UNDERSTANDING PRESERVICE TEACHERS' INTENTIONS TO ENACT AUTONOMY SUPPORT: DRAWING FROM SELF-DETERMINATION THEORY AND MINDSET THEORY

by

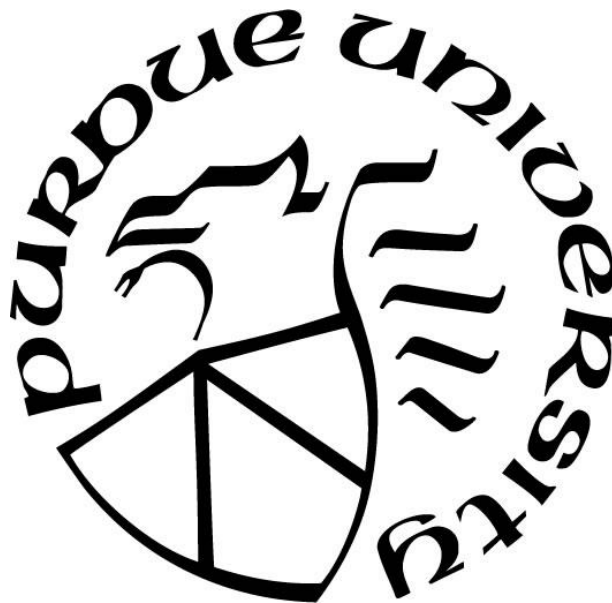**Dongyao Tan**

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Dedicated to my family

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ABSTRACT

Self-Determination Theory (Ryan & Deci, 1985, 2018) suggests that teachers' autonomy support and control practices (i.e., motivate students through internal motivational resources or through external pressure and control) directly impact student motivation, achievement, and well-being (Ryan & Deci, 2018). To prepare future teachers who engage in autonomy support practices, the dissertation aimed to examine preservice teachers' intentions to enact autonomy and control, and the individual beliefs and motivations predicting such intentions, through a combined perspective of Self-Determination Theory and Self-Theories of intelligence or the mindset theory (Dweck, 1986, 2000). Growth and fixed mindset, the incremental and fixed beliefs about individual attributes (e.g., intelligence, talent; Dweck, 2000), was proposed as an additional individual factor contributing to autonomy and control practices beyond other factors specified in Self-Determination Theory.

Participants were preservice teachers enrolled in the teacher education programs from three Midwestern universities. Through a quantitative survey study ($N = 237$), Study 1 examined the interrelationships among growth mindset, autonomous motivational orientation, intrinsic motivation for teaching, beliefs about autonomy, and intentions to enact autonomy in daily teaching. Structural equation models revealed that growth mindset and autonomous orientation were positively correlated. Both growth mindset and autonomous orientation significantly predicted intrinsic motivation for teaching and beliefs about autonomy support, and indirectly predicted intentions to enact autonomy support through beliefs about autonomy support. Intrinsic motivation for teaching also significantly predicted intentions to enact autonomy support through beliefs about autonomy support. The findings supported the unique role of growth mindset beyond other predictors of autonomy support.

Study 2 adopted a qualitative approach, and examined in-depth the dynamics between preservice teachers' mindset and intentions to enact autonomy and control and by extension the highly related intentions to enact structure and involvement (i.e., the practices to promote student competence and to support their relational needs; Ryan & Deci, 2018). Although structure and involvement are constructors under the broader umbrella of autonomy, in this work, structure and involvement were conceptualized separately from autonomy to highlight practices that specifically

support basic psychological needs for competence, relatedness, and autonomy respectively. Participants were assigned to a growth-mindset group (strong growth mindset), a mixed-mindset group (relatively mixed mindset), and a fixed-mindset group (relatively fixed mindset). Interviews ($N = 17$) highlighted the practices preservice teachers used and would continue to use with specific examples from practicum experience and upon reflections of given scenarios, focusing on difficult situations when students have motivation-behavior and/or ability issues. The difficult situations reflect "pressure from below" that is predominant in daily teaching and easily pull out teachers' control practices (Reeve, 2009). Field journals ($N = 103$) collected from a foundational educational psychology class reported preservice teachers' observations and evaluations of teacher autonomy/control practices in practicum, and if same practices would be implemented in future teaching and modifications. Results revealed that the interview fixed-mindset group had strongest intentions to enact control under "pressure from below," and in particular when facing students with combined motivation, behavior, ability problems that would create highest pressure. All groups demonstrated relatively high intentions for structure and involvement. Although the groups demonstrated low to moderate intentions for autonomy specifically, overall, autonomy supportive practices were well endorsed by participants in all three mindset groups, as structure and involvement are practices which fit under the broader umbrella of autonomy. Larger percentages of participants in the field journal growth- and mixed-mindset groups reported intentions for autonomy and not using control than the fixed-mindset group; similar percentages of participants in all groups reported intentions for control.

The dissertation responds to teacher education researchers' proposition that examining preservice teachers' beliefs and motivations should be a central concern of teacher education (Levin, 2015). It also responds to the recent call in educational psychology for multifaceted models of motivation from complementary perspectives (Linnenbrink-Garcia & Patall, 2016). The combined perspective provides new insights into understanding teacher autonomy support and control. Meanwhile, the studies have practical implications for training preservice teachers to provide autonomy support for their future students, and to cope with the pressure and difficulties they will often encounter in real world classrooms and refrain from control practices.

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INTRODUCTION

Overview of the dissertation

Problem statement

Researchers in the field of teacher beliefs (Levin, 2015; Watt & Richardson, 2015) have been arguing that examining preservice teachers' beliefs and motivations should be a central concern of teacher education. It helps teacher education programs exert real influence on preservice teachers—addressing their misconceptions and naïve and maladaptive theories that hinder their teaching practices in the future, and helping them develop adaptive beliefs and motivations that benefit their future teaching.

Self-Determination Theory (SDT, Deci & Ryan, 1985a; Ryan & Deci, 2018) has become a major and influential framework for the study of teacher motivations and practices (Watt & Richardson, 2015). According to SDT, one critical teacher motivational practice that directly impacts students' motivation, achievement, and well-being is autonomy support, that is, the active nurturing of students' capacities to be self-regulating by taking students' perspectives and relating to their interests (Ryan & Deci, 2018). Teachers engaging in autonomy support satisfies student basic psychological needs for autonomy (behaving with a sense of volition), competence (mastering one's environment), and relatedness (feeling connected with others), which in turn promote student motivation, achievement, and well-being, Teachers who engage in autonomy support practices (i.e., supporting autonomy) typically also engage in the highly interdependent structure practices (i.e., supporting competence) and involvement practices (i.e., supporting relatedeness) (Ryan & Deci, 2018).

On the other hand, although autonomy support has demonstrated important value for education, in reality teachers often resort to control practices (i.e., command, criticize, motivate through external pressure). This is a result of "pressure from below" (i.e., student misbehaviors, low engagement, negative perceptions of student ability), "pressure from above" (i.e., testing pressure, school requirements, national standards), and "pressure from within" (i.e., a controlled rather than autonomous disposition/orientation, and positive beliefs about control as opposed to autonomy) (Hornstra, Mansfield, van der Veen, Peetsma, & Volman, 2015; Reeve, 2009). Control

practices undermine student basic psychological needs, and typically signal absence of autonomy and involvement practices. Teachers may still engage in structure practices but in a controlling rather than autonomy supportive way. To prepare future teachers who are ready to provide autonomy support to students and reduce control practices when facing various levels of pressure in real world classrooms, it is vital to study preservice teachers' intentions to enact autonomy support or control, and to help them develop adaptive beliefs and motivations that predict such intentions. Pre-service teachers are generally not practicing yet, studying their intentions most closely mirror the actual practices they are likely to engage in when they start practicing (Ajzen, 2002; Fishbein et al., 1992; Fishman, Beidas, Reisinger, & Mandell, 2018).

The SDT literature suggests that antecedents to autonomy support include individual level and contextual level factors. Most important individual factors are related to personal beliefs and motivations. One important antecedent is autonomous causality orientation as opposed to controlled causality orientation, namely, the intrapersonal propensities to organize behavior by orienting toward interests, values, and supports, as opposed to social controls and external judgments and contingencies in the social context (Reeve, 1998; Ryan & Deci, 2018). Another important antecedent is beliefs about autonomy support/control, namely the beliefs about the effectiveness of autonomy/control, how easy it is to implement autonomy/control, and whether autonomy/control is a norm of the teachers' schools (Hornstra et al., 2015; Reeve, 2009; Reeve et al., 2014). A few scholars also examined intrinsic motivation for teaching as a predictor of autonomy support, namely, the interest and enjoyment in the teaching activity (Goudas, Biddle, & Underwood, 1995; Kingma, Kamans, Heijne-Penninga, & Wolfensberger, 2016; Pelletier, Séguin-Lévesque, & Legault, 2002).

Drawn from another major motivation theory widely used in education—the mindset theory or self-theories (Dweck, 1986, 2000), a small number of recent studies have also found teachers' mindset as another predictor of autonomy support. Teachers' growth and fixed mindset refers to the implicit self-theories or beliefs about whether intelligence is malleable and incremental or fixed and innate. Some studies investigating the antecedents to autonomy support have indicated that mindset might be an underlying mechanism that directly or indirectly predicts autonomy support and/or control (e.g., Hornstra et al., 2015; Kingma et al., 2016; Leory, Bressoux, Sarrazin, & Trouilloud, 2007). From early on, another line of research investigating the impact of teachers' or

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parents' mindsets on their practices has also indicated a potential link between mindset and autonomy support, such that the practices influenced by mindsets shared key characteristics with autonomy support or control (e.g., Grolnick, Gurland, DeCourcey, & Jacob, 2002; Grolnick, Price, Beiswenger, & Sauck, 2007; Moorman & Pomerantz, 2010). For example, adults' growth mindset was associated with trying to understand children's reasons for disruptive behaviors rather than giving commands and punishments (Dweck, Chiu, & Hong, 1994). It is likely that as opposed to control practices, teachers with a growth mindset tend to engage in autonomy practices, and by extension structure and involvement practices, for these teachers focus on the process of student learning rather than the outcomes, which allows them to be sensitive to what students need. These teachers make efforts and use strategies to facilitate the learning process and solve problems when facing difficulties (Dweck, 2000). On the other hand, teachers with a fixed mindset may resort to control practices, especially when facing pressure and difficulties. They experience higher internal pressure (e.g., ego involvement, self-defeating; Dweck, 2000), and the "pressure from within" may pull out control practices (Reeve, 2009). Their sensitivity to external pressure, avoiding challenges in face of difficulties and focusing on outcomes may also lead them to control student behaviors as an easier and quicker way to achieve desired outcomes. They may also easily give up and do nothing in the face of difficulties instead of engaging in any autonomy, competence, and relatedness supportive practices to solve the problems in their classrooms (Dweck, 2000).

Moreover, autonomous orientation and growth mindset could be two closely related intrapersonal influences and underlying mechanisms that directly or indirectly predict autonomy support. Two decades ago, going along with the theoretical propositions of the mindset theory, Koestner and Zuckerman (1994) have proposed that causality orientations and mindsets function in the same way; causality orientations and mindsets create psychological frameworks that direct people's goals, motivations, beliefs, and behaviors in similar patterns. Literature has also suggested many similarities between mindsets and causality orientations. For example, they are both proposed as key parts of one's personality or dispositions, and have global influences (Molden & Dweck, 2006; Reeve, 1998). Both are (a) developmental outcomes of social environments and socializations, and (b) developmental inputs or sources for further development (Dweck, 2000; Ryan & Deci, 2018). They also share a series of similar outcomes such as intrinsic motivation (e.g., Dweck, 2002; Goudas et al., 1995; Rawsthorne & Elliot, 1999), learning goals (e.g., Dweck & Leggett, 1988; Koestner & Zuckerman, 1994), better self-regulation and persistence (Berzonsky,

2004; Blackwell, Trzesniewski, & Dweck, 2007), and positive affect and emotional functioning (Knee & Zuckerman, 1998; Yeager & Dweck, 2012). Regardless of the similarities between mindset and autonomous orientation, they represent their own unique constructs. They may overlap but also complement each other in influencing autonomy support directly, as well as indirectly through other autonomy support predictors such as intrinsic motivation for teaching (e.g., Kingma et al., 2016) and beliefs about autonomy support (e.g., Reeve et al., 2014).

There is a dearth of research on how mindset may intertwine with autonomy support and its predictors. Mindset could be another "factor from within" that predict autonomy support/control, in addition to the sources posited in SDT such as autonomous/controlled causality orientation. It is important that teacher education addresses "factors from within" and help preservice teachers prepare to reduce controlling teaching in their future classrooms, especially when "pressure from below" and "pressure from above" that pull out control could be unavoidable and pervasive. Studying mindset has added value to understand autonomy support and control in addition to current SDT explanations.

Purpose of the dissertation

The broad aim of the dissertation is to examine preservice teachers' personal beliefs and motivations that contribute to preservice teachers' intentions to enact autonomy support, drawing upon both SDT and the mindset theory. Specifically, the beliefs include mindset (a global belief) and beliefs about autonomy support (a contextual belief). The motivations include autonomous orientation (a global motivation) and intrinsic motivation for teaching (a domain-specific motivation). Part of the dissertation also extends to preservice teachers' intentions to enact structure and involvement that are highly relevant to intentions to enact autonomy support.

The purpose is twofold. First, to test the interrelationship between growth mindset and autonomous orientation, and how they may directly and indirectly contribute to preservice teachers' intentions to enact autonomy support through intrinsic motivation for teaching and beliefs about autonomy support. The interrelationships among the constructs are proposed based on SDT and mindset theory and literature, and tested via structural equation models in Study 1, a quantitative survey study.

The second purpose of the dissertation is to investigate in depth the dynamics between preservice teachers' mindsets and their intentions to enact autonomy support, structure, and involvement. Specifically, Study 2, a qualitative study with interview and field journal data, investigated the intentions to enact autonomy support (versus control), structure (versus chaos), and involvement (versus low involvement) in pre-service teachers with fixed, mixed, and growth mindsets, especially when facing "pressure from below". The focus is on autonomy support and control, but extends to structure and involvement because autonomy supportive teachers often at the same time tend to students' needs of competence and relatedness and engage in structure and involvement practices (Ryan & Deci, 2018). Although structure and involvement are constructs under the broader umbrella of autonomy, in this work, structure and involvement were conceptualized separately from autonomy to highlight practices that specifically support basic psychological needs for competence, relatedness, and autonomy respectively.

The dynamics between mindsets and intentions is investigated in general situations, but also focus on the "pressure from below" situations specifically. "Pressure from below" is often a most direct and pervasive form of pressure in daily teaching that triggers control practices (Hornstra et al., 2015). Moreover, teachers with different mindsets are likely to demonstrate different practices under "pressure from below."

Research questions

Taken together, the dissertation answers the following research questions:

1. Are preservice teachers' mindset and autonomous orientation closely positively associated?

2. Do preservice teachers' mindset and autonomous orientation (IVs) predict intentions to enact autonomy support (DV) directly and indirectly through intrinsic motivation for teaching and beliefs about autonomy support (mediators)?

