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Student learning in Australian high schools: Contrasting personological and contextual variables in a longitudinal structural model☆

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ABSTRACT

We tested relations between high school students' personal characteristics and how they perceive teaching in their school (*Presage*), their learning strategies (*Process*), and the outcomes of learning (*Product*), based on data from 2002 students across 12 Australian high schools surveyed one year apart. Confirmatory factor analysis established the construct validity of scales and longitudinal structural equation modeling was used to estimate direct and indirect effects, including possible gains or declines, between Presage, Process and Product variables. We found across Presage variables, teacher support and academic self-efficacy had the clearest direct relations with Product outcomes, as well as the most salient indirect relations through Process variables. Sociodemographic and personological Presage variables were generally less salient. Findings suggest building academic self-efficacy and positive perceptions of teacher support should enhance both Processes and Products of learning in secondary settings. The novel Process variable of Personal Best goal-setting also shows promise for intervention.

1. Introduction

The education of adolescents has received increasing attention over recent decades as policymakers recognize high levels of academic achievement will underpin personal as well as national success in the "global marketplace" (Carnoy & Rhoten, 2002). However, for many, adolescence is a life stage involving substantial challenges. The impact of the physical, emotional, and social changes across the second decade of life are felt by adolescents. In the context of schooling, it is not uncommon that "the early adolescent years mark the beginning of a downward spiral in school-related behaviors and motivation that often lead to academic failure and school dropout" (Eccles, Lord, & Midgley, 1991, p.521). Personological factors such as prior knowledge (Shing & Brod, 2016) and broad personality factors – foci of this study – have important roles to play in academic motivation, engagement, and success. While seeking to understand students' progress through school, however, it is vital to remember that "school motivation cannot be understood apart from the social fabric in which it is embedded" (Weiner, 1990, p. 621). This study draws on a framework for understanding adolescent students' perceptions of learning environments, the 3P model (Biggs, 1993, 1999; Biggs & Moore, 1993; Karagiannopoulou & Milienos, 2015), to test relations between high school students' personal characteristics and how they perceive teaching in their school (*Presage*), the learning strategies that they use (*Process*), and the subsequent outcomes of learning (*Product*) over the course of a school year. In testing these relations in high school settings, we extend a previous preliminary study (Ginns, Martin, & Papworth, 2014) that explored the above relations in a cross-sectional design. The present study tests relations between a broader range of Process and Product variables, while controlling for prior variance in these measures thereby aiding understanding of shifts (gains or declines) on key 3P variables over time.

1.1. The 3P model

The 3P model (Biggs, 1985, 1993, 1999) has had a substantial impact in higher education as an organizing framework for both student learning research (e.g., Karagiannopoulou & Milienos, 2015; Sun & Richardson, 2016) and academic development at the institutional level (Barrie, Ginns, & Prosser, 2005; Biggs, 1993; Biggs, Kember, & Leung, 2001). Drawing on general systems theory (von Bertalanffy, 1968), the 3P model holds students' academic motivations for task engagement and learning strategies to be a function of both personological and contextual factors. Students' motivations and learning strategies (referred to in combination as *approaches to learning*) are construed as

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relational – that is, they are not completely stable individual differences, but vary at least in part as a function of student perceptions of the teaching and learning environment. Understanding the complexity of student learning in realistic educational settings through multi-faceted constructs is a long-standing concern in higher education, reflected, for instance, in cognate research on learning patterns, construed as a coordinating concept uniting "cognitive, affective, and regulative learning activities, beliefs about learning, and learning motivations" (Vermunt & Donche, 2017, p. 270). Likewise, the theory of self- vs. externally-regulated learning (de la Fuente-Arias, 2017) considers the interactions between regulatory behaviors emanating from within the student and from the teaching context, as a foundation for outcomes of learning (e.g., satisfaction with learning, achievement) as well as teaching (e.g., satisfaction with teaching).

1.1.1. Presage factors

Presage factors provide the starting point for considering factors related to learning, and are held to operate before teaching and learning takes place. Biggs (2001) distinguishes between "hard" and "soft" Presage factors, with the former "not easily changed by teaching" (p.72). On the student side, a range of "hard" sociodemographic factors such as age, gender, prior academic achievement, parental education, non-English speaking background, and personality, may predict learning Processes and Products (for reviews see Baeten, Kyndt, Struyven, & Dochy, 2010; Biggs, 1987; Biggs & Moore, 1993); these factors are largely beyond the control of schools (with some exceptions, e.g. academically selective schools have control over the academic ability with which students enter). "Soft" factors, in contrast, are relatively mutable. Such factors situated in the teaching context include the design and orchestration of teaching and learning activities (de la Fuente et al., 2017), assessment tasks (Gibbs & Simpson, 2004–2005), and teacher attitudes, especially supportiveness of students (Martin & Dowson, 2009). On the student side, a student's academic self-efficacy – the belief that one has the skill and ability to achieve academically (Honicke & Broadbent, 2016; Pajares, 1996) – is another soft Presage factor that can shift as a result of a range of factors under school control, such as personalization of academic tasks (Wigfield & Tonks, 2002).

