Learning and Instruction

Science class is too hard: Perceived difficulty, disengagement, and the role of teacher autonomy support from a daily diary perspective☆

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ABSTRACT

The current research aimed to investigate students' daily experiences in high school classes by answering the following questions: to what extent does daily perceived difficulty of science classwork predict daily feelings of competence and disengagement? Are autonomy-supportive teaching strategies useful when work in science class is perceived to be more difficult than the average day? Two-hundred and eighteen high school students in 43 science classes participated in the daily diary study across a six-week instructional unit. Results of multilevel modeling revealed that on days when students perceived their science classwork to be more difficult than usual, they experienced a decrease in perceived competence, which was in turn associated with an increase in disengagement. In addition, the current research suggested that the decrease in perceived competence and subsequent decrease in engagement as a function of perceived difficulty was minimized when students perceived their teachers to provide autonomy support. Discussion centers on the theoretical and practical implications.

1. Introduction

Why do some high school students experience a low sense of competence in their science classes and what are the consequences of those feelings? One likely answer is that when students perceive task demands to exceed their skills in science class, their perceptions of competence suffer and they disengage from class activities. In fact, a great deal of research demonstrates that students are more likely to disengage from a task when it is perceived to be too hard (e.g., Fong, Zaleski, & Leach, 2015; Moneta & Csikszentmihalyi, 1996). While past research has examined the consequences of task difficulty by manipulating the difficulty of a task (e.g., Fulmer & Frijters, 2011), this research provides no information about students' daily experience of difficult course work within an authentic science classroom. Moreover, given evidence suggesting that disengagement is a critical predictor of academic struggles during adolescence (e.g., Balfanz, Herzog, & Mac Iver, 2007), it is surprising that little is known about how students' daily experiences in the classroom predict changes in their classroom disengagement. Thus,

one of the main purposes of the current study was to examine the extent to which perceptions that classwork was more difficult than average predicted changes in students' perceptions of competence and disengagement in high school science classrooms on a daily basis.

Due to the diversity of students and their experiences of course work in a given science classroom, it is rarely possible for teachers to adjust the class content for each and every student in the classroom context every day. Thus, it becomes critical to ask whether there are strategies that can mitigate the potentially negative correlates of students experiencing science classwork as more difficult than typical. One potential answer lies in the motivational power of autonomy-supportive strategies in the classroom. Autonomy-supportive strategies, which encourage students to relate their interests and preferences to learning activities, seem likely to facilitate the inner motivational resources and competence students need to tackle difficult tasks (e.g., Reeve, 2009; Reeve, Jang, Carrell, Jeon, & Barch, 2004). Thus, the second purpose of this study was to explore the extent to which autonomy-supportive practices buffer undesirable correlates of students' perceiving that

science course work is too hard on any given day.

2. Literature review

2.1. The dangers of disengagement

Engagement refers to active involvement in a task or activities, while disengagement, the focus of this investigation, reflects not merely low engagement, but the active and sometimes intentional detachment from such tasks (Furrer & Skinner, 2003; Skinner & Belmont, 1993; Skinner, Furrer, Marchand, & Kindermann, 2008). Engagement and disengagement have both behavioral and emotional components, with behavioral disengagement including behaviors such as giving up, passivity, or lack of initiation of the activities and emotional disengagement including experiences of frustration, discouragement, or dejection. Recent research has increasingly suggested that maximizing students' engagement and minimizing disengagement in class is critical to their learning and achievement (e.g., Carini, Kuh, & Klein, 2006; Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Strambler & Weinstein, 2010; Wang & Holcombe, 2010). Disengagement is associated with lower grades (e.g., De Castella, Byrne, & Covington, 2013), and higher rates of school dropout (Henry, Knight, & Thornberry, 2012). Given the risks associated with disengagement, the current study examines its relationship with an understudied, though potentially important contributor to students' disengagement in high school classrooms, namely, students' perceptions that class activities are difficult.

2.2. The role of perceived difficulty in perceived competence and disengagement

Self-determination theory (SDT) provides a framework for understanding why students' perceptions of coursework being experienced as difficult may have consequences for their perceptions of competence and disengagement. According to SDT, experiencing a sense of competence, along with autonomy and relatedness, is an essential need that underlies students' adaptive motivation and psychological functioning, including their engagement (Deci & Ryan, 2000). Importantly, the environment, and students' perceptions of it, has a great deal of power for supporting or thwarting students' experiences of competence and their subsequent motivation and engagement (Deci & Ryan, 2000). While tasks that are perceived to provide an *optimal challenge*, that is, tasks that demand a high but attainable level of skill (Ryan & Deci, 2017), are likely to be the best at promoting competence need satisfaction, intrinsic motivation, and engagement, tasks that are perceived to be more difficult than current skills are likely to diminish students' sense of competence and lead to disengagement (e.g., Deci, 1975; Reeve, 2012). Tasks that are perceived to be too easy may, similarly, do little to promote a sense of competence and may even lead to disengagement in the form of boredom (e.g., Nakamura & Csikszentmihalyi, 2014, pp. 239–263), though the threat to perceptions of competence is less with easy compared to difficult tasks.