3. How do preservice teachers with growth, mixed, and fixed mindsets intend to enact autonomy support, structure, and involvement, especially when they face "pressure from below"?

Hypotheses

Study 1 answers research questions 1 and 2. The independent constructs are individual level characteristics/attributes that are hypothesized as predictors of intentions to enact autonomy support, the dependent construct. It is hypothesized that growth mindset and autonomous orientation (IVs) would be positively significantly correlated, and given the functional similarities between growth mindset and autonomous orientation, they would both positively significantly predict intentions to enact autonomy support (DV) directly and indirectly through intrinsic motivation for teaching and positive beliefs about autonomy support (mediators).

Study 2 answers research question 3. Preservice teachers with a strong growth mindset or a relatively mixed mindset are hypothesized to show stronger intentions to enact autonomy support as well as structure and involvement compared with preservice teachers with a fixed mindset. In contrast, preservice teachers with fixed mindsets would be more likely to have intentions to enact control. Study 2 provides triangulation for research question 2 concerning the structure of the hypothesized model, specifically the link between growth mindset and intentions to enact autonomy support which was less explored in past research.

Overview of research design

The dissertation involves two studies which broadly follow a sequential mixed-method design. Quantitative data collected from study 1 informs participants selection of study 2, and study 2 provides triangulation evidence to study 1. The dissertation follows a postpositivism paradigm, using the mindset theory and SDT as theoretical frameworks, and a case study methodological approach. A sample of preservice teachers from the teacher education programs at three public universities in Indiana form the broad case. Selected participants for study 2 also form specific cases of preservice teachers with growth, mixed, and fixed mindsets. Multiple data sources are collected, including surveys, field journals, and interviews.

Specifically, Study 1 uses a survey measure to collect quantitative data from preservice teachers enrolled in the teacher education programs from three public universities in Indiana. Study 1 tests the hypothesized model through structural equation modeling. The model tests how mindset and autonomous orientation (IVs) may be positively associated, and how they may positively

contribute to intentions to enact autonomy support (DV) directly or indirectly through intrinsic motivation for teaching and beliefs about autonomy support (mediators).

Study 2 uses qualitative data to zoom into the dynamics between mindset and intentions to enact autonomy support. The study also extends to mixed and fixed mindsets besides growth mindset, and intentions to enact control, structure and involvement besides intentions to enact autonomy. First, a few preservice teachers with growth, mixed, and fixed mindsets identified by the survey in study 1 are selected for semi-structured interviews. Interviews further explore in depth the intentions to enact autonomy support (v.s. control), structure (v.s. chaos), and involvement (v.s. low involvement) in preservice teachers with growth, mixed, and fixed mindsets. The focus is on "pressure from below" situations where students demonstrate behavior, motivation, and ability issues. This is when teachers tend to be controlling, and when teachers with different mindsets tend to deal with the situations differently. Second, preservice teachers' field journals written for a foundational educational psychology class are collected to compare intentions to enact autonomy, structure, and involvement in preservice teachers with different mindset determined by a mindset survey. The field journal asked preservice teachers to evaluate an observed instance of autonomy supportive or controlling teaching in their practicum, and report if they would use the same practice in their classroom and what they would do differently.

Theoretical frameworks

The dissertation uses SDT and the mindset theory as theoretical frameworks to investigate preservice teachers' intentions to enact autonomy support as well as structure and involvement, and the beliefs and motivations contributing to such intentions. SDT and the mindset theory are two motivation theories widely applied to education settings to inform teacher practices in recent decades. This section reviews the two theoretical frameworks.

Self-Determination Theory

The concept of autonomy support comes from SDT (Deci, 1971; Ryan & Deci, 2018), a theory of motivation approaching psychological growth, integrity, and wellness from an organismic perspective. SDT differentiates intrinsic, extrinsic motivation and amotivation along a continuum from autonomous/self-determined to controlled/non-self-determined regulation styles.

SDT particularly focuses on the social contextual influences on human motivation, and emphasizes the dialectic between the growth-oriented human organism and the social environments that support or thwart human growth through the basic psychological needs (BPN) of autonomy, competence, and relatedness.

One major contribution of SDT to educational research is the emphasis on the importance of teachers' autonomy support practices, and the importance of supporting student basic psychological needs for autonomy, competence, and relatedness. Autonomy supportive practices, or autonomy supportive, structure, and involvement practices altogether, help satisfy the universal basic psychological needs of autonomy, competence, and relatedness, which then affect students' motivation, engagement, development, learning, performance, and psychological well-being (Reeve, 2009). Autonomy support has often been operationalized as the motivational social climates teachers create, or as teachers' motivating style, "the interpersonal sentiment and behavior a teacher uses to motivate his or her students to engage in learning activities" (Reeve et al., 2014, p.94). SDT mainly characterizes the classroom social climates or teachers' motivating styles and practices as autonomy supportive versus controlling. Broadly speaking, the social climates or motivating styles are also characterized as competence/effectance supportive versus overly challenging and discouraging, or chaotic and permissive (i.e., structure versus chaos), and relatedness/relational supportive versus impersonal or rejecting (i.e., involvement versus low involvement) (Ryan & Deci, 2018). Autonomy, structure, and involvement are considered interpersonal influences from individuals' social contexts.

Besides the focus on interpersonal influences from social contexts, SDT also studies three general causality/motivational orientations as parts of individuals' intrapersonal influences (Deci & Ryan, 1985b). The first causality orientation is the autonomous orientation, the propensities to organize behavior by orienting toward interests, values, and supports in the social context, even when it is controlling. The second causality orientation is the controlled orientation, the propensities to organize and regulate behaviors by orienting towards social controls and external judgments and contingencies, even when the social environment is autonomy supportive. The third causality orientation is the impersonal orientation, the propensity to orient toward obstacles and to feel a lack of control in pursuing goals and outcomes, feeling anxious, incompetent, and amotivated. People generally have one dominant type of orientation, but can also hold the other

two types of orientations in different contexts and situations. These three orientations align with autonomous motivation, controlled motivation, amotivation and their corresponding regulatory styles, as well as autonomy-supportive, controlling, and amotivating social contexts (Ryan & Deci, 2018). The autonomous and controlled orientations and motivations are most studied.

Mindset theory

The mindset theory, self-theories, or theories of implicit beliefs about intelligence (Dweck, 1986, 2000), is the most influential theory regarding people's implicit beliefs about the malleability of intelligence. The beliefs about intelligence also extends to beliefs about the malleability of personality, talent, and other individual attributes. People who view intelligence as malleable also tend to view personality, talent and other individual attributes as malleable. The theory posits that people generally hold two types of beliefs about intelligence. The first is a growth mindset or an incremental belief about intelligence, the belief that intelligence is malleable and can be developed over time. The second is a fixed mindset or an entity belief about intelligence, the belief that intelligence is fixed at birth and cannot be changed. These beliefs are coherent with other beliefs, goals, and values in one's "meaning system", and are key to one's personality and sense of self (Dweck, 2000; Molden & Dweck, 2006). Children started to develop the meaning system since early age under socialization influences at home and later from school, and they form a relatively stable meaning system around the age of 10 to 12. People have one dominant type of mindset, but they also hold both types of mindsets in different situations. The theory posits that mindset is the underlying mechanism for various goals, beliefs, values, motivations, and behaviors. For example, Dweck and Leggett's (1988) motivational model of achievement postulates that different beliefs about intelligence result in different goal orientations which lead to adaptive and maladaptive cognitive, affective and behavioral outcomes.

The two types of implicit beliefs about intelligence, or growth and fixed mindset, reveal most salient cognitive, affective, and behavioral differences when individuals face difficulties and failures. Fixed mindseted people are discouraged and easily give up when facing difficulties, but growth mindseted people embrace the challenge with confidence and persistence. This is because different mindsets are associated with different attributions. Fixed mindseted people tend to notice the negative, evaluative, and outcome and ego centered information from their social environment,

and they attribute failures and success to ability which they view as innate and uncontrollable. Growth mindseted people on the other hand attend to more process-oriented information in their social environment, and they attribute failures and success to something they can control. For example, they think failures only represent a temporary lack of knowledge and they can improve and achieve desired outcomes through time and effort. Fixed mindseted people tend to experience higher internal pressure, or "pressure from within". They tend to be more vulnerable, helpless, self-defeating, and seek easy and quick solutions when facing difficulties such as when there is "pressure from below" or "pressure from above" in their social environment.

Dweck's decades of research has shown that the influence of mindsets is across domains including for example teaching, parenting, sports, business, and relationships (Dweck, 2006). Promoting students' growth mindset has been an educational goal in K-12 classrooms (Education Week Research Center, 2016). Promoting teachers' growth mindset is equally important, as teachers' mindsets directly impact students' as well as their own motivation, achievement, development, and practices (e.g., Blackwell et al., 2007; Dweck, 2014; Leroy et al., 2007; Lynott & Woolfolk, 1994; Ratten, Good, & Dweck, 2012; Shim, Cho, & Cassady, 2013).

Conceptualizations and operationalization of study constructs

The study constructs are conceptualized and operationalized based on the frameworks of SDT and the mindset theory. The constructs in Study 1 are intentions to enact autonomy support and the personal beliefs and motivations predicting the intentions, including mindset, autonomous orientation, intrinsic motivation for teaching, and beliefs about autonomy support. The constructs in Study 2 are intentions to enact autonomy, structure, involvement, and the personal beliefs of growth, mixed, and fixed mindsets.

Intentions to enact autonomy, structure, involvement

Intentions to enact autonomy support practices is conceptualized as the intentions to enact these practices in general and on a daily basis in Study 1. The conceptualizations are based on Reeve et al.'s (2014) definition of teachers' motivating styles—the autonomy supportive and/or controlling practices and strategies teachers use in their classrooms in general, and on a daily basis. As Study 2 is tied with specific interviews and field journal prompts and is more context specific,

the intentions to enact autonomy, structure, and involvement practices are broadened to more general intentions to enact these practices in future classrooms. Specifically, intentions to enact autonomy support refers to preservice teachers' intentions to provide interpersonal sentiment and behavior to identify, nurture, and develop students' inner motivational resources (i.e., autonomy support), rather than pressure students to think, feel, or behave in a specific way (i.e., control) (Reeve, 2009; Reeve et al., 2014). Intentions to enact structure refers to preservice teachers' intentions to facilitate children's capacities to safely and confidently gain mastery to internal and external worlds, to organize the environment to promote mastery and effectiveness (i.e., structure), as opposed to give little structure and guidance being permissive (i.e., chaos) (Ryan & Deci, 2018). Intentions to enact involvement refers to preservice teachers' intentions to dedicate resources to students, include attention and engaged caring, and allow the children to feel both relationally connected and emotionally supported when facing challenges (i.e., involvement), as opposed to neglect social emotional affects being rejecting and impersonal (i.e., low involvement) (Ryan & Deci, 2018).

SDT usually conceptualizes teachers' practices or motivating styles as autonomy supportive and controlling practices/styles, and in general autonomy support is considered an overarching construct that encompasses structure and involvement and supports all three basic psychological needs for autonomy, competence, relatedness. However, researchers have also conceptualized teachers' practices more specifically to include autonomy support, structure, and involvement, which explicitly match the autonomy, competence, and relatedness dimensions of basic psychological needs and highlight each need (Ryan & Deci, 2018). The dissertation follows this separate conceptualizations of teacher practices to include autonomy (versus control), structure (versus chaos), and involvement (versus low involvement).

Autonomy support is often operationalized in the following ways. First, students' report on teachers' classroom autonomy supportive practices via surveys (e.g., Levesque-Bristol, Knapp, & Fisher, 2010; Roth & Weinstock, 2013) or interviews (e.g., Wallace & Sung, 2017). Second, teachers' self-report via surveys (e.g., Kingma et al., 2016; Leroy et al., 2007; Trouilloud, Sarrazin, Bressoux, & Bois 2006), interviews (e.g., Hornstra et al., 2015), or scenario prompts (e.g., Reeve et al., 2014) that measure their daily autonomy supportive/controlling teaching practices. Third, researchers' observations of teacher practices in natural settings (e.g., Rogat, Witham, & Chinn,

2014) or laboratory settings (e.g., Grolnick et al., 2002; Moorman & Pomerantz, 2010). Those practices were rated and classified as autonomy supportive and controlling. In addition, autonomy support is also sometimes operationalized as intentions to enact autonomy support rather than measuring actual autonomy support practices. For example, Muenks, Miele, Ramani, Stapleton, and Rowe (2015) asked parents to read two scenarios of children struggling with completing a task, and presented them with a list of controlling or autonomy supportive behaviors to let them imagine what behaviors they would adopt. The assumption is that intentions to enact autonomy support is viewed as a proxy of the actual autonomy support practices.

Structure and involvement are also operationalized in similar and different ways. Autonomy supportive practices are often also competence and relatedness supportive (Ryan & Deci, 2018). Many studies have implicitly measured some parts of structure and involvement as components of autonomy support practices, such as attending to negative affect (involvement; Reeve, 2009) and giving informational feedback (structure; Reeve & Jang, 2006). Other studies assessed structure and involvement separately from autonomy, such as studies using The Physical Educators' Motivating Styles Scale (PEMOS; Richards & Washburn, 2017) and the Teachers as Social Context Questionnaire (TASCQ; Wellborn, Connell, Skinner, & Pierson, 1988). Common assessment methods also include surveys (e.g., Klassen, Perry, & Frenzel, 2011), interviews and scenarios (e.g., Klassen et al., 2011), and observations (e.g., Jang et al., 2010).

Autonomy support, structure, involvement in this dissertation are operationalized as preservice teachers' intentions to enact these practices, and a proxy of preservice teachers' actual practices of enacting these practices when they teach. Intentions represent an immediate antecedent to behaviors (Ajzen, 2002; Fishbein et al., 1992; Fishmanet al., 2018). Some preservice teachers in their junior, senior, and post-baccalaureate years may have gained relatively rich experience from field teaching, hence their intentions to enact autonomy, structure, and involvement mirror their actual enactments more closely. Intentions to enact structure and involvement are operationalized as their own dimensions separately but closely related to intentions to enact autonomy versus control. Study 1 measures intentions to enact autonomy support through preservice teachers' self-report using surveys. Study 2 prompted preservice teachers' intended practices in interviews and field journals, and the intended practices are classified to the autonomy, structure, and involvement dimensions through the researchers' lens.

Mindset, autonomous orientation, intrinsic motivation, beliefs about autonomy

Mindset, autonomous orientation, intrinsic motivation for teaching, and beliefs about autonomy support either represent a type of personal belief or a type of personal motivation.

