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Multidimensionality of parental involvement and children's mathematics achievement in Taiwan: Mediating effect of math self-efficacy

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ABSTRACT

The present study confirmed the multidimensional construct of Taiwanese parental involvement and examined the direct and indirect influences of parental involvement on students' mathematics achievement, that is, the mediating effects of math self-efficacy. Questionnaires were administered to 1286 seventh grade students in Central Taiwan, and structural equation modeling was utilized. The results indicated that the multidimensional model of parental involvement in mathematics contained three components: parental beliefs and expectations, managerial involvement (i.e., parental instruction), and structural involvement (i.e., resources parents provide for children). In addition, results suggested that parental involvement is indirectly associated with students' mathematics achievement through the mediating effects of math self-efficacy, either partially or completely. The conceptual framework and measures can contribute to future work on parenting, including research designed to map multidimensional constructs that describe parental involvement and studies that explore how parental involvement shapes school outcomes of early adolescents in mathematics through their math self-efficacy.

1. Introduction

Recent cross-cultural studies show that elementary and middle school Chinese students in Taiwan, China, Hong Kong, and Singapore demonstrate higher academic achievement, particularly in mathematics, than their American counterparts (Foy & Olson, 2009; Mullis, Martin, Foy, & Arora, 2012). The Trends in International Mathematics and Science Study 2011 research of the International Association for the Evaluation of Educational Achievement reported that Taiwan performed above the international average on mathematics at the fourth and eighth-grade levels. Several studies aimed to identify factors influencing this achievement; some have proposed parental involvement as a critical factor in students' mathematics achievement (Chao, 2000; Fan, 2001; Fan & Chen, 2001; Hong & Ho, 2005; Leung, 2002). Hong and Ho (2005) suggested that parental involvement majorly influences children's academic achievements in an Asian-American sample. Parental participation was seemingly the most influential factor; the effect was both immediate and long lasting. Additionally, they found ethnic differences with respect to effects of parental involvement on academic achievement.

Parental involvement is defined in numerous ways, ranging from parental aspiration, expectation, interest, and attitudes and beliefs regarding education to more active parental participation and practice in specific activities at home or school. Although researchers have proposed specific dimensions of parental involvement (Grolnick & Slowiaczek, 1994; Hong & Ho, 2005), many have used global, generalized measures that may have different effects on learning. Therefore, parental involvement might be conceptualized differently in different cultural groups. For example, in academically-oriented Chinese-speaking societies, parental involvement focuses mainly on school-related attitudes (e.g., academic beliefs, high expectations), direct assistance (e.g., parental instruction, monitoring, hands-on practice), and indirect assistance (e.g., home structure for supporting learning, provision of resources) to enhance children's school performance (Chao, 2000; Wong-Lo & Bai, 2013). In Amy Chua's recent popular memoir *Battle Hymn of the Tiger Mother*, she mentioned that “tiger parents” in Asian-heritage families “believe that they know what is best for their children” (2011, New York, NY, Penguin Books, p. 53). In other words, there is a common perception that Chinese parents are much concerned when it comes to their children's schoolwork and are exceedingly demanding of their children academically.

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In regard to such traditional Chinese values, parents in Taiwan are no exception. Ho, Chen, Tran, and Ko (2010) suggested that Taiwanese parental involvement in children's education is often considered an extension of their responsibilities. Taiwanese parents seriously consider any involvement and practice that will efficiently coordinate school and home environments to help children perform well academically (Kung, 2002). For Taiwanese parents, such cultural conceptions relating to children's academic success have been highly influential in shaping their involvement. Therefore, dimensionalities in parental involvement possibly differ across cultures. A more precise and differentiated construct of parental involvement is needed to address this issue from a cultural perspective.

Previous research on social-cognitive aspects of school performance has attempted to explain students' learning outcomes (Leung, 2002). Among the varied social cognitive factors, mathematics self-efficacy frequently arises as a variable that facilitates the attainment of certain outcomes, such as mathematics achievement (Chang, 2012; Kung, 2009; Pietsch, Walker, & Chapman, 2003). Self-efficacy is defined as an individual's expectations of their abilities to accomplish certain tasks. Kung (2009) reported that mathematics performance and mathematics self-efficacy measures are both significantly and positively correlated.

Of particular interest is the finding that these factors either directly or indirectly affect mathematics achievement and might be mutually influential. Although several studies intended to identify influencing factors—parental (Aunola, Nurmi, Lerkkanen, & Rasku-Puttonen, 2003; Fan, 2001), and social-cognitive (Leung, 2002)—that influence achievement independently, little empirical research has linked these factors when ascertaining the mathematics achievements of students thus far. This study aims to advance research on the effects of multidimensional conceptualization of parental involvement and mathematics self-efficacy on mathematics achievement, using a mediating perspective.