Empirical research largely supports SDT's theoretical predictions. Most research on perceived difficulty suggests that perceived difficulty leads to diminished motivation and disengagement, though a great deal of this research has been conducted by providing students with a difficult task (or not) outside of the classroom environment (e.g., Fulmer & Frijters, 2011; Keller & Bless, 2008). For example, Fulmer and Frijters (2011) found that 10–14 years old students reported lower levels of enjoyment, perceived competence, and effort for reading a text that was well beyond their reading abilities compared to their reports of enjoyment, perceived competence, and effort for reading in general. In another study with 6th and 7th grade students who were given a challenging math and reading task, ratings of the perceived difficulty of the task was associated with less situational interest, increased negative affect, and less perceived competence (Tulis & Fulmer, 2013).

Though less research on actual or perceived task difficulty has

focused on students' experience in an authentic classroom, past field research has also supported the predictions of SDT. For example, in one qualitative study (Aschbacher, Li, & Roth, 2010) involving interviews with high school science students, some students reflected on their struggles in science class and suggested that not being able to understand the class content really undermined confidence and interest. Quantitative studies investigating the relationships between students' *daily* experience of class difficulty and their experiences of perceived competence and disengagement are also limited, though several studies provide some support for our prediction that perceptions that classwork is difficult on a given day predicts lowered perceived competence and disengagement in the classroom. For example, a repeated-measures study by Schweinle, Meyer, and Turner (2006) in which 42 elementary students were surveyed for 8 consecutive days revealed that perceived challenge in math class was positively associated with social affect (e.g., feeling cooperative, open, and involved) and negatively associated with self-efficacy (a construct similar to perceived competence). However, although this study assessed students' daily perceptions of their math classes, it only examined average classroom-level math class challenges and did not examine students' daily experiences. Similarly, Malmberg, Walls, Martin, Little, and Lim (2013) conducted a one-week intensive longitudinal study with 292 elementary school students and found that on average, students experienced a significant decrease in perceived competence for lessons that students perceived to be difficult, with some individual differences in this within-person association.

While prior research has made it clear that extensive variance in students' experiences exists within students rather than between students (e.g., Malmberg et al., 2013; Pöysä et al., 2018; Tolvanen et al., 2011; Vasalampi et al., 2016), few studies have focused on the role of perceived difficulty at the day level and disengagement has not been examined as an outcome. As such, the extent to which students' daily perception of task difficulty in class plays a role in their daily perceived competence and disengagement during class remains unclear. Moreover, although previous work has been informative, it falls on future research to explore whether this pattern will extend to high school students' experiences of perceived competence and disengagement in science class. Taken together, these findings suggest a need to examine the daily association between high school students' perceptions of difficult classwork and their perceptions of competence and disengagement in authentic classrooms *within* students rather than between students. The current study seeks to fill these gaps in the existing literature.

2.3. The potential of autonomy support for mitigating risks associated with difficult classwork

Given the likelihood of detrimental correlates of students perceiving classwork to be difficult, finding strategies that teachers can use to mitigate the risks associated with perceived difficulty is important. One straightforward solution is to adjust the task demands or the level of the challenge of classwork to make sure it matches students' skills (e.g., Nakamura & Csikszentmihalyi, 2014, pp. 239–263) or to guide and scaffold students interaction with a task so that they can handle the challenge with assistance, in line with the idea of a zone of proximal development (Vygotsky, 1978). However, the reality of the classroom is that there is often a great deal of variation in students' perceptions of classwork both across students, and even within students, that often make creating optimal challenge and scaffolding every students' experience with each task difficult. It is often not possible for teachers to assess and adapt class content to each student and even to one student across multiple days.

An alternative motivation-focused approach that may not require as much individualization for each student is for teachers to adopt an autonomy-supportive orientation. SDT emphasizes the importance of autonomy support for students' engagement (e.g., see Reeve, 2012; Reeve et al., 2004). Broadly, autonomy support in the classroom