Beliefs have a wide conceptual range without a single agreed definition. Researchers engaged in studying teacher beliefs and closely related concepts frequently find it difficult to clearly state what they are studying exactly (Scott, 2015). Beliefs are often intertwined with values, attitudes, and motivations. There are four common cores of teacher beliefs: (a) beliefs are generally used to describe individual, subjective mental constructs, (b) there are linked cognitive and affective aspects to beliefs, (c) beliefs are generally considered temporally and contextually stable, and (d) beliefs significantly influence how teachers interpret and interact with the problems of practice (Scott, 2015). Individuals' beliefs also form a "complex, interconnected, and multidimensional" system. Beliefs differ in various levels of specificity, they can be "implicit or explicit, primary or derivative (i.e., grounded in primary beliefs), and core or peripheral (i.e., more or less convicted)" (Buehl & Beck, 2015, p.66). Although many researchers think beliefs are more or less stable, they also think beliefs have some plasticity and a situated nature as well (Buehl & Beck, 2015). Recently researchers in the field of teacher beliefs started to systematically utilize motivation theories to investigate teachers' motivations and beliefs together (Watt & Richardson, 2015).

Motivations are concerned with what "moves" people to action, and theories of motivation specifically focuses on what "energizes and gives directions to behavior (Ryan & Deci, 2018, p. 31). Different from other theories' focus on the amount and strength of motivation, SDT further defines motivations in regard to different types (i.e., intrinsic motivation, extrinsic motivation, amotivation) and sources (i.e., interpersonal/social contextual and intrapersonal/individual sources) of motivation that impact the quality and dynamics of behavior (Ryan & Deci, 2018). Similar to how beliefs differ in levels of specificity, motivation is also seen as differentiated in generality/specificity. In their hierarchical model of motivation, Vallerand and Ratelle (2002) specified three levels of generality of intrinsic and extrinsic motivation. The most general, global level is related to individual differences in motivational orientations. General causality orientations represent this level. A less general level is related to motivational differences in domains, such as intrinsic motivation in sports, extrinsic motivation in academia, etc. The least general level is related to situation-specific motivation, that is, intrinsic/extrinsic motivation for a particular

activity in a particular setting at a particular time, or autonomous/controlled regulation underlying an action within a domain. The model also proposes that motivation at a particular level is determined by the next higher, more general level (and also social contextual factors). For example, domain-specific motivation is determined by the more global level of general causality of orientations. Meanwhile, a bottom-up influence among levels of motivation is also possible.

Mindset and autonomous orientation are conceptualized as representing the global, general, more stable level of beliefs and motivations. First, the mindset theory defines mindset as the implicit beliefs about intelligence that are key to one's personality (Dweck, 1986; Molden & Dweck, 2006). Around the age of 10 to 12, people generally have developed a mature mindset and a system of beliefs, values, and goals associated with it—termed as "a meaning system" which remains relatively stable (Dweck, 2002). Mindset is viewed as the core part of the meaning system and the origin of other beliefs, values, goals, and behaviors (Dweck, 2000). Second, SDT defines autonomous orientation as a type of general motivational orientation and global individual difference. Autonomous orientation is one form of the general causality orientations. Ryan and Deci (2018) pointed out that general causality orientations are studied as global level individual differences and intrapersonal influences alongside SDT's focus on interpersonal/social contextual influences. Ryan and Deci also argued it is important to study how people interpret and give psychological meanings to their contexts and act accordingly, which is significantly affected by people's personalities. They further specified that personalities include classic traits as well as individual differences in general causality orientations. In addition, researchers also used different terms to describe autonomous orientation in relation to dispositions or personalities such as autonomous functioning, defined as an autonomy trait and disposition (Weinstein, Przybylski, & Ryan, 2012). Autonomous orientation was also referred to as a "personality characteristic" (Reeve, 1998), or "autonomy-oriented beliefs, motivations, values, and personality dispositions" (Reeve, 2009, p. 171). Specifically, fixed and growth mindset refer to teachers' general, implicit beliefs about whether intelligence is innate and fixed at birth or can be learned and improved through time and efforts (Dweck, 1986, 2000), and a mixed mindset refers to the mixed, in-between beliefs along the growth and fixed mindset continuum. Autonomous and controlled orientations refer to the intrapersonal motivational propensities to organize behavior by orienting toward interests, values, and supports, or by orientating toward social controls and external judgments and contingencies in the social context (Reeve, 1998; Ryan & Deci, 2018).

Beliefs about autonomy support and intrinsic motivation for teaching are conceptualized to represent the less general, domain-specific and context-relevant beliefs and motivations. First, beliefs about autonomy support is conceptualized as a type of belief concerning values and judgments of autonomy support (Reeve et al., 2014). That is, the beliefs about whether autonomy support is effective and realistic (Reeve, 2009). Beliefs about autonomy support is also tied with specific scenarios of autonomy supportive teaching and controlling teaching in some studies (Reeve et al., 2014), as well as in the current study. That is, participants are prompted to report their beliefs about autonomy support teaching in response to the scenarios (see Study 2 measurement). Hence, beliefs about autonomy support here represent the more situated and derivative types of beliefs discussed in Buehl and Beck (2015). Second, intrinsic motivation for teaching is conceptualized as a type of motivation for the domain of teaching, or the teaching activity and profession. It represents the interest and enjoyment in teaching, and a high quality, prototype motivation, the most autonomous form of motivation along the SDT's intrinsic-extrinsic motivation continuum (Ryan & Deci, 2018). In study 1, beliefs about autonomy support and intrinsic motivation for teaching are conceptualized as mediators between mindset, autonomous orientation, and intentions to enact autonomy support, considering (a) the mindset theory presents different types of goals, beliefs, perceptions, motivations, and behavior patterns as a result of mindset (Dweck & Leggett, 1988), and (b) SDT presents domain- or situation-specific motivations as mediating the effect of autonomous orientation on people's effectiveness in interacting with their surroundings (Ryan & Deci, 2018). Specifically, beliefs about autonomy support refers to the beliefs about the effectiveness and ease-of-implementation of autonomy supportive teaching activities (Reeve et al., 2014). Intrinsic motivation for teaching refers to the interest and enjoyment in the teaching activity (Deci, Eghrari, Patrick, & Leone, 1994).

Mindset is a key construct in the dissertation. Connecting to SDT, mindset is operationalized as another source of "factor from within" that influences preservice teachers' use of autonomy or control motivating styles (Hornstra et al., 2015; Reeve, 2009). Fixed mindset is another source of "pressure from within" that pulls out the controlling motivating style and growth mindset reduces the "pressure from within". Mindset is assessed through surveys using Dweck's (2000) original Theories of Intelligence Scale (TIS). This scale is the common method mindset research uses to assess mindset. In addition, autonomous orientation, intrinsic motivation for teaching, and beliefs about autonomy are measured through preservice teachers' self-report using surveys in Study 1.

Significance of the dissertation

The combined perspective of mindset theory and SDT to understand preservice teachers' intentions to enact autonomy, structure, involvement corresponds to the recent call in educational psychology for multifaceted models of motivation (Farley et al., 2016; Linnenbrink-Garcia & Patall, 2016), which enriches the understanding of motivation phenomenon from complementary perspectives. This is important as educational outcomes are "multiply determined" (Linnenbrink-Garcia & Patall, 2016, p.97). The examination of personal beliefs and motivations predicting intentions to enact autonomy support also corresponds to teacher education researchers' calls that examining preservice teachers' beliefs and motivations should be a central concern of teacher education (Levin, 2015).

Theoretically, the dissertation helps teacher educators and researchers understand preservice teachers' intentions to enact autonomy, and by extension intentions to enact control, structure and involvement. Drawing from the mindset theory alongside SDT may help advance our understanding of the mechanisms or sources underlying autonomy support beyond what SDT explains (both Study 1 and Study 2). Mindset adds to the examination of the "factor from within" sources different from the sources for autonomy support/control SDT has specified. SDT places basic psychological needs as the key to motivation, well-being, and achievement, and SDT places central importance on the autonomy dimension and autonomy support as essential in supporting all three needs. In SDT, personal autonomous orientation and beliefs about autonomy, as opposed to personal competence beliefs, are most important individual level factor influencing provision of autonomy support. Mindset aligns with the competence dimension of basic psychological needs in SDT. Both needs for competence or perceived competence in SDT and the implicit theories of intelligence in the mindset theory belong to educational psychologists' inquiries of what Usher (2016) termed "personal capability beliefs," while mindset foregrounds competence or capability beliefs but from a different angle. Mindset theory posits that it is not the perceived competence per se, it is growth mindset that enables individuals to have positive beliefs, goals, values, motivations, achievement, and well-being, namely the personal capability beliefs that desired outcomes are controllable no matter the current individual competence (e.g., intelligence, ability) are high or low. For example, even if teachers' needs for competence is thwarted in a controlling environment (e.g., "pressure from below"), a malleable view of competence (i.e., growth mindset) may still allow the teachers to experience the environment as less controlling and refrain from control

practices. The mindset theory contends that the confidence of having smartness and competence is not enough, it is the confidence that they can achieve desired outcomes through efforts and strategies that yields optimal outcomes (Dweck, 2000). Mindset could complement SDT in explaining the individual level factor influencing the provision of autonomy support/control, and by extension structure and involvement. A fixed mindset might add "pressure from within", while a growth mindset might reduce the "pressure from within" to help teachers cope with the "pressure from below" and "pressure from above" in real world classrooms, and refrain from controlling teaching.

Practically, the dissertation helps teacher educators understand how to better prepare preservice teachers for autonomy supportive teaching (both Study 1 and Study 2) as well as competence and relatedness supportive teaching (Study 2) in their future classrooms, which also has implications for in-service teacher training and professional development. Study 1 provides a model for the various personal beliefs and motivations contributing to autonomy support, which can serve as a guide for areas of teacher education interventions that promote preservice teachers' autonomy support. By focusing on the "pressure from below" situations, Study 2 has implications for helping preservice teachers deal with the challenges they are likely to encounter every day in their future classrooms, and refrain from controlling teaching.

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STUDY 1. UNDERSTANDING PRESERVICE TEACHERS' INTENTIONS TO ENACT AUTONOMY SUPPORT: A COMBINED PERSPECTIVE OF SELF-DETERMINATION THEORY AND MINDSET THEORY

Introduction

Teachers' autonomy supportive teaching practices, the active nurturing of students' capacities to self-regulate by taking students' perspectives and relating to their interests, is vital for student motivation, achievement, and well-being (Ryan & Deci, 2018). However, teachers often resort to controlling teaching practices under the various levels of pressure in real world classrooms (Reeve, 2009). They command, criticize, motivate through pressure, which undermines student motivation and learning (Ryan & Deci, 2018). To prepare future teachers who engage in autonomy supportive teaching, teacher educators should examine preservice teachers' intentions to enact autonomy support in their future classrooms, and the factors that predict such intentions. It is ideal but less feasible to examine actual autonomy support practices, as previous teachers generally are not teaching yet. Intentions to enact autonomy support most closely mirror preservice teachers' actual enactment of autonomy support in the future (Ajzen, 2002; Fishman, Beidas, Reisinger, & Mandell, 2018).

Examining preservice teachers' personal beliefs and motivations should be a central concern of teacher education (Levin, 2015; Watt & Richardson, 2015). It helps teacher education programs exert real influence on preservice teachers—addressing their misconceptions and maladaptive theories that harm their teaching practices in the future, and helping them develop adaptive beliefs and motivations that benefit teaching. According to Self-Determination Theory (SDT; Deci & Ryan, 1985a; Ryan & Deci, 2018), personal beliefs and motivations that predict autonomy supportive teaching include (a) autonomous orientation (as opposed to controlled orientation, i.e., the intrapersonal propensities to organize behavior by orienting toward interests, values, and supports rather than toward external pressure; Deci & Ryan, 1985b), (b) positive beliefs about autonomy support (i.e., beliefs that autonomy support is effective, easy to implement, and is a norm of the school; Reeve, 2009; Reeve et al., 2014), and (c) intrinsic motivation for teaching (i.e., the enjoyment of the teaching activity; e.g., Kingma, Kamans, Heijne-Penninga, & Wolfensberger, 2016).

Motivation theory integration has become a trend recently, which allows better explanations of education outcomes (Linnenbrink-Garcia & Patall, 2016). Drawing from another motivation framework, Dweck's Self-Theories or the mindset theory (Dweck, 1986, 2000), an additional predictor of autonomy support might be growth as opposed to fixed mindset, that is, the belief that intelligence and other individual attributes can develop through time and effort rather than fixed at birth (Dweck, 2000). Koestner and Zuckerman (1994) proposed that growth mindset and autonomous orientation function in the same way in framing one's motivations, beliefs, and behaviors. Some empirical evidence also revealed the positive association between growth mindset and teachers' autonomy support (e.g., Leory, Bressoux, Sarrazin, & Trouilloud, 2007).

Drawing from both the Self-Determination Theory and Dweck's mindset theory, the current study examines preservice teachers' intentions to enact autonomy support in their future teaching, and the personal beliefs and motivations contributing to such intentions including growth mindset, autonomous orientation, beliefs about autonomy support, and intrinsic motivation for teaching. The study has practical implications for teacher education, as well as theoretical implications regarding the individual factors contributing to autonomy support that adds to SDT's current explanations.

The importance of autonomy support

Self-Determination Theory, a theory of human motivation and development, has been widely applied to education research and practices, and has become a major and influential framework for the study of teacher motivations and practices (Watt & Richardson, 2015). One critical contribution of SDT is the emphasis on teachers' autonomy support as opposed to control. Robust evidence has revealed the important role of autonomy support in student motivation, learning, and well-being, which is validated with all levels of education and across cultures (Reeve, 2002; Ryan & Deci, 2018).

Autonomy supportive practices are characterized as welcoming students' perspectives and feelings, nurturing students' inner motivational resources, providing explanatory rationale, and engaging in informational noncontrolling communications (Reeve, 2009). A central proposition of SDT is that all individuals have basic psychological needs of autonomy (behaving with a sense of volition), competence (mastering one's environment), and relatedness (feeling connected with

others); satisfactions of these needs are central to one's motivation, development, and well-being. Autonomy support is essential in supporting the basic psychological needs, which in turn promotes autonomous motivation including intrinsic motivation and internalized extrinsic motivation (Ryan & Deci, 2018). Autonomy support also contributes to student engagement, persistence, preference for optimal challenges, positive emotions, development in self-worth, creativity, deeper thinking, improved learning strategies, and academic achievement (e.g., Benita, Roth, & Deci, 2014; Reeve, 2002, 2009; Vansteenkiste et al., 2010). In contrast, controlling practices are characterized as monopolizing the learning materials, giving little time for students to independently solve problems, exerting demands and directives, and using controlling language for communications. Controlling practices lead to controlled motivation (i.e., extrinsic motivation alien to the self) and amotivation (i.e., absence of motivation) (Ryan & Deci, 2018), as well as thwart students' basic psychological needs, intrinsic motivation, confidence, self-worth, positive functioning, self initiative, and positive feelings (Assor, Kaplan, Kanat-Maymon, & Roth, 2005; Reeve, 2009).

