive students demonstrated less-adaptive learning characteristics, with high avoidance orientations. Avoidant-but-adapting students exhibited high scores for avoidance and mastery-approach orientations. The goal profiles were investigated with respect to stability and change over one year transition. Our study reflects mastery-avoidance goal's unique contribution to the classification of students and its' influences on educational and psychological outcomes and provides insights into the 2 × 2 model of achievement goal orientations.

1. Introduction

Students' motives for learning are critical in the transition from childhood to adolescence because learning in school can be challenging due to changes in cognitive abilities, learning contexts, and experiences. It has been shown that a student's goals around academic achievement have a strong association with achievement and psychological well-being (Wentzel, 1998). Particularly in math, students transitioning to middle school face abstract and difficult concepts and sometimes experience frustration when the learning process is not smooth. Therefore, understanding students' achievement goal orientation in math becomes crucial before implementing any strategy to increase students' motivation to seek success in math.

In the past few decades, many researchers have distinguished different achievement goals. The well-known theories include the 2-factor (performance and mastery goal orientation; Dweck, 1986), 3-factor (mastery, performance approach, and performance avoidance; Elliot & Harackiewicz, 1996), and 2 × 2 (or 4-factor: performance approach, mastery approach, performance avoidance, and mastery avoidance; Elliot & McGregor, 2001) models. Although these achievement goals are proved to be distinct psychological constructs, they might not exclude each other in an individual's motivation process. As early as 1997, Harackiewicz, Barron, Carter, Lehto, and Elliot (1997) have emphasized that an individual can pursue multiple goals simultaneously; adopting mastery goal and performance goal at the same time might enhance achievement outcome in a more flexible way. Therefore, the multiple-goal perspective has been recognized in the past decade and has provided directions in investigating how different strengths in multiple goals are related to cognitive and affective outcomes. A methodological problem that researchers faced was that variable-centered approach such as correlational investigation could not reflect the complexity of multiple goals because this approach is limited in the association between individual goal and covariates or outcomes. Pastor, Barron, Miller, and Davis (2007) has pointed out that research focusing on the regression relationship between different goal orientations and other variables encounter problems such as multicollinearity. Interactive relationships among goal orientations also make the investigation complicated when multi-way interaction was involved. Applications of person-centered analytic techniques were therefore emerged. A few studies exploring achievement goals with a person-centered approach have sought distinguishable patterns of achievement goals among students to understand the interplay of different achievement goals (e.g., Pastor et al., 2007; Schwinger & Wild, 2012; Tuominen-Soini, Salmela-Aro, & Niemivirta, 2008, 2011, 2012). From this point of view, students who have similar achievement goals can be grouped together, and it is the relative emphasis on one or more

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of these goals that contributes to students' heterogeneity on specific academic and psychological outcomes.

However, some limitations in previous studies make the literature incomplete. First, the student population of interest has mainly included elementary school students (Grades 3–6), Grade 7 middle school students, high school students (Grades 9, 11, 12), and college students. The classification of 7th graders based on achievement goal orientation has been studied (Jang & Liu, 2012; Shim & Finch, 2014), but the stability of classifications from Grades 7 to 8 has not been explored. We believe that a longitudinal investigation including Grade 8 would provide important information about student growth or change in a secondary school environment. Second, previous research has defined achievement goals differently. In particular, mastery avoidance was of less concern in most previous studies. Elliot, Chirkov, Kim, and Sheldon (2001) demonstrated that students in collectivistic cultures (e.g., Chinese culture) are more likely to adopt avoidance goals than those in individualistic cultures. In addition, Shih (2008) found 8th graders in Taiwan more frequently adopt mastery-avoidance than performance-approach goals. The role of mastery avoidance seems to be critical for Taiwanese students and cannot be neglected.

Hence, the current study aims to fill in this gap by focusing on students who have recently transitioned from elementary school to middle school (Grade 7) and the ways in which their achievement goal orientations change over a year. The classification of students was conducted using four achievement goal orientations (performance approach, mastery approach, performance avoidance, and mastery avoidance). Group differences in self-esteem, math-related motivations (self-concept and self-efficacy), math learning strategies, and achievement were further tested.