1.1. The multidimensionality of parental involvement on mathematics achievement in Taiwan

Generally parental involvement includes different methods undertaken by parents to help their children's daily learning process at home or school (Epstein, 2013). Furthermore, establishing a meaningful definition of parental involvement in diverse cultural backgrounds must include the possibility that cultural beliefs might influence parents' perspectives or practices regarding involvement. “Tiger parenting,” as described by Chua (2011), has emphasized on parenting roles in Chinese-heritage families: “All decent parents want to do what's best for their children. The Chinese just have a totally different idea of how to do that” (p. 63). In Taiwan, parents believe education to be crucial means for their children to improve their status in life (Ho et al., 2010). Taiwanese parents involve themselves in their children's schooling in numerous practical ways: providing children with significant psychological and practical support, purchasing extra resources to supplement their children's academic work and/or enrolling them in enrichment classes and special after-school or weekend programs (Chao, 2000; Ho et al., 2010; Kung, 2002; Wong-Lo & Bai, 2013). Such a perspective recognizes the fundamental differences in practices across cultures.

Many studies have indicated that parental involvement is a multidimensional construct and that different dimensions have varied influences on students' academic achievement (e.g. Fan, 2001; Fan & Chen, 2001; Grolnick & Slowiaczek, 1994; Hong & Ho, 2005; Kung, 2002). Grolnick and Slowiaczek (1994) proposed a multidimensional model for exploring parents' influence on their children's learning process and suggested a three-dimensional model: personal involvement (e.g., sharing the affective experience of caring about school), behavior involvement (e.g., participating in school activities), and intellect/cognition involvement (e.g., exposing the child to cognitively stimulating materials). Of particular interest to the present study is how Taiwanese parents involve themselves in their children's performance and how to specify multidimensional components of parental involvement within a Taiwanese cultural context.

Based on Grolnick and Slowiaczek's (1994) multidimensional conceptualization of parental involvement, in combination with Chao (2000) and Wong-Lo and Bai's (2013) Chinese-cultural hertige perspectives, this study proposes a three-dimensional model of personal involvement, managerial involvement, and structural involvement. Originally, the first component, personal involvement, referred to children sharing the affective experience of their parents' beliefs and expectations. In considering cultural variation, this involvement mainly focuses on Taiwanese parents' academic beliefs and has thus been termed “parental beliefs and expectations.” Managerial involvement refers to parental instruction, monitoring, and hands-on practices, such as directly helping children with their homework. It is parallel to behavior involvement, but emphasizes home-based involvement instead of participation in school-based activities (Wong-Lo & Bai, 2013). The last component, structural involvement (i.e., intellect/cognition involvement based on Grolnick and Slowiaczek's (1994) classification), is more indirect: the child is exposed to cognitively-stimulating materials, and the home is structured to support learning and provide resources.

Some studies have demonstrated that not all kinds of parental involvement positively affect academic performance. One possible explanation for this is different measurements of parental involvement have been applied in these studies, specifically in those from different cultural backgrounds. Understanding the complexity of the relationship between parental involvement and academic achievement requires the consideration of several factors, and existing research has failed to demonstrate whether the cultural-based model in any way affects Taiwanese students' achievement. This study attempts to substantiate the multidimensional construct of Taiwanese parental involvement by incorporating a cultural perspective and examining direct and indirect parental involvement in terms of influence on students' mathematics achievement.

1.2. The effect of math self-efficacy on mathematics achievement

Bandura's social learning theory (1986) suggests that self-efficacy beliefs mediate the effect of other performance determinants, such as prior experience, on subsequent performance. Researchers have also cautioned that self-efficacy evaluation should be “domain-specific,” as ill-defined and generalized measures of perceived self-efficacy seemingly yield inconsistent and ambiguous findings (Multon, Brown, & Lent, 1991).

This study on mathematics considers this domain-specific requirement. Taking the level, strength, and generalizability that Bandura (1997) suggested and the subject-specific self-efficacy for mathematics that Pietsch et al. (2003) hypothesized, Kung (2009) proposed the construct of mathematics self-efficacy as a second-order factor, incorporating the four first-order factors of insistency, confidence, subject-specific, and problem-specific for Taiwanese students. In attempting to understand performance in a specific domain, i.e., mathematics achievement, the self-efficacy perspective is well attested, and most researchers have reported a strong association between mathematics self-efficacy and performance (Chang, 2012; Kung, 2009; Pietsch et al., 2003). Chang (2012) reported a direct effect between elementary school students' mathematics self-efficacy and their mathematics achievement.

Although several studies have focused on adolescents' mathematics achievement (e.g., Pietsch et al., 2003), it is of particular importance to examine mathematics self-perceptions in children coping with the transition from elementary school to junior high school. This is because early adolescents confront multiple changes that occur simultaneously in this transitional period (e.g., puberty, changing relationships with parents and friends, and cognitive development). These changes