Given the importance of autonomy support, it is critical that teacher education programs prepare preservice teachers for autonomy supportive teaching in their future classrooms. However, in real world K-12 classrooms, the various levels of pressure can easily pull out control from teachers, and controlling teaching is often the default way of teaching (Reeve, 2009). The sources of pressure include "pressure from below" (i.e., student behavior, motivation, and ability problems), "pressure from above" (i.e., school requirements, national standards, high-stakes testing), and "pressure from within" (i.e., teachers' beliefs that control practices are optimal, teachers' control-oriented personality dispositions) (Hornstra, Mansfield, van der Veen, Peetsma, & Volman, 2015; Reeve, 2009). The pressure can be particularly overwhelming for novice teachers who just enter the teaching profession, therefore they are more likely to resort to controlling teaching (Leroy et al., 2017; Schmidt, Klusmann, Lüdtke, Möller, & Kunter, 2015). It is meaningful to examine preservice teachers' personal beliefs and motivations to reduce "pressure from within" in order to cope with "pressure from below" and "pressure from above," which is particularly helpful when preservice teachers transition to real classroom teaching.

The importance of studying preservice teachers' beliefs and motivations

One major goal of teacher education research is to examine teachers' beliefs and motivations, and the roles of the beliefs and motivations in classroom practices (Skott, 2015). Richardson (1996) suggested that beliefs should be the focus of change and instruction in teacher education programs; one goal of teaching should be helping students form adaptive belief systems that benefit rather than hinder their teaching practices. Levin (2015) in her systematic review of teacher beliefs development argued that identifying preservice teachers' beliefs should be a central concern of teacher education, and effective interventions could equip preservice teachers with enough pedagogical knowledge to enact adaptive beliefs into practice. Patrick and Pintrich (2001) also strongly advised the identification of preservice teachers' belief systems to ultimately improve instruction and future professional development. In their motivational analysis of teacher beliefs, Watt and Richardson (2015) also argued for the importance of studying teacher motivations along with beliefs, and the importance of applying major motivation theories to the study of teacher beliefs.

It is important to examine preservice teachers' beliefs and motivations that contribute to autonomy support. Before they enter the teacher education programs, many preservice teachers may have developed a fixed mindset, a controlled motivational orientation, or other negative beliefs and motivations that hinder autonomy support. Sustained interventions are needed to change these preexisting beliefs and motivations (Dweck, 2000; Ryan & Deci, 2018), as conceptual change is difficult (Patrick & Pintrich, 2001) and motivational orientations are generally stable (Deci & Ryan, 1985b). Teacher education may seem a weak intervention in some cases; even if preservice teachers demonstrate adaptive beliefs and motivations in their teacher education programs, they may reverse to their original beliefs and motivations when they start practicing in real world classrooms (Richardson, 1996). It is exactly due to the difficulties that studying beliefs and motivations in preservice teacher education are important as a first step for long-term, effective interventions of the teacher education "long continuum" (Beck & Kosnik, 2017; Flores, 2016).

Despite these difficulties, adaptive beliefs and motivations contributing to autonomy support can be successfully cultivated in teacher education programs. The academic elements of preservice teacher education do have an impact on changing beliefs and motivations that improve practices,

although perhaps (a) not recognized by teachers, and (b) a time lag may exist between when teachers start their career and when the knowledge they learned as preservice teachers begin to take into effect in practice (Richardson, 1996). There is also strong empirical evidence that some stable beliefs and motivations can be changed effectively. For example, a growth mindset is found to be teachable across populations (Blackwell, Trzesniewski, & Dweck, 2007; Dweck, 2000). It was also found that preservice teachers can cultivate a more autonomous, dispositional motivation through teacher educators' autonomy nurturing practices (Paige, 2007; Parrott, Ros-Voseles, & Eaton, 2013). Studying preservice teachers' beliefs and motivations that contribute to autonomy support has implications for helping them cultivate these positive beliefs and motivations.

Understanding intentions to enact autonomy support from Self-Determination Theory

Predictors of autonomy support include individual and contextual factors (e.g., Hornstra et al., 2015; Kingma et al., 2016; Leroy et al., 2007; Roth & Weinstock, 2013). The current study focuses on individual factors of preservice teachers' personal beliefs and motivations that teacher educators can nurture. Three such beliefs and motivations that contribute to intentions to enact autonomy support based on the SDT literature include autonomous orientation, positive beliefs about autonomy support, and intrinsic motivation for teaching which are also positively associated with each other.

Autonomous orientation

Autonomous orientation is one form of general causality orientations (GCO) that is relatively stable and related to individuals' dispositions (Deci & Ryan, 1985b). Autonomous orientation refers to the propensities to organize behaviors by orienting towards interests, values and supports in the social environment. Another form of GCOs often discussed is controlled orientation, the propensity to orient towards social controls and external contingencies. A third less discussed form of GCOs is impersonal orientation, the propensity to orient towards obstacles and a feeling of being unable to control outcomes, incompetence and amotivation. People generally have one dominant type of orientation, but can also hold the other two types of orientations dependent on contexts and situations (Ryan & Deci, 2018).

SDT posits that autonomous orientation aligns well with autonomy support, individuals with autonomous orientation tend to perceive more autonomy support from others as well as providing more autonomy support to others (Ryan & Deci, 2018). In their early study of causality orientation, Deci & Ryan (1985b) found a strong association between adults' autonomous orientation and the autonomy support they provided to children. Reeve (1998) examined the motivating styles of 301 beginning preservice teachers and found that autonomous oriented participants assimilated the knowledge of autonomy and controlling teaching addressed in class rather easily, while control-oriented participants accommodated the information only partially. Teachers also adopt more controlling instructions when they have a controlling disposition or a controlled causality orientation (Forstadt, 2007; Reeve, 1998, 2009). For example, Jang and Reeve (2009) asked teachers to complete a personality test, and observed and rated teacher use of controlling teaching during instruction. They found that the control-oriented aspects of teachers' personality predicted the extent to which teachers adopted controlling teaching (cited in Reeve, 2009). In addition, autonomous orientation helps buffer against the negative effects of external and social contextual pressure (Ryan & Deci, 2018). Therefore, teachers with an autonomous orientation are likely to provide autonomy support to students even if under external pressure and in a controlling environment.

Beliefs about autonomy support

Beliefs about autonomy support is a close predictor of autonomy support (De Meyer et al., 2015; Reeve, 2009; Reeve et al., 2014). Reeve (2009) discussed that teachers' pre-existing autonomy-oriented beliefs and values impacted their autonomy supportive or controlling teaching style. Even if teachers receive interventions to provide autonomy support, if they perceive that autonomy support is unrealistic, naïve, and inappropriate, they may still resist providing autonomy support. Reeve and colleague's (2014) empirical research on 815 PreK-12 teachers across eight countries revealed that three types of beliefs about autonomy support all independently predicted teachers' autonomy supportive or controlling teaching, including the beliefs autonomy is effective, easy to implement, and represents a norm of their school. In Hornstra and colleagues' (2015) study, teachers assigned to an autonomy supportive cluster also more frequently expressed beliefs in favor of autonomy support compared to teachers assigned to a controlling cluster.

Intrinsic motivation for teaching

SDT differentiates intrinsic, extrinsic motivation and amotivation along a continuum from autonomous/self-determined to controlled/non-self-determined regulation styles. Autonomous forms of motivation and regulation styles include intrinsic motivation(a spontaneous interest in the activity itself), integrated regulation (evaluating and bringing an identification into a coherent self), and identified regulation (identifying the value of an activity and embracing it as one's own). Controlled forms of motivation and regulation styles include introjected regulation (doing what people think one should do because it is generally expected of the individual), external regulation (engaging in an activity in order to obtain a reward or avoid a punishment), and amotivation (lack of intentionality and motivation).

Intrinsic motivation for teaching, the most autonomous form of motivation along the SDT motivation continuum, can potentially contribute to autonomy support. Autonomous motivation is often a predictor of high-quality teaching (Kunter & Holzberger, 2014). For example, Hein and colleagues (2012) found that teachers' autonomous motivation was associated with student-centered teaching while non-autonomous motivation was associated with teacher-centered teaching. Intrinsic motivation as the most autonomous form of motivation should be closely linked to autonomous orientation and autonomy support (Ryan & Deci, 2018), it may buffer against external pressures that pull out controlling teaching, such as school rigid requirement on teacher responsibility, classroom chaos, and students' negative attitudes (Reeve, 2009; Ryan & Deci, 2018). For example, Pelletier, Seguin-Levesque, and Legault (2002) found that teachers with autonomous motivation such as high intrinsic motivation and low external regulation are more likely to support students' autonomy. Kingma and colleagues (2016) also reported positive correlation between intrinsic motivation for teaching and university lecturers' autonomy supportive teaching.

Autonomous orientation, intrinsic motivation for teaching, and beliefs about autonomy support

The predictors of autonomy support from the SDT perspective should also be interrelated. SDT posits that autonomous orientation aligns well with autonomous motivation (Ryan & Deci, 2018). Individuals with autonomous orientation orient towards interests and growth, tend to have

autonomous motivation represented by intrinsic motivation and identified and integrated regulation styles (Ryan & Deci, 2018). Moreover, SDT literature typically describes autonomous/controlled orientation and beliefs about autonomy support as two sources of "factors from within" (Hornstra et al., 2015; Reeve, 2009) that predict practices of autonomy support or control, suggesting alignment of autonomous orientation and beliefs about autonomy support. In their examination of antecedents to teachers' controlling practices, Haerens, Vansteenkiste, Aelterman, and Van den Berghe (2016) also specified that "factor from within" or personality functioning of teachers are more "distal variables" that "feed into" more "proximal antecedents" including teachers' motivation for teaching and their beliefs about control/autonomy. Therefore, teachers with an autonomous orientation are naturally likely to have intrinsic motivation for teaching which is related to their interests and values, and positive beliefs about autonomy support as they orient towards autonomy support. More empirical evidence is needed to validate the relations.

Understanding intentions to enact autonomy support from mindset theory

The mindset theory, or self-theories of intelligence (Dweck, 1986, 2000), is another popular motivation theory widely applied in education. According to this theory, teachers tend to hold two types of implicit beliefs about intelligence: an incremental belief or a growth mindset that intelligence can improve through time and effort, and an entity belief or a fixed mindset that intelligence is innate and fixed at birth. Growth and fixed mindsets are central in one's meaning system of beliefs, goals, and values that are coherent with each other, and lie at the heart of one's personality (Dweck, 2008). Mindset and the meaning system create a psychological framework that predicts individuals' various beliefs and motivations, and cognitive, affective, and behavioral outcomes (Dweck & Leggett, 1988). Teachers' growth mindset might be another "factor from within" that contribute to their intentions to enact autonomy support. Some empirical evidence has implicitly and explicitly suggested this link (e.g., Leroy et al., 2007). Moreover, growth mindset and autonomous orientation share functional similarities (Koestner & Zuckerman, 1994), which suggests growth mindset may similarly predict autonomy support as autonomous orientation does.

Mindset and autonomy support

Two lines of research have suggested associations between growth/fixed mindset and autonomy support/control. The first line of research follows the SDT framework and examines predictors of teachers' or parents' autonomy support. A small number of these studies examined mindset as a predictor. For example, in their path analysis with 336 teachers, Leroy and colleagues (2007) found that teachers believing academic ability can be improved through efforts reported a favor of autonomy supportive climate, while fixed mindset predicted a drop in teachers' support of autonomy. Kingma and colleagues' (2016) study reported some mixed findings. University lecturers' fixed mindset was significantly related to structures they provided in classrooms, while growth mindset was significantly related to autonomy practices. Moreover, some studies also suggested an indirect link between mindset and autonomy support. For example, Grolnick and colleagues in their experimental studies (Grolnick, Gurland, DeCourcey, & Jacob, 2002; Grolnick, Price, Beiswenger, & Sauck, 2007) found that mothers with high ego-involvement and contingent self-worth were more sensitive to social pressures and focused more on the outcomes rather than the task process, compared to the control group. They adopted more controlling practices and spent more time giving answers to children with a goal of completing the tasks. A fixed mindset is typically characterized by ego involvement and contingent self-worth (Dweck, 2000), hence individuals with a fixed mindset may tend to use control practices under external pressure.

The second line of research follows the mindset theoretical framework, and is concerned with the impact of mindsets on parenting, teaching, and organization management. The practices influenced by mindset can be characterized as autonomy support or control. For example, Muenks, Miele, Ramani, Stapleton, and Rowe (2015) studied 300 parents' global mindset (general beliefs about intelligence) and subject-specific mindset (beliefs about children's math and verbal abilities), and their interactions with children. The more parents believed abilities were fixed, the more they endorsed controlling and performance-oriented interaction behaviors and the less likely they endorsed autonomy-supportive and mastery-oriented behaviors. Trouilloud, Sarrazin, Bressoux, and Bois (2006) also commented that teachers with fixed mindset may tend to praise students considered gifted and create a competitive, controlling environment, while teachers with growth mindset may tend to create environments that foster autonomy and internalization. Moreover, Moorman and Pomerantz's (2010) experiments revealed that mothers induced to an entity mindset displayed helpless emotions and "unconstructive involvement" in their children's learning such as

performance oriented teaching and control. In addition, Chiu and Dweck (1994) found that college students with fixed mindsets more frequently recommended punishment for children's not obeying teachers' instructions, which indicates control. Those with growth mindset were more likely to try to understand children's reasons for doing the job and providing encouragement and motivational rationales, which indicates autonomy support (cited in Dweck, Chiu, & Hong, 1995).

In summary, research both following the SDT and the mindset theoretical frameworks has suggested a potential link between mindset and autonomy support. However, the link remains largely implicit, with limited fragmented evidence and mixed findings. More empirical evidence is needed to understand the relation between mindset and autonomy support.

Growth mindset and autonomous orientation

Another reason to draw from the mindset theory to examine autonomy support is the similarities between growth mindset and autonomous orientation. According to SDT and the mindset theory, both mindsets and causality orientations represent a part of one's personality or disposition. Individuals have a dominant type of either a growth mindset or a fixed mindset (Dweck, 2015) as well as either an autonomous orientation or a more controlled or impersonal orientation (Ryan & Deci, 2018). Perhaps the most salient similarities between mindsets and causality orientations lie in their various resembling outcomes, which suggest their functional similarities.

In fact, Koestner and Zuckerman (1994) suggested that causality orientations function in much the same way with Dweck's patterns of mindsets and achievement behaviors. They found that first, students with high autonomous orientation tended to adopt learning goals, were more confident in their academic abilities, and demonstrated similar levels of persistence and motivation after failures and successes. Second, students with high controlled orientation tended to adopt performance goals, experience hostile feelings, and persist in a rigid ego-involved way when receiving failure feedback. Third, students with impersonal orientation demonstrated low confidence in their ability, helplessness and lowered persistence and performance after failures. The authors argued that these outcomes of causality orientations align with the motivation patterns growth and fixed mindset create. Similar to the outcomes of autonomous orientation, growth mindset also contributes to a learning goal and persistence after failures. Similar to the outcomes of controlled and/or impersonal orientations, fixed mindset also leads to performance goal, ego

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involvement, and a tendency of giving up when facing setbacks (Dweck & Leggett, 1988). Koestner and Zuckerman's findings indicate that autonomous orientation and growth mindset might be parallel, and controlled and impersonal orientations and fixed mindset might be parallel, with regard to the similar outcomes they share.