2. Literature review

2.1. Achievement goal orientation theories

Achievement goal orientation is a set of beliefs that reflect the reasons or purposes for engaging in academic or learning tasks (see Elliot, 2005). Whereas researchers differ somewhat on definitions and labels (Hulleman, Schrager, Bodmann, & Harackiewicz, 2010), most research in achievement goal theory distinguishes between mastery goals and performance goals. Individuals who strive to perform a task for the purpose of learning, understanding, and achieving self-improvement based on intrapersonal standards are referred to as mastery goal oriented. However, individuals who exert effort on a task for the purpose of showing their competence and evaluating themselves using external reference points are considered performance goal oriented (see Elliot, 2005). Elliot and Harackiewicz (1996) further differentiated performance goals into performance-approach and performance-avoidance goals. With performance-approach goals, an individual intends to show their competence based on the comparison with peers, while those who adopt performance-avoidance goals intend to avoid the demonstration of incompetence. Elliot also suggests that a distinction can be made between mastery-approach and mastery-avoidance goals; mastery avoidance refers to avoiding misunderstanding or not mastering the task (Elliot & McGregor, 2001). Therefore, a more complete picture of achievement goals is differentiated along two dimensions: how competence is defined and how competence is valenced (Elliot & McGregor, 2001).

The 2 × 2 framework of Elliot and McGregor has not been fully supported by all researchers in this domain (see Jang & Liu, 2012). Particularly, researchers have raised questions about the utility of mastery avoidance. Sideridis and Mouratidis (2008) noted that in a survey on physical education among primary and middle school students, students provided no statements that reflected a mastery-avoidance goal. Young students may not care about losing skills. In contrast, some evidence has supported separating mastery approach and mastery avoidance. For instance, mastery approach and mastery avoidance predict learning-related outcomes differently (Elliot & McGregor, 2001). Mastery avoidance has been empirically differentiated from mastery approach among secondary students using a non-metric multidimensional scaling technique (Madjar, Kaplan, & Weinstock, 2011).

Although the most recent development of achievement goal theory has aimed to separate mastery goals into task-based and self-based competence/incompetence references (e.g., a 3 × 2 model, Elliot, Murayama, & Pekrun, 2011), the current study only focused on the theories that have been widely discussed and accepted. For the remainder of the article, the 2 × 2 framework is labeled the 4-factor model (Pastor et al., 2007), which served as the theoretical basis of the study.

2.2. Achievement goals, academic self-efficacy, self-concept, and metacognition

Research on achievement goals has reported relationships between achievement goal orientation and other variables, such as academic self-efficacy, self-concept, and metacognition. Academic self-efficacy refers to an individual's perceived ability to attain a desired result (Coutinho & Neuman, 2008). Academic self-concept regards to self-perception about academic achievement (Marsh, Craven, & McInerney, 2005). Liem, Lau, and Nie (2008) conducted a survey among Grade 7 students in Singapore with an average age of approximately 15 years and reported that English performance-approach and mastery goal orientations were positively related to self-efficacy in English learning. However, English performance avoidance was negatively related to self-efficacy in English learning. In Pajares and Cheong's (2003) study, which included students in Grades 4–11 in the United States, the results suggested that English writing performance avoidance was negatively associated with writing self-efficacy and self-concept; a performance-approach orientation in English writing was positively related to writing self-efficacy and self-concept. Similarly, Lau and Lee (2008) found that for primary and secondary school students in Hong Kong, mastery- and performance-approach orientations positively predicted Chinese self-efficacy, while a performance-avoidance orientation negatively predicted Chinese self-efficacy. Chiang and Lin (2012) examined 2 × 2 achievement goal orientations and math self-efficacy for Taiwan secondary school students of 7th grade and found that mastery-, performance-approach orientations were positively related to math self-efficacy, whereas mastery-, performance-avoidance orientations showed a negative relationship to math self-efficacy. In a study with primary and secondary students (Grades 5, 6, 8), Niepel, Brunner, and Preckel (2014) found positive relationship between performance-approach goals and academic self-concept changes overtime, while negative relationship was found between performance-avoidance goals and academic self-concept changes overtime.

Metacognition was defined as “knowledge and cognition about cognitive phenomena” (Flavell, 1979, p. 906). In the learning context, metacognition refers to higher-order mental processes such as making plans, using appropriate skills to solve problems, and making estimates of performance (Dunslosky & Thiede, 1998). Coutinho and Neuman (2008) pointed out that all four achievement goals in the 2 × 2 framework are positively associated with metacognition. In earlier research by Schraw, Horn, Thorndike-Christ, and Bruning (1995), students with strong mastery goals reported more metacognitive knowledge compared to students with weaker mastery goals. Vrugt and Oort (2008) also suggested that performance-approach and mastery goals predict the use of metacognition, but performance avoidance is not related to metacognition.

Taken together, these data suggest that individuals with approach orientations (performance or mastery) have high self-efficacy and tend to use metacognition in learning. Those who have performance-avoidance or mastery-avoidance orientations demonstrate low self-efficacy and self-concept. The relationship between goal orientation in the 4-factor model and metacognition remains unclear; however, mastery