1.1.2. Process factors

Relations between Presage and Product factors may be direct, but may also be mediated through Process factors. Such mediation is held to be a sign of metacognitive activity or *metalearning* (Biggs, 1985), as students come to understand their own capacities and goals in the light of the opportunities and constraints of the learning environment (Biggs & Moore, 1993). Hattie (2009) argues "a meta-cognitive approach to instruction can help students learn to take control of their own learning by defining their own learning goals and monitoring their progress in achieving them" (p.246). Research based on the 3P model has typically identified two "approaches to learning", each incorporating a strategy and motive component (see Biggs et al., 2001). Students are argued to adopt a deep approach to learning when they seek personal meaning in and elaborate connections within to-be-learned materials, often as a result of an intrinsic interest in the topic. In contrast, students who adopt a surface approach are more likely to use rote memorization strategies when learning, often motivated by extrinsic reasons such as coping with assessment requirements (see Biggs et al., 2001). Recent research informed by student learning theory has also linked approaches to learning with students' self-regulation of learning (de la Fuente, Zapata, Martínez-Vicente, Sander, & Cardelle-Elawar, 2015; de la Fuente, Zapata, Martínez-Vicente, Sander, & Putwain, 2015; Fryer & Vermunt, 2018), academic emotions (e.g., resilience, coping strategies; de la Fuente et al., 2017), and teachers' external regulation of learning (de la Fuente-Arias, 2017), with the DEDEPRO model (de la Fuente, Zapata, Martínez-Vicente, Sander, & Cardelle-Elawar, 2015; de la Fuente, Zapata, Martínez-Vicente, Sander, & Putwain, 2015) differentiating between Design and Development phases during the Process phase of both learning and teaching. Beyond student learning theory, a number of other theoretical models have contrasted deep vs. surface learning strategies (e.g., Alexander, 1997) or processing (e.g., Craik & Lockhart, 1972; for a critical review, see Dinsmore & Alexander, 2012). Following Ginns, Martin and Papworth (2014), the present study focuses on students' learning strategies of memorization and elaboration, as well as a novel metalearning strategy of Personal Best goal-setting (discussed below).

1.1.3. Product factors

Products within the 3P model traverse a range of potential learning outcomes. Across a range of assessment tasks, educators will typically be concerned with students' understandings of the syllabus, measuring differences in understanding and achievement informed by various taxonomies (e.g., Biggs & Collis, 1982; Krathwohl, 2002). Beyond such outcomes, and often depending on their particular missions, schools may consider a range of school engagement, institutional or affective constructs as desirable outcomes. In the context of Australian education, for example (the site of the present study), the Melbourne Declaration on educational goals for young Australians (MCEETYA, 2008) holds that that Australian schooling should promote equity and excellence, and support all young Australians to become successful learners, confident and creative individuals, and active and informed citizens. Such overarching goals (that are not dissimilar to goals in many education systems around the world) require students not only engage with and enjoy their schooling, but also require that schooling gives students the capacity and ambition for further and continuing education. Beyond outcome measures derived from either student performance (e.g., grade point average) or self-report (e.g., satisfaction with school), Product measures derived from the teaching context, such as teachers' work satisfaction, may also play a role in understanding the dynamics of teaching and learning in an institution (de la Fuente-Arias, 2017).

1.2. 3P model-based research in high schools

The 3P model has provided a guiding framework for a substantial body of research in higher education, but fewer studies situated in high school settings. Recent studies informed by the 3P model (e.g., Lee, Johanson, & Tsai, 2008; McInerney, Cheng, Mok, & Lam, 2012) have used structural modeling methods which can be expected to provide more reliable tests of hypothesized relations than earlier studies (e.g., Ramsden, Martin, & Bowden, 1989). Ginns, Martin and Papworth (2014) sought to extend high-school-based research informed by the 3P model in a large cohort of Australian high school students (n = 5198), using structural equation modeling to test relations between a comprehensive range of measures including sociodemographic, prior achievement, measures of Big 5 personality factors characterized as "hard" Presage factors, and academic self-efficacy and teacher supportiveness variables characterized as "soft" Presage factors (cf. Biggs, 2001); Process variables, as measured by students' use of elaboration and memorization strategies; and Product variables, as measured by previously uninvestigated outcomes including class participation, homework completion, and educational aspirations. Initial evidence of construct validity of all included constructs was provided using confirmatory factor analysis. The most salient statistically reliable sources of direct and indirect (via memorization and elaboration) paths in the model came from the soft Presage factors of academic self-efficacy and students' perceptions of teacher supportiveness. Notwithstanding this general pattern, specific personality-based and sociodemographic variables were the source of several direct and indirect paths, including large direct relations between extraversion and class participation (β = 0.31), and conscientiousness and homework completion (β = 0.32).