A large body of literature also suggests common outcomes of growth mindset and autonomous orientation, including intrinsic or in general autonomous or self-determined motivation (Aronson, Fried, & Good, 2002; Dweck, 2014; Ryan & Deci, 2018), positive emotional functioning and well-being (Baard, Deci, and Ryan, 2004; Deci & Ryan, 1985b; Diener & Dweck, 1980; Dweck & Molden, 2008), adaptive self-regulation, greater persistence, higher quality of behavior, and better performance, especially in difficult or complex situations (Berzonsky, 2004; Blackwell et al., 2007; William & Deci, 1996; Yeager & Dweck, 2012). For example, similar to autonomous orientation, growth mindset is also associated with endorsement of self-determination. Dweck and Molden (2008) suggested that people with a growth mindset tend to believe they can control their thoughts, feelings, and motivations to achieve desired outcomes. This belief about controllability enhances perceived free will, defined as the perception of choice, agency, or self-determination.

Despite these similarities, growth mindset and autonomous orientation are both their own unique constructs. Causality orientations is essentially about intrapersonal support for autonomy and the notion of self-determination, and has origins in the locus of causality concept. Mindsets is mostly concerned with beliefs about competence and the notion of controllability, and has origins in the locus of control concept. Locus of causality (de Charms, 1968; Heider, 1958) concerns whether one sees oneself as the initiator for behavior and outcomes (i.e., an internal locus of causality), or as controlled by external regulations and contingencies (i.e., an external or impersonal locus of causality). Autonomous orientation and controlled orientation represent an internal and an external perceived locus of causality respectively (Ryan & Deci, 2018). Locus of control (Rotter, 1966), concerns whether one believes he/she does or does not have control over desired outcomes through engaging in requested behaviors. Dweck and Leggett (1988) talked about locus of control as contingent on perceived individual attributes (e.g., perceived current ability). One's beliefs about individual attributes as controllable or uncontrollable are represented by a growth mindset and a fixed mindset respectively. They specifically connected mindset to the

controllability dimension of attribution theory (Weiner, 1974). Although both locus of causality and locus of control originate from attribution theory (de Charms, 1968; Heider, 1958; Weiner, 1974, 1979), Weiner (1979) contended that the locus of causality and the controllability dimensions of attribution are distinct. For example, whether teachers' motivation is autonomous or controlled (i.e., internal or external locus of causality), a growth mindset allows them to believe causes for success and failures such as ability and motivation are controllable, and desired outcomes are achievable. Therefore, in a controlling environment, growth mindset may allow teachers to experience less pressure. Hence, growth mindset is conceptually different from autonomous orientation, and may have an additional role in predicting autonomy support beyond autonomous orientation.

Mindset, intrinsic motivation for teaching, and beliefs about autonomy support

The functional similarities between mindsets and causality orientations suggest that theoretically, growth mindset may be positively associated with intrinsic motivation for teaching and beliefs about autonomy support, in a similar way as autonomous orientation is. The relation between mindset and intrinsic motivation is well documented in the mindset literature (Dweck, 2000, 2002, 2014). For example, Aronson and colleagues (2014) found that African American students induced to adopt a growth mindset enjoyed the academic processes more than those induced to a fixed mindset. Dweck (2002) commented that children's entity beliefs were related to decreased intrinsic motivation for school. Growth mindset was also found vitally important for new teachers to maintain motivations for teaching and to tackle the difficulties they encounter in the beginning of their career (Dweck, 2014). Teachers with a growth mindset are likely to be intrinsically motivated at work, which may reduce the contextual pressures that pull out controlling teaching.

Furthermore, although growth mindset and beliefs about autonomy support have not been studied together, beliefs about autonomy support appears coherent with the beliefs and values in the growth mindset meaning system (Dweck, 2000). Teachers with a growth mindset are likely to believe in the merit of providing process-focused feedback such as providing motivational rationales, understanding students' problems and offering strategies, which are characteristics of

autonomy supportive practices. More empirical evidence is needed and these relations will be specifically examined in the current study.

The added value of studying mindset

The study draws from mindset theory alongside SDT to understand autonomy support. SDT has specified that predictors of autonomy support include autonomous orientation, beliefs about autonomy support, and intrinsic motivation for teaching, examining growth mindset together with these predictors has added value. First, it helps test the functional similarities between growth mindset and autonomous orientation. Despite their various similarities, mindset and autonomous orientation have been scantly studied together. Empirical data directly linking growth mindset and autonomous orientation are sparse. Second, it helps empirically explicate the relation between mindset and autonomy support practices that literature suggested but scantly tested. Research has suggested a positive association, but our knowledge is vague and limited.

Third and most importantly, it may help advance our understanding of the mechanisms or sources underlying autonomy support beyond what SDT explains. As reviewed earlier, SDT per se has provided a relatively comprehensive explanation for this issue. Reasons for autonomy support or control can be summarized as "factor from above," "factor from below," and "factor from within" (Haerens et al., 2016; Hornstra et al., 2015; Reeve, 2009). Mindset adds to the examination of the "factor from within" sources different from the existing ones and complement SDT's explanations. SDT places central importance on autonomy while the mindset theory places central importance on competence but from a different angle. A teacher with autonomous orientation experience high autonomy and low control intrapersonally, they experience less "pressure from within." Similarly, the malleable view of competence (e.g., intelligence, ability, talent) and the confidence to control desired outcomes of a growth mindseted teacher also help reduce "pressure from within," especially when they encounter "pressure from below" and "pressure from above." This combined perspective corresponds to the recent trend in educational psychology research of integrating different motivation theories to study motivation and learning, which enriches understanding and better guides practices (Linnenbrink-Garcia & Patall, 2016).

Present study

Taken together, from a combined perspective of SDT and the mindset theory, the purpose of the present study is twofold. First, investigate the interrelationships among preservice teachers' intentions to enact autonomy support and the personal beliefs and motivations predicting such intentions, including autonomous orientation, growth mindset, intrinsic motivation for teaching, and positive beliefs about autonomy support. Second, test if growth mindset and autonomous orientation function in similar ways in predicting intentions to enact autonomy support. This investigation helps advance our understanding of what predicts autonomy support in addition to current SDT explanations, and has practical implications to help preservice teachers cultivate positive beliefs and motivations that contribute to autonomy supportive teaching in their future classes.

Conceptualizations of study constructs

The present study conceptualizes intentions to enact autonomy support as the intentions to engage in autonomy support behaviors/practices in general and on a daily basis when preservice teachers start real world classroom teaching. This is based on Reeve and colleagues' (2014) definition of autonomy support motivating style—the autonomy supportive practices and strategies teachers use in their classrooms in general, and on a daily basis. Intentions to enact autonomy support is operationalized as a proxy construct of preservice teachers' actual enactment of autonomy supportive behaviors in their future classrooms, as behavioral intentions represent an immediate antecedent to behaviors (Ajzen, 2002). For preservice teachers who have gained relatively rich experience from field teaching, such as those in their junior, senior, and post-baccalaureate years in our sample, their intentions to enact autonomy support mirror actual enactment of autonomy support more closely.

Based on the generality/specificity of beliefs and motivations, autonomous orientation and growth mindset are conceptualized as representing global, stable, core personal beliefs and motivations; intrinsic motivation for teaching and beliefs about autonomy support are conceptualized as representing more derivative, domain and context specific personal beliefs and motivations. Beliefs differ in various levels of specificity, they can be "implicit or explicit, primary or derivative (i.e., grounded in primary beliefs), and core or peripheral (i.e., more or less convicted)"

(Buehl & Beck, 2015, p.66). Beliefs are more or less stable, but also have some plasticity and a situated nature (Buehl & Beck, 2015). Similarly, Vallerand and Ratelle (2002) specified that motivation follows a hierarchical structure and follows three levels of generality/specificity. The most general, global level is related to one's general motivational orientations. A less general level is related to domain-specific motivation, such as intrinsic motivation in the teaching domain. The least general level is situation-specific motivation for a particular activity in a particular setting at a particular time. The general global level of beliefs and motivations usually determine the next more specific level of beliefs and motivations. Haerens and colleagues (2016) also specified that "factor from within" or personality functioning of teachers are more "distal variables" of autonomy support and control behaviors, while teachers' motivation for teaching and their beliefs about control/autonomy are more "proximal antecedents".

Hypotheses

Based on the SDT and mindset theoretical frameworks, a hypothesized model was created (Figure 1). The model showed that growth mindset and autonomous orientation (the stable general beliefs and motivations) would be positively significantly correlated. They would also function in similar ways in predicting intrinsic motivation for teaching, beliefs about autonomy support (the more specific beliefs and motivations), and intentions to enact autonomy support (the behavior-proxy outcome). Specifically, growth mindset and autonomous orientation (IVs) would both positively significantly predict intentions to enact autonomy support (DV) directly, and indirectly through intrinsic motivation for teaching and positive beliefs about autonomy support (mediators).
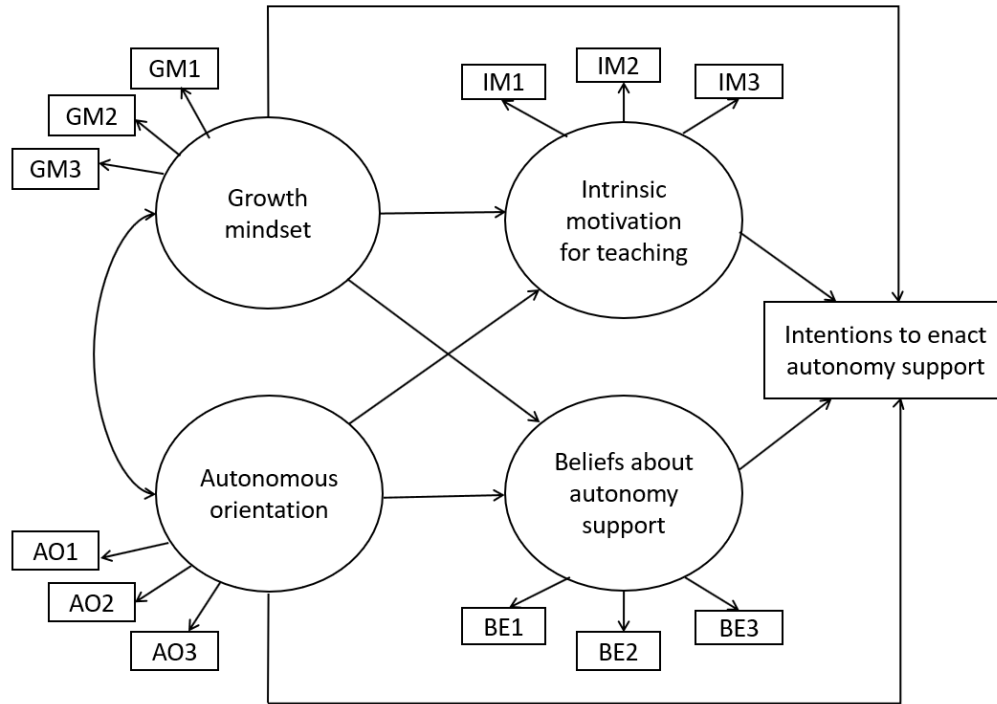
Figure 1. Hypothesized model of the interrelationships among growth mindset, autonomous orientation, intrinsic motivation for teaching, beliefs about autonomy support, and intentions to enact autonomy support. GM1, GM2, GM3 represent three indicators for growth mindset, AO1, AO2, AO3 represent three indicators for autonomous orientation, IM1, IM2, IM3 represent three indicators for intrinsic motivation for teaching, BE1, BE2, BE3 represent three indicators for beliefs about autonomy support; intentions to enact autonomy support is an observed construct.

Methods

Participants and context

The study participants were 237 preservice teachers enrolled in the teacher education programs from three public universities in Indiana. The main participating university offers various majors in the area of education. Students from six colleges enrolled in the teacher education program and top five enrolled majors included elementary education, agriculture education, special education, social studies education, and early childhood education and exceptional needs. A total of 907 undergraduate and 375 graduate students enrolled in the teacher education program in the 2017-2018 academic year, including 1069 White students and 1037 female students. Course work and practicum are both important elements of the teacher education program. Required coursework includes foundation courses (e.g., Exploring Teaching as a Career, Multiculturalism and Education, Learning and Motivation, Classroom Assessment), methods courses (e.g., Literacy in the Primary Classroom, Use of Assessment Techniques in Special Education), and subject matter courses. The

foundational educational psychology class is one of the foundation courses. The class addresses autonomy supportive and controlling teaching, and SDT was one of the main motivation theories addressed in the semester participants were recruited from this class. Students gain clinical experiences as early as from their first year through field teaching or practicum involving observing the class, helping the teacher, and sometimes teaching a lesson. Student teaching starts in junior year in the local area. There are also opportunities to teach in other parts of the state, the country or the world. Students earn a bachelor's degree and gain a teacher licensure of Indiana state upon completing all requirements.

Ninety-four percent of the participants ($n = 223$) were from the main participating university, including students enrolled in a foundational educational psychology class from this university in the fall 2018 semester ($n = 100$) who were recruited to participate. Most participants recruited from this class were enrolled in the teacher education program, eight were not enrolled and their data were removed, 24 planned to enroll and their data were kept.

The sample included predominantly female White undergraduate students, which was representative of the student demographics of the participating teacher education programs. The participant age ranged from 18 to 43. Most participants were 18 (23.5%), 19 (24.8%), 20 (19.6%), and 21 (14.3%), and the average age was 19.45. Majority were female ($n = 202$; male: $n = 35$). Reported academic levels showed 67 participants were freshmen, 71 were sophomores, 41 were juniors, 35 were seniors, and 21 were post baccalaureate and graduate students. Of the 129 participants who reported race, 107 were White or Caucasian (not Hispanic), 5 were Black or African-American, 7 were Hispanic, 4 were Asian or Pacific Islanders, and 6 were other races. Majors included elementary education ($n = 89$), elementary and special education dual licensure ($n = 20$), agriculture education ($n = 28$), social studies education ($n = 21$), English education ($n = 13$), learning design and technology ($n = 12$), mathematics education ($n = 11$), biology education ($n = 9$), arts education ($n = 7$), engineering technology teacher education ($n = 6$), general education or educational studies ($n = 6$), family and consumer science education ($n = 5$), early childhood and exceptional needs ($n = 5$), and other/unclear ($n = 5$).

Procedures

Data collection took place from fall 2018 to summer 2019. Preservice teachers enrolled in the foundational educational psychology class from the main participating university were first recruited to take an electronic survey. Then a mass survey invitation was sent to preservice teachers enrolled in the teacher education programs in the three universities, excluding the students who had already participated. To reduce social desirability, the survey reminded participants that "There are no right or wrong answers." and that they were expected to "Indicate what is actually true for you instead of what you think should be true."

