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Using structural equation modeling and multidimensional scaling to assess students' perceptions of the learning environment and justice experiences

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ABSTRACT

This study assessed science students' perceptions of the learning environment as a function of individual experiences of the teachers' just (TJ) behavior. The personal Belief in a Just World (BJW) was considered as a resource that has the potential to enhance those experiences. Data were gathered from 306 high-school students by using three scales: the 'What Is Happening In This Class?' scale (WIHIC), the Personal Belief in a Just World scale, and the Teacher Justice scale. Structural equation modeling (SEM) and smallest space analysis (SSA) were used to explore the WIHIC structure and compute the relationships between the examined variables. Path analysis main results showed that students who evaluated their TJ behavior toward them personally as just held a more positive evaluation of the learning environment. Interpretation of these findings in conjunction with the SSA results, applications and implications for future research are discussed.

1. Introduction

A wide variety of studies, mainly focused on instructional methods, have reported a consistent contribution of perceived constructivist learning environments to students' cognitive and affective learning outcomes (Afari, Aldridge, Fraser, & Khine, 2013; Alt, 2014b; Rita & Martin-Dunlop, 2011; Waldrip, Fisher, & Dorman, 2009). The current study attempts to raise consciousness about one understudied key predictor of the perceived learning environment – the student's subjective just experience (Mikula, 2005). The way students intuitive percept, process and evaluate their teachers' just behavior is seen as a key component of several learning-setting-specific constructs (Taylor, 1962).

Moreover, the belief in a just world (BJW) (Lerner, 1965) has been recently shown as a major personal predictor of students' experience of their teachers' just behavior and learning environment perceptions (Alt, 2014a; Peter & Dalbert, 2010). The BJW enables the individuals interpreting the events of their life in a meaningful way and thus they are more inclined to believe that others (e.g., teachers) treat them justly.

To the author's knowledge the connections between students' just experience, BJW and perceptions of the learning environment have been examined among secondary school students (Peter & Dalbert, 2010) and college students (Alt, 2014a). The current study will assess these hypothesized connections with relation to high-school environments, using structural equation modeling (SEM) and multidimensional scaling (MDS) methods. This study could give further insights into possible associations between the examined constructs in constructivist-based high-school settings, and could provide practical implementations for teaching practices aimed at facilitating constructivist learning environments.

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2. Theoretical framework

2.1. Learning environment experiences

The classroom learning environment includes instructional processes, teacher–student relationships, student–student relationships and student attitudes (Brophy, 1999). Observable characteristics, such as school buildings and materials used for instruction, could define the learning environment. However, the students' subjective perception of their learning setting has been proven to be a more fruitful definition of the learning environment. This perception has been associated with a variety of students' affective and cognitive outcomes, such as academic self-efficacy, academic achievement, self-concept, and learning strategies (Dorman, Fisher, & Waldrip, 2006; Gupta & Fisher, 2012; Reid & Fisher, 2010).

Recent studies on classroom environment perceptions have focused on the constructivist pedagogical approach (Alt, 2014b; Fraser, Aldridge, & Adolphe, 2010; Loyens, Rikers, & Schmidt, 2008; Taylor & Fraser, 2013; Wegerif & De Laat, 2011). Constructivism is a view of learning that perceives the individual as an active and responsible agent in his/her knowledge acquisition process (Brooks & Brooks, 1999). This view is shared by cognitive constructivism and social constructivism. However, while cognitive constructivism is concerned with the individual's construction of knowledge, social constructivism stresses the collaborative processes in knowledge building (Windschitl, 2002). Accordingly, individual learning processes are informed by personal characteristics as well as by external social factors, and meaning is constructed from the interaction between existing knowledge and social situations (Vygotsky, 1978).

Based on the socio-cultural constructivist theory, the learning environment stresses on the student-centered pedagogy, in which students learn the course materials while being encountered with authentic problems. The need to develop problem-solving skills is recognized in these environments, as well as acquiring necessary knowledge and new information through self-directed learning. Learning takes place in small student groups, guided or facilitated by a tutor, in contrast to the instructor role in the traditional lecture-based teaching (Barrows, 1996).

These features may be grouped around three key tenets of the constructivist learning environment (Alt, 2014b; De Kock, Sleegers, & Voeten, 2004): the first tenet (*constructive activity*) is that learning is a constructive activity which pertains to the process of 'learning to learn'. This principle is based on the idea that learning occurs during meaningful perplexing problem-solving in real life situations and incorporates high order meta-cognitive learning functions toward knowledge. The second tenet (*teacher–student interaction*) is that learning is a situated contextual activity. This principle stresses on the self-regulated learner, and on shifting the external control over the learning process as used in traditional settings, to the student's internal control for learning. The teacher's role is to model the learning process while providing guidance, and to stimulate students to reflect on their own learning processes. The final tenet (*social activity*) is that learning is a social activity. This principle emphasizes the cooperative dialogical nature of the learning process aimed at promoting new forms of learning.

During the past decades the constructivist view of learning has taken a leading theoretical position and made a major impact on science education (Fraser et al., 2010; Taylor & Fraser, 2013; Waldrip et al., 2009).

Despite the growing attention paid to constructivist pedagogic challenges in the context of learning environments, the instructional principles of this theory, which are aimed at directing the nature of educational processes, have not been sufficiently clarified. Nonetheless, during the past two decades, attempts to map instructional constructivist principles on educational materials and the learning environment have yielded varied results. For example, Taylor, Fraser and Fisher (1997) developed the Constructivist Learning Environment Survey (CLES) to assess the degree to which secondary students perceived a mathematics or science learning environment to be consistent with five key dimensions of constructivism.

Another scale is the What Is Happening In this Class (WIHIC) Questionnaire developed by Fraser, Fisher, and McRobbie (1996). The WIHIC includes relevant dimensions from past questionnaires combined with dimensions that measure particular aspects of constructivism operating in contemporary classrooms. The WIHIC measures high-school students' perceptions on a wide range of dimensions that are important to the current situation in classrooms. It consists of seven scales: *student cohesiveness, teacher support, involvement, investigation, task orientation, cooperation* and *equity*. Table 1 displays the WIHIC sub-scales, along with a brief description and a sample item from each sub-scale in the questionnaire.

The WIHIC questionnaire has been extensively used to measure the psychosocial aspects of mathematics and science classroom learning environment in various contexts since its development (MacDowell-Goggin & Fraser, 2004; Hoffner Moss & Fraser, 2002; Taylor & Fraser, 2004). Results from current studies reveal that the WIHIC dimensions are good indicators of a number of learning outcomes, such as actual and perceived learning environments, academic efficacy, anxiety, cognitive achievements, and attitudes toward the subject matter (Afari et al., 2013; Fraser et al., 2010; Rita & Martin-Dunlop, 2011; Robinson & Fraser, 2013; Taylor & Fraser, 2013; Waldrip et al., 2009). These studies support the validity and reliability of the WIHIC in portraying the nature of science classroom environments.

2.2. Students' experience of their teachers' just behavior

Information processing models suggest that the processing of environmental stimuli depends on personality characteristics (e.g., Warr & Knapper, 1968). Drawing on these models, Peter and Dalbert (2010) contend that the individual perception of the teachers' just (hereinafter: TJ) behavior could act as a potential personal predictor of the class climate experience. The connection between this individual-level factor of TJ and the perceived class climate has been