Measures

Growth mindset

Theory about Intelligence Scale (TIS; Dweck, 2000) was used to measure growth mindset. It included eight items on a 6-point Likert Scale (1 = strongly disagree, 6 = strongly agree). Scores of 3 and below indicate a fixed mindset, scores of 4 and above indicate a growth mindset (Dweck et al., 1995). Sample items included "No matter who you are, you can significantly change your intelligence level (growth)." and "You have a certain amount of intelligence, and you can't really do much to change it." Four negatively worded items were reverse coded so that higher scores represented stronger growth mindset. The scale had a good reliability of $\alpha = .925$.

For Structural Equation Modeling (SEM) analyses, the eight items were combined into parcels to create three indicators. The first indicator was the mean of items 1, 3, the second indicator was the mean of items 4, 7, and the third indicator was the mean of items 2, 5, 6, 8. Each indicator contained one to two reverse coded items.

Autonomous orientation

The Index of Autonomous Functioning (IAF; Weinstein, Przybylski, & Ryan, 2012) was used to measure autonomous orientation which the scale developers referred to as "autonomous functioning" or "autonomy orientations/dispositions." Three subscales with 15 items constituted the scale: (a) Self-Congruence (i.e., seeing oneself as the author of behavior, actions are volitional; e.g., "My decisions represent my most important values and feelings"), with a reliability of $\alpha = .710$;

(b) Interest-Taking (i.e. spontaneous open reflection of oneself and one's experiences; e.g., "I am interested in why I act the way I do"), with $\alpha = .802$; (c) Susceptibility to Control (i.e. the tendency to be motivated by external and internal pressures, indicating absence of autonomous orientation; e.g., "I do things in order to avoid feeling badly about myself"), with $\alpha = .659$. Items from the Susceptibility to Control subscale were reverse coded. Items were answered on a 7 point scale (1 = strongly disagree, 7 = strongly agree). The scale had a relatively low reliability for our sample with $\alpha = .695$, as items from the Susceptibility to Control subscale before reverse coding were positively correlated with items from the Self-Congruence and Interest-Taking subscales. Similar problems were also reported in other studies (e.g., Yu, Zhang, Nunes, & Levesque-Bristol, 2018), suggesting different samples may have different profiles of autonomous orientation. Nonetheless, Weinstein et al. (2012) recommended using all three subscales, and we decided to keep the Susceptibility to Control items in order to well represent the autonomous orientation construct.

For SEM analyses, the 15 items were combined into parcels to create three indicators. Each indicator combined items from each subscale of Self-Congruence, Interest-Taking and Susceptibility to Control. This way of creating indicators was also applied for other motivation scales. For example, the Self-Determination Index (SDI) includes six types of motivation specified in SDT, and indicators for the latent construct self-determined motivation are created with combining items from each type of motivation (Levesque-Bristol, Knapp, & Fisher, 2010). Specifically, the first indicator was the mean of items 3 from each subscale, the second indicator was the mean of items 1 and 2 from each subscale, and the third indicator was the mean of items 4 and 5 from each subscale.

Intrinsic motivation for teaching

The subscale Interest/Enjoyment from the Intrinsic Motivation Inventory (IMI; Deci, Eghrari, Patrick, & Leone, 1994) was adapted to measure intrinsic motivation for teaching. This scale measures interest/enjoyment while performing a given activity, and was modified to the teaching activity/profession. Two sample items were "I think teaching is very enjoyable." and "I think teaching is a boring activity." Two negatively worded items were reverse coded. The scale had seven items placed on a 7-point scale (1 = strongly disagree, 7 = strongly agree), and a good reliability of $\alpha = .895$.

For SEM analyses, the seven items were combined into parcels to create three indicators. The first indicator was the mean of items 1, 3, the second indicator was the mean of items 2, 4, 5, and the third indicator was the mean of items 6, 7. The first two indicators contained one reverse coded item respectively.

Beliefs about autonomy support/control

The scale Beliefs about Motivating Style in Reeve and colleagues' (2014) study was adapted to measure beliefs about autonomy support and control. This measure includes one scenario of autonomy supportive teaching approach and one scenario of controlling teaching approach, and follow-up questions measuring beliefs about autonomy support and beliefs about control respectively. Reeve and colleagues (2014) measured "pure" beliefs about autonomy support, as well as "net" beliefs about autonomy support in their study. The "pure" beliefs about autonomy support used items following the autonomy supportive teaching scenario, while the "net" beliefs about autonomy support also used items following the controlling teaching scenario by subtracting beliefs about control from "pure" beliefs about autonomy support. Following their practice and to take control besides autonomy into consideration, we also tested both "pure" and "net" beliefs about autonomy support separately.

The scenarios of autonomy supportive and controlling teaching feature commonly encountered daily teaching tasks—planning and preparing a lesson, starting the class, motivating students, keeping students on task, providing help when students encounter difficulties, dealing with complaints, and teachers' communication styles. Each scenario is followed by three sets of questions asking if the presented teaching approach is effective (two items, hereinafter refers to as effective items), easy to implement (two items, hereinafter refers to as easy items), and how normative the approach is in the school the teacher is teaching (two items). Our survey included the four effective and easy items for autonomy support/control beliefs that applied most to our sample. Two example items are "If you taught in this way, how much would your students benefit in terms of learning and achievement? (effective item)" and "Can most teachers teach this way, or is this approach to teaching simply asking too much of teachers? (easy item)". Items were placed on a 7-point scale (1 = extremely ineffective/difficult, 7 = extremely effective/easy).

The final measure of "pure" beliefs about autonomy support used for analysis included three items, after removing one easy item that had a small factor loading. With only three items, the reliability of the measure ($\alpha = .670$) was acceptable, given that cronbach alpha values depend on the number of items in the scale (Nunnally, 1978). Including all four items would reduce the reliability to $\alpha = .630$.

The "net" beliefs about autonomy support used all four items for "pure" beliefs about autonomy and all four items for beliefs about control. Theoretically, effective items and easy items for beliefs about control should be positively correlated (Reeve et al., 2014). However, they were negatively correlated for our sample who tended to believe control was ineffective but easy. Therefore, to avoid negative Psi values in SEM analysis, we created two indicators for "net" beliefs about autonomy by combining the effective and easy items for each indicator. Specifically, we computed the two indicators in the following way: first indicator = mean of [(autonomy effective item 1 - control effective item 1) + (autonomy easy item 1 - control easy item 1)]; second indicator = mean of [(autonomy effective item 2 - control effective item 2) + (autonomy easy item 2 - control easy item 2)].

Intentions to enact autonomy support/control

The scale Teachers' Motivating Style in Reeve and colleagues' (2014) same study was adapted to measure intentions to enact autonomy support and control. This measure also uses the two autonomy supportive and controlling teaching scenarios introduced above. Each scenario is followed by one question measuring teachers' daily autonomy supportive and controlling practices: "Does this approach to teaching describe what you do on a daily basis to motivate and engage your students?". Similar to "pure" and "net" beliefs about autonomy support, Reeve and colleagues (2014) also measured "pure" and "net" practices of autonomy support. Following this practice, we also tested both "pure" and "net" intentions to enact autonomy support separately.

To measure intentions rather than actual behaviors to enact autonomy support and control, we modified the questions to "Does this approach to teaching describe what you would do on a daily basis to motivate and engage your students?" The items were placed on a 1-7 point scale (1 = No, not at all; 7 = Yes, very much). The intentions to enact autonomy support measured with the autonomy supportive teaching scenario represented "pure" intentions to enact autonomy support.

We also constructed "net" intentions to enact autonomy support by subtracting intentions to enact control from "pure" intentions to enact autonomy support.

Data analysis

Data were cleaned before analyses, including checking data assumptions such as normality, and deleting multivariate outliers and cases with more than 50% missing data (Tabachnick & Fidel, 2007). Two-sample independent t-tests were performed first to verify if the participants recruited from the educational psychology class ($n = 100$) were significantly different from the other participants for the study variables ($n = 137$), particularly beliefs about autonomy support and intentions to enact autonomy support which might be influenced by taking the class. Participants recruited from the class were significantly lower in intrinsic motivation in teaching, mean was 5.97 (compared with participants not from this class whose mean was 6.19), $t_{(235)} = -2.69$, $p < .01$, which was not necessarily related to taking this class, supporting that these participants and the other participants could be treated as one sample. However, participants recruited from this class were also significantly lower in beliefs about control, mean was 4.06 (compared with participants not from this class whose mean was 4.32), $t_{(235)} = -2.30$, $p < .05$, hence when we tested the model with "net" beliefs about control, we still treated the participants as one sample but this model was more exploratory.

The hypothesized model was tested with Lisrel 8.80. through structural equation modeling which allows simultaneous testing of all variables and assessment of relationships between variables with the influence of all other variables controlled (Byrne, 1998). Descriptive statistics were checked, and correlations among all study variables were obtained. Each latent construct had three indicators to make the model more parsimonious. In addition, as intentions to enact autonomy support was measured by one item, it represented an observed construct in the model. We tested two separate sets of models, one original set of models with "pure" intentions to enact autonomy support and "pure" beliefs about autonomy support, including the hypothesized model and a modified model by adding a path from intrinsic motivation for teaching to beliefs about autonomy support based on preliminary analysis. Then we tested one alternative set of models with "net" intentions to enact autonomy support and "net" beliefs about autonomy support, parallel to the original model set including the hypothesized model and the modified model with and without

estimating the path between intrinsic motivation for teaching and beliefs about autonomy support respectively.

SEM models were evaluated based on fit indices above .95 for the CFI and IFI, and .90 for the GFI, and values for error indices less than .05 for excellent fit and less than .08 for acceptable fit based on the RMSEA (Tabachnick & Fidel, 2007). For each set of models, the test of differences was examined to determine if the modified model is significantly improved from the unmodified model. The functional similarities between growth mindset and autonomous orientation were evaluated by comparing the paths and effect sizes between each of the two constructs and the mediator and outcome variables in the model respectively. Similar paths with similar effect sizes to the outcome variable suggest functional similarities.

Results

Original structural equation models

The original model set used "pure" beliefs about and "pure" intentions to enact autonomy support. Table 1 presents correlations among all study variables. All variables were positively significantly correlated, except the correlation between growth mindset and intentions to enact autonomy support. The correlations generally had relatively moderate effect sizes. Beliefs about autonomy support had a relatively strong correlation with intentions to enact autonomy support. The correlation between growth mindset and autonomous orientation was positive, significant, but relatively weak.

Table 1. Correlations among study variables for the original models

	1	2	3	4	5
1. Growth mindset	1				
2. Autonomous orientation	.138*	1			
3. Intrinsic motivation for teaching	.282**	.402**	1		
4. "Pure" beliefs about autonomy support	.241**	.292**	.292**	1	
5. "Pure" intentions to enact autonomy support	.109	.301**	.204**	.614**	1

*$p < .05$. ** $p < .01$

The hypothesized model was first tested (Figure 2). The model fit was good, χ^2 (57) = 90.855, $p < .01$; IFI = .980; CFI = .980; GFI = .946; RMSEA = .050. All factor loadings were significant at $p < .001$ (see Table 2 for factor loadings). As hypothesized, the covariance between growth mindset and autonomous orientation was significant and positive ($\varphi = .161$, $p < .05$). Significant positive relationships were found between growth mindset and intrinsic motivation for teaching ($\gamma = .253$, $p < .001$) and between autonomous orientation and intrinsic motivation for teaching ($\gamma = .441$, $p < .001$), as well as between growth mindset and beliefs about autonomy support ($\gamma = .204$, $p < .01$) and between autonomous orientation and beliefs about autonomy support ($\gamma = .364$, $p < .001$), with moderate effect sizes. Beliefs about autonomy support was also significantly positively and strongly associated with intentions to enact autonomy support ($\beta = .682$, $p < .001$). In addition, the association between autonomous orientation and intentions to enact autonomy ($\gamma = .149$, $p < .05$) was significant. However, compared to simple correlation results, the association between growth mindset and intentions to enact autonomy ($\gamma = -.063$, $p > .05$) was still not significant, and the association between intrinsic motivation for teaching and intentions to enact autonomy support became not significant ($\beta = -.083$, $p > .05$).
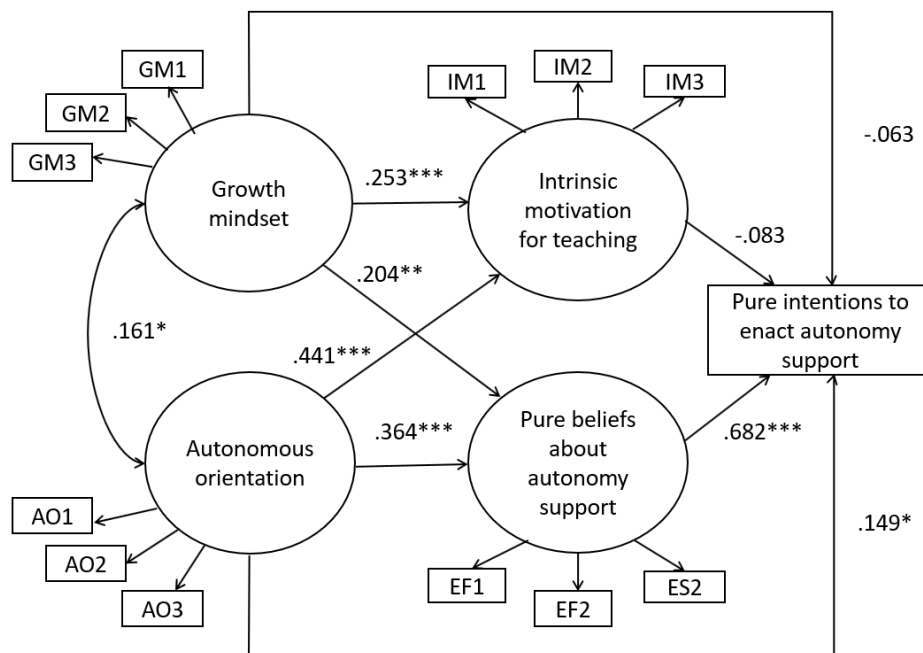
Figure 2. Original model with standardized regression coefficients.
GM = growth mindset; AO = autonomous orientation; IM = intrinsic motivation for teaching; EF = belief about the effectiveness of autonomy support; ES = belief about the ease-of-implementation of autonomy support;
* $p < .05$. ** $p < .01$. *** $p < .001$.

These preliminary results showed that the relation between intrinsic motivation for teaching and intentions to enact autonomy support was significant in simple correlation analysis, but became not significant in the SEM model, hence we assumed that this relation was fully mediated by beliefs about autonomy support. Therefore, we further tested a modified SEM model by adding a path from intrinsic motivation for teaching to beliefs about autonomy support (Figure 3). The model fit was excellent, χ^2 (56) = 84.071, $p < .01$; IFI = .983; CFI = .983; GFI = .951; RMSEA = .046. All factor loadings were significant at $p < .001$ (Table 2). The association between intrinsic motivation for teaching and beliefs about autonomy support was positive and significant ($\beta = .223$, $p < .01$). Compared to the first model, the associations between growth mindset and beliefs about autonomy support ($\gamma = .149$, $p < .05$) and between autonomous orientation and beliefs about autonomy support ($\gamma = .244$, $p < .01$) became weaker. The other associations among the constructs remained about the same with the first model. The modified model showed improved fit indices compared to the first model, but the test of the differences suggested this modified model was not significantly better (Δ df = 1, $\Delta \chi^2 = 6.784$, $p > .01$).
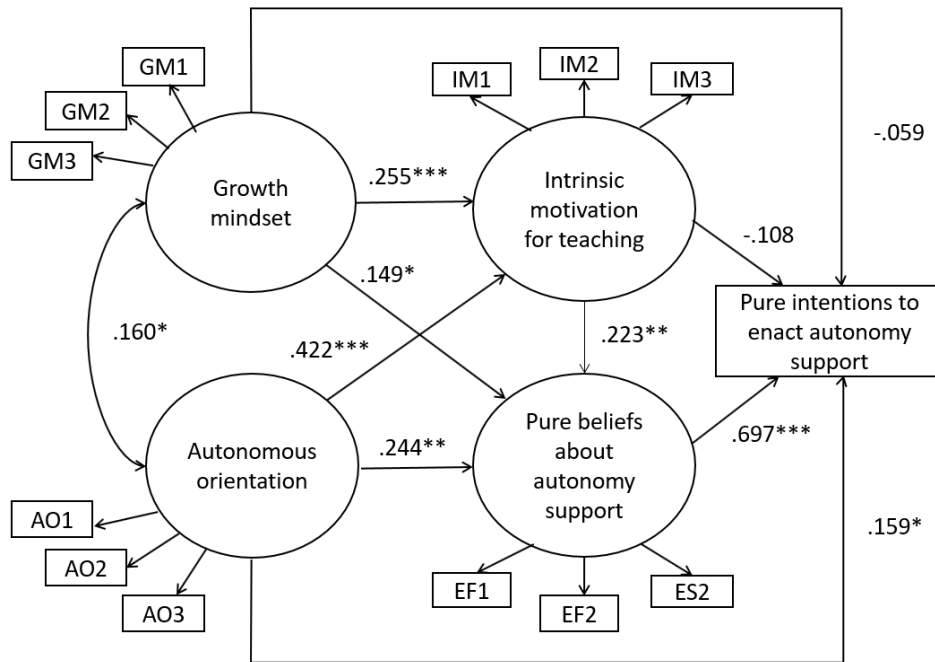
Figure 3. Modified original model with standardized regression coefficients.

$* p < .05. ** p < .01. *** p < .001.$

Table 2. Factor loadings for the original models

Construct	Indicator	Factor loading	
		Hypothesized model	Modified model
Growth mindset	GM1	.913***	.913***
	GM2	.913***	.912***
	GM3	.945***	.945***
Autonomous orientation	AO1	.761***	.765***
	AO2	.694***	.702***
	AO3	.705***	.704***
Intrinsic motivation for teaching	IM1	.833***	.832***
	IM2	.927***	.929***
	IM3	.727***	.725***
"Pure" beliefs about autonomy support	EF1	.827***	.832***
	EF2	.881***	.877***
	ES2	.361***	.360***
"Pure" intentions to enact autonomy support	NA	NA	NA

Note. *** $p < .001$

Alternative structural equation models

SEM analyses were performed to test the alternative model set with "net" beliefs about autonomy support and "net" intentions to enact autonomy support. Correlations among the constructs (Table 3) were similar to the correlations for the original models, except that growth mindset was significantly but weakly correlated with net intentions to enact autonomy. Parallel to the original models, the alternative model was first tested without estimating the path between intrinsic motivation and "net" beliefs about autonomy (Figure 4), and then estimating this path (Figure 5).

Table 3. Correlations among study variables for the alternative models

	1	2	3	4	5
Growth mindset	1				
Autonomous orientation	.138*	1			
Intrinsic motivation for teaching	.282**	.402**	1		
"Net" beliefs about autonomy support	.183**	.254**	.245**	1	
"Net" intentions to enact autonomy support	.136*	.264**	.269**	.640**	1

* $p < .05$. ** $p < .01$

The alternative model (Figure 4) had a good fit, $\chi^2 (46) = 84.408$, $p < .001$; IFI = .975; CFI = .975; GFI = .947; RMSEA = .061. All factor loadings were significant at $p < .001$ (see Table 4

for factor loadings). The paths among constructs had similar coefficient values and significance with the original model (Figure 2), except the following. First, the covariance between growth mindset and autonomous orientation was not significant but very close to significant (φ = .153 with critical value of 1.936 compared with 1.960, p > .05). Second, the association between autonomous orientation and "net" intentions to enact autonomy became not significant (γ = .030, p > .05) albeit their significant simple correlation.
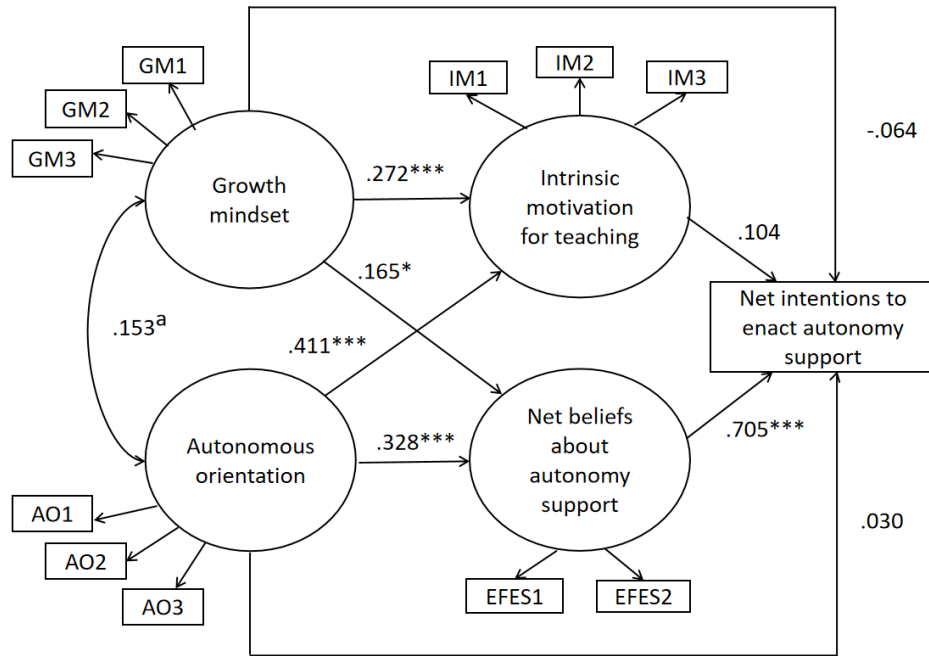
Figure 4. Alternative model with standardized regression coefficients.
[a] represents marginally significant.* p < .05. ** p < .01. *** p < .001.

When the alternative model was modified with the path between intrinsic motivation and net beliefs about autonomy support was estimated (Figure 5), the model had a good fit, χ^2 (45) = 82.605, p < .001; IFI = .976; CFI = .975; GFI = .948; RMSEA = .061. All factor loadings were significant at p < .001 (Table 4). Unexpectedly, the path between intrinsic motivation and beliefs about autonomy support was not significant (β = .123, p > .05) albeit the significant simple correlation between the two constructs. Moreover, the path between growth mindset and "net" beliefs about autonomy became not significant (β = .132, p > .05), albeit their significant simple correlation. Other paths and the model fit stayed similar to the alternative model in Figure 4. The

test of differences suggested this modified alternative model was not significantly better than the first alternative model (Δ df = 1, $\Delta \chi^2$ = 1.803, $p > .01$).
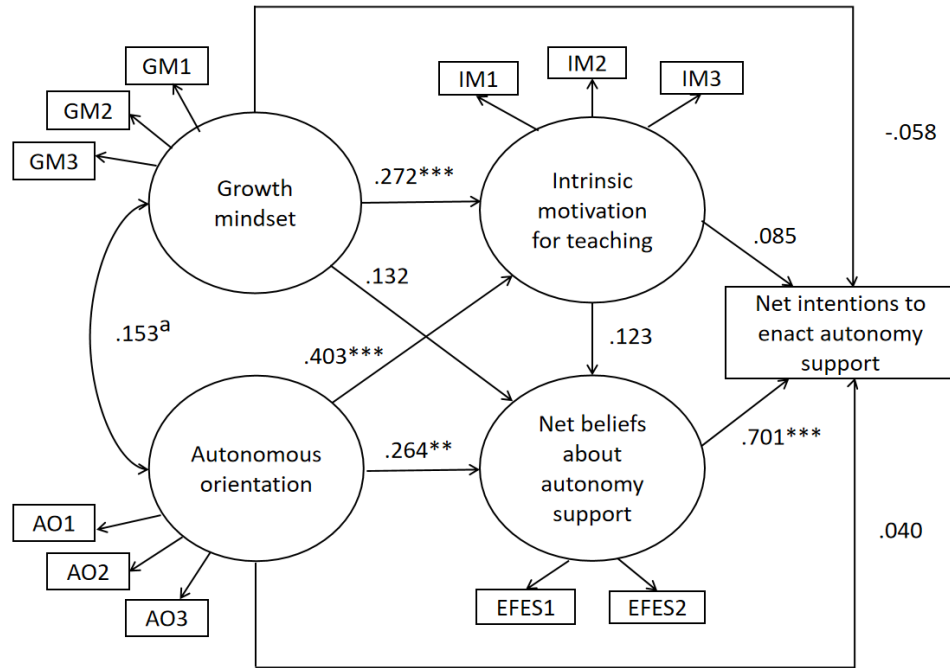
Figure 5. Modified alternative model with standardized regression coefficients.
[a] represents marginally significant. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4. Factor loadings for the alternative models

Construct	Indicator	Factor loading	
		Hypothesized model	Modified model
Growth mindset	GM1	.918***	.918***
	GM2	.916***	.916***
	GM3	.945***	.946***
Autonomous orientation	AO1	.773***	.773***
	AO2	.682***	.688***
	AO3	.686***	.686***
Intrinsic motivation for teaching	IM1	.830***	.830***
	IM2	.930***	.931***
	IM3	.713***	.712***
"Net" beliefs about autonomy support	EFES1	.716***	.714***
	EFES2	.865***	.867***
"Net" intentions to enact autonomy support	NA	NA	NA

Note. *** $p < .001$

Discussion

The present study examined preservice teachers' intentions to enact autonomy support and the beliefs and motivations contributing to such intentions from a combined perspective of SDT and mindset theory, and tested a hypothesized model displaying interrelationships among the constructs. Putting aside the modified alternative model (Figure 5) which has some nuanced abnormalities and divergent results, the results of the original and the alternative models (Figures 2, 3, 4) are convergent overall. The major findings supported hypotheses in general. Growth mindset and autonomous orientation are positively correlated, although the effect size is small; they predicted intentions to enact autonomy support through beliefs about autonomy support and intrinsic motivation for teaching for the current sample, while the variance explained for intentions to enact autonomy support came more strongly from autonomous orientation.

The original models

The original models partially support the proposition that growth mindset and autonomous orientation function in similar patterns (Koestner & Zuckerman, 1994), suggesting growth mindset and autonomous orientation are positively associated, and they create psychological frameworks that influence preservice teachers' beliefs, motivations, and intentions in similar and different ways. First, results supported the positive association between growth mindset and autonomous orientation, as the covariance between growth mindset and autonomous orientation was significant. However, the association is relatively weak as expected, as these two constructs are conceptually different. Second, both growth mindset and autonomous orientation significantly predicted intrinsic motivation for teaching and beliefs about autonomy support, and indirectly predicted intentions to enact autonomy support through beliefs about autonomy support. Intrinsic motivation for teaching also significantly predicted intentions to enact autonomy support through beliefs about autonomy support. However, the effect of growth mindset on intentions to enact autonomy support was only indirect, but the effect of autonomous orientation on intentions to enact autonomy support was both indirect and direct. Compared to autonomous orientation, the relations among mindset and intrinsic motivation and beliefs about autonomy also had smaller effect sizes. These results are reasonable as mindset is centered around the notion of competence, its association with autonomous motivation (intrinsic motivation for teaching), beliefs about autonomy and intentions

to enact autonomy could be weaker compared to autonomous orientation that centers around the notion of autonomy. Growth mindset and autonomous orientation could be two different but also coherent aspects of one's general personality (Dweck, 2000) or disposition orientations (Reeve, 2009) that altogether contribute to one's more domain/context/situation specific beliefs, motivations, intentions, and behaviors regarding autonomy support, with autonomous orientation having the most contribution.

These findings are consistent with previous SDT literature. The SDT framework focuses on the notion of autonomy, and proposes that volitional acts and behaviors lead to optimal outcomes. When individuals have an autonomous orientation or disposition that is general, stable, and core to one's ways of living, the individual is more likely to be intrinsically or autonomously motivated toward what they do, have a positive belief about supporting volitional acts, and enact the support of volitional acts (Ryan & Deci, 2018). Linking to the current findings, first, autonomous orientation aligns with one's autonomous motivation including intrinsic motivation (Ryan & Deci, 2018). Admittedly, preservice teachers may have intrinsic motivation for teaching even if they have a general controlled orientation, as they chose the teaching profession. The current study, however, provides further evidence that participants with an autonomous orientation also tended to be intrinsically motivated in teaching that came from an autonomous interested self rather than from others' expectations or external pressure. Second, the orientation towards autonomy also made it natural for participants to identify with providing autonomy support (i.e., positive beliefs about autonomy support) which in turn made them intend to actually provide autonomy support (i.e., intentions to enact autonomy support). Autonomously oriented teachers were also found more ready to assimilate knowledge of autonomy supportive teaching in other studies (Reeve, 1998), suggesting that cognitively they identified with autonomy support that is coherent with their prior conception or belief. Beliefs about autonomy support is a close precursor to autonomy supportive teaching in SDT studies (Reeve, 2009; Reeve et al., 2014), and the more general level autonomous motivational orientation might function over intentions to enact autonomy support practices through the more specific level beliefs about autonomy support. Autonomous orientation could be a more distal predictor of intentions to enact autonomy support compared to beliefs about autonomy support. In addition, the alignment between autonomous orientation and intentions to enact autonomy support, revealed by the significant association between the two constructs, was also congruent with SDT findings (Deci & Ryan, 1985b; Forstadt, 2007). When preservice

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teachers had a propensity to orient towards autonomy, they were more likely to create a social environment as autonomy supportive for their students.

The findings are also consistent with the mindset theoretical framework. Mindset theory focuses on the notion of a competent self, and whether competence and desired outcomes are controllable (Dweck & Leggett, 1988). When individuals believe they can achieve competence through time and effort, and current lack of knowledge and competence do not define the self as incapable and worthless, they are more likely to focus on the processes to achieve competence. They take actions to control what they do and how to do it, take time figuring out strategies and making efforts towards their goals, instead of seeking a quick and easy solution to solve their problem, giving up, or persisting in a rigid ego-involved way to achieve desired outcomes (Dweck, 2000). The focus on improvement also makes individuals look for potential in others, hence growth mindseted teachers were found more likely to give process-focused rather than trait-focused feedback, such as encouragement and support to the students and suggestions for concrete strategies (Dweck, 2002; Rattan, Good, & Dweck, 2012). Linking to the current investigation, first, the study results further support the positive association between growth mindset and intrinsic motivation for teaching, consistent with prior findings (e.g., Aronson et al., 2002; Dweck, 2002). When participants had a general growth mindset that orient towards seeking growth and improvement and focusing on processes, they are more likely to be intrinsically or autonomously motivated toward what they do rather than being motivated towards outcomes and external contingencies. When they encounter difficulties, they still believe they are competent or can achieve competence, and that beliefs about competence is an important part of intrinsic motivation (Dweck, 2000; Ryan & Deci, 2018). Participants might be inherently intrinsically motivated for teaching as they chose the teaching profession, as discussed above, regardless of whether they had a growth or a fixed mindset. Nonetheless, the intrinsic motivation of a fixed mindset teacher could easily shift to more controlled motivation when they encounter difficulties in teaching. Second, the finding also supported that growth mindset predicted beliefs about autonomy support, which literature has scantly discussed, but aligns with the mindset framework. Autonomy support is characterized by a process and growth focus, centering around making efforts to support student needs in the learning process, giving them time to self-regulate, use strategies and improve from deficiencies to achieve competence. It is in contrast to control which is often a quicker and easier way to solve problems and to achieve the desired outcomes of getting teachers' right answers,

especially when difficulties and various pressure arise in daily teaching. Hence, the growth mindseted participants who were oriented towards process and growth were also likely to identify with the process and growth focused autonomy support approach rather than the controlling approach. They were likely to have positive beliefs about autonomy support, coherent with their belief and meaning system (Dweck, 2000). The positive beliefs about autonomy support then promoted their intentions to enact autonomy support.

In the models, beliefs about autonomy support was the strongest predictor of intentions to enact autonomy support, and it mediated the relations between intentions to enact autonomy support and other study variables. Beliefs about autonomy support was the closest precursor to intentions to enact autonomy because first, these two constructs were measured from the sets of questions using the same autonomy supportive teaching scenario. Second, theoretically beliefs about autonomy support is closely aligned with autonomy support practices (Reeve et al., 2014), hence it could be a stronger predictor of intentions to enact autonomy support compared with intrinsic motivation and the more general level autonomous orientation and growth mindset. With this strong precursor in the model, the direct relations between intentions to enact autonomy support and the other predictors might become weaker and not significant.

Moreover, the effect of growth mindset and autonomous orientation on beliefs about autonomy support became weaker after adding intrinsic motivation as a predictor of beliefs about autonomy support. This emerging finding from the modified model suggests that besides the most general level growth mindset and autonomous orientation, the more domain specific intrinsic motivation for teaching also had its unique role in explaining preservice teachers' beliefs about autonomy support. Participants who were intrinsically motivated to teach should enjoy the teaching process and focus on the process rather than the end product. They should believe it is enjoyable and worthwhile to take the time and seek out best approaches to foster student inner motivational resources and help students learn and grow, which are characteristics of autonomy support. Given the alignment between autonomous orientation and beliefs about autonomy support, and the alignment between autonomous orientation and autonomous motivation as noted earlier, it is natural that intrinsic motivation as the most autonomous form of motivation should align with beliefs about autonomy support.

Some of the findings did not support hypotheses. First, growth mindset did not directly predict intentions to enact autonomy support, and only indirectly predicted it through intrinsic motivation for teaching and beliefs about autonomy support. Although some prior research suggested a direct association between mindset and autonomy support, some suggested the association was indirect and most research implied the association implicitly. For example, Leroy and colleagues (2007) found that entity theory directly predicted the autonomy supportive climate teachers created, but incremental theory indirectly predicted the climate through teaching efficacy. Kingma and colleagues (2016) also found mindset was significantly correlated with structure but not autonomy. Therefore, the current study gives further evidence that growth mindset as a general level antecedent might be a more distal and indirect predictor of autonomy support.

Meanwhile, intrinsic motivation for teaching did not directly predict intentions to enact autonomy support, and only indirectly predicted it through beliefs about autonomy support. While a direct association was not supported, the finding is consistent with some prior literature. Kingma and colleagues (2016) for example found that teachers' intrinsic motivation for teaching was positively but not significantly related to autonomy supportive teaching. The results suggest beliefs about autonomy support was the most immediate precursor to intentions to enact autonomy support and fully mediated the effect of intrinsic motivation for teaching on intentions to enact autonomy support, considering their significant simple correlation and the non-significant beta weight in the SEM model. Perhaps intrinsic motivation for teaching does not always lead to intentions to enact autonomy support. Intrinsic motivation for teaching may contribute to the beliefs that autonomy support was the better path, as our results suggest. Theoretically, intrinsic motivation may also reduce the pressure that could induce a controlling teaching approach and contribute to autonomy supportive teaching. However, motivations and beliefs are not always congruent with each other and translate into practices (Buehl & Beck, 2015). Even if teachers are intrinsically motivated, or in a broader sense autonomously motivated, if they believe control rather than autonomy support is the best teaching approach, they would then adopt the control approach (Reeve, 2009). Teachers might also have to resort to controlling teaching under pressure even if they enjoy the teaching process and have intrinsic motivation. Therefore, intrinsic motivation and intentions to enact autonomy support might not be directly associated.

Finally, factors not examined in the model could offer alternative explanations for the results. For example, many participants should have learned about autonomy support and growth mindset through their teacher education training, which may have contributed to their positive beliefs about and intentions to enact autonomy support, and growth mindset. The student-centered mode of mentoring of the main participating teacher education program could have created an autonomy supportive environment that fostered participants' autonomous orientation and intrinsic motivation. Teachers with richer teaching experience and knowledge (Leroy et al., 2007) and from certain majors or fields (Yu et al., 2018) may also tend to be more self-determined motivationally and more autonomy supportive. However, overall, the results further supported that autonomous orientation, growth mindset, and intrinsic motivation could contribute to positive beliefs about autonomy support, and positive beliefs about autonomy support in turn closely predicted participants' intentions to enact autonomy support.

The alternative models

The alternative models were more exploratory and the results should be interpreted with caution. Overall, the alternative model results were similar to the original model before adding the path between intrinsic motivation and beliefs about autonomy support. First, the covariance between growth mindset and autonomous orientation was very close to significant. Second, both growth mindset and autonomous orientation significantly functioned through similar paths, they directly predicted intrinsic motivation and "net" beliefs about autonomy, and indirectly predicted "net" intentions to enact autonomy through "net" beliefs about autonomy.

One difference is that autonomous orientation did not directly significantly predict "net" intentions to enact autonomy in the alternative model. This is probably due to the fact that intentions to enact control was also taken into account, which might also explain the less salient significance between growth mindset and autonomous orientation, as relationships among all variables are controlled and estimated altogether in SEM models. Participants overall may have dominant intentions to enact autonomy, but they may also have intentions to enact control at the same time, hence the "net" intentions to enact autonomy was not as strong as the "pure" intentions to enact autonomy, reducing the magnitude of its relations with the other study variables.

In the modified model, some results were unexpected. The association between intrinsic motivation for teaching and "net" beliefs about autonomy support was not significant, and adding the path between the two variables made the association between growth mindset and "net" beliefs about autonomy support not significant as well. There is not a clear reason for these few abnormalities. Again, with beliefs about control taken into consideration, the relations between intrinsic motivation for teaching and "net" beliefs about autonomy might become not significant in the model albeit their significant simple correlation. The relation between growth mindset and "net" beliefs about autonomy might also become weaker, especially when intrinsic motivation also seemed to mediate the relation between growth mindset and "net" beliefs about autonomy. Furthermore, these unexpected results could relate to measurement issues and how the model was constructed. "Net" beliefs about autonomy only had two indicators and incorporated one item about ease-of-implementation that had a small factor loading, which might introduce errors and reduce reliability.

Despite these nuanced differences, the original and alternative models in general had convergent results. Major findings generally supported the positive association between growth mindset and autonomous orientation albeit small effect size, and that they both indirectly predicted intentions to enact autonomy through intrinsic motivation for teaching and beliefs about autonomy support.

Implications

Theoretically, the study contributes to our understanding of the personal/individual level factors (as opposed to contextual level factors) that predict preservice teachers' intentions to enact autonomy support, and the hierarchical structure of the factors. These personal factors include not only the most studied autonomous orientation and beliefs about autonomy support, but also intrinsic motivation for teaching and growth mindset. Previous research has not tested these variables in a single model to understand autonomy support. Our model reveals that beliefs about autonomy support served as the most immediate precursor to intentions to enact autonomy support, while it was predicted by autonomous orientation, growth mindset, and intrinsic motivation whose effects on intentions to enact autonomy were more indirect and distal. Additionally, autonomous

orientation also had direct effect on intentions to enact autonomy support in the original model, hence it was an important predictor as well.

Moreover, the combined perspective of mindset theory and SDT corresponds to the recent call in educational psychology for multifaceted models of motivation (Farley et al., 2016; Linnenbrink-Garcia & Patall, 2016), which enriches the understanding of motivation phenomenon from complementary perspectives. This is important as educational outcomes may be "multiply determined" (Linnenbrink-Garcia & Patall, 2016, p.97). Despite its weaker relations with the other study constructs compared with autonomous orientation, growth mindset had its unique role in our models, it was a different source that can reduce "pressure from within" and indirectly explained intentions to enact autonomy support from a different angle. In SDT, although an individual oriented towards autonomy is typically also oriented towards satisfactions of competence, autonomy/a volitional self is central and functions as the primary factor influencing all needs, motivations, beliefs, and behaviors (Ryan & Deci, 2018). Mindset theory on the other hand, places competence at the center, and the belief a desired competent self is controllable is the ultimate source for all beliefs, goals, values, motivations, and behaviors. The belief about controllability of competence is what matters most rather than the perceived competence or satisfactions of needs for competence per se. Our results suggest perhaps both growth mindset and autonomous orientation as a core part of one's personality or disposition altogether predict one's belief, motivation, and behavior patterns in daily life, but with different emphases and can complement each other.

Practically, the model in the study can serve as a guide for areas of teacher education interventions to promote preservice teachers' autonomy support. Our results suggest teacher educators should not only teach theories and practices about autonomy support, but also attend to the personal beliefs and motivations contributing to it. Teacher educators should help preservice teachers examine their previous beliefs about autonomy support and cultivate positive beliefs about autonomy support, which is the strongest predictor of intentions to enact autonomy support. Not only evidence should be provided regarding how effective autonomy support is in students' motivation and achievement especially in long terms, but also specific strategies and methods should be taught and practiced to make preservice teachers believe implementing autonomy support is effective and can be easy. This positive belief is most important for controlled oriented

teachers or perhaps teachers with fixed mindset who may tend to have negative beliefs about autonomy support; they may resist to enact autonomy support if they believe it is unrealistic and unhelpful (Reeve, 2009). In addition, promoting preservice teachers' intrinsic motivation for teaching should also be a goal for teacher education, as intrinsic motivation for teaching contributes to teachers' positive beliefs about autonomy supportive and autonomy supportive teaching. Evidence suggests intrinsic motivation can be substantially fostered, and the teacher education learning environments should allow preservice teachers to experience autonomy, success, and acknowledgement (Reeve, 2009).

Long term intervention should also target cultivating preservice teachers' autonomous orientation and growth mindset. These core beliefs and motivations are the ultimate underlying mechanisms predicting teachers' beliefs about autonomy support and in turn autonomy supportive or practices in the long run, and could have stable influences across situations. As growth mindset and autonomous orientation might be difficult to foster and need sustained intervention, the teacher educators should maintain an environment that nurtures promote growth mindset and autonomous orientation in their daily teaching practices and daily interactions with preservice teachers. Teacher educators may want to develop a strong growth mindset themselves first, and understand that as people's personality is malleable (Dweck, 2000, 2008), so do the global and enduring mindset and autonomous orientation. Moreover, it could be helpful to teach theories about growth mindset and SDT early on in the teacher education program, and continue to reinforce and deepen preservice teachers' knowledge about and identification with growth mindset and autonomy support throughout the teacher education program. As discussed earlier, many preservice teachers in the current sample should have more or less learned about autonomy support and growth mindset (e.g., those recruited from the educational psychology class), which might have contributed to their positive beliefs and motivations regarding autonomy support, and which suggests explicitly learning the theories might be useful. This is consistent with suggestions from previous literature that teaching theories and practices about autonomy support is helpful, as interventions to have inexperienced preservice teachers learn autonomy support were proved successful (Reeve, 1998). Such teaching can enhance the awareness and mindfulness of the reasons and harmful results of controlling teaching and the benefits of autonomy supportive teaching for both students and teacher themselves (Brown & Ryan, 2003), as well as skills to teach in autonomy supportive manners (Reeve, 2009), which ultimately enhance preservice teachers' intentions to enact

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autonomy support. In addition, linking to practicum experiences, having preservice teachers reflect on how their beliefs and motivations act out in practices can raise awareness and mindfulness, which could facilitate the cultivation of more adaptive beliefs and motivations (Reeve, 2009). Meanwhile, helping preservice teachers enact autonomy supportive teaching through practicum is important, as practicing the skills and achieved competence to enact these skills could help them better internalize what they learned about autonomy support (Ryan & Deci, 2018).

Limitations and future research

One limitation of the study is that although participants' intentions to enact autonomy support is a proxy of their possible actual practices in the future, it is unclear how the intentions and the adaptive beliefs and motivations contributing to such intentions will be actually enacted in their future teaching, especially for the freshman and sophomores in the early stage of these preservice teachers' teacher training who accounts for a large proportion of the sample. Whether preservice teachers enact the adaptive beliefs and motivations they developed in teacher education programs in their teaching practices is controversial (Buehl & Beck, 2015), but it is another issue beyond the scope of our inquiry. At least developing these adaptive intentions, beliefs and motivations in teacher education programs is a good start and a reasonable realistic expectation of preservice teacher education (Loughran & Hamilton, 2016), and interventions at the in-service teachers level should continue to help teachers develop such positive beliefs, motivations and intentions. Future studies could use longitudinal method and track preservice teachers' development until they start practicing, and examine if intentions to enact autonomy support actually contribute to actual practices of autonomy support and the factors influencing the development.

Moreover, the study focused on growth mindset and autonomous orientation, not one's mindset and causality orientation as a whole, and also only beliefs about and intentions to enact autonomy but not control per se. It is unclear how the results could be generalized to preservice teachers with fixed mindset and controlled/impersonal orientations as well as to beliefs about and intentions to enact control practices. Future studies could examine mindset and causality orientation more comprehensively and provides a more holistic picture to the understanding of the "factor from within" influences on autonomy support and control. An additional set of future

analyses could also test the potential "additive effect" of mindset by comparing the model with paths from mindset to the mediators and outcome specified and the model without those paths specified, as well as comparing if the indirect effects of mindset and autonomous orientation are significantly different via bootstrapping. Longitudinal, observational, mixed methods studies with richer data sources could facilitate our understanding of how the study constructs interplay. In addition, person-centered approach examining preservice teachers' individual profiles of mindset and causality orientation is helpful for using integrative approaches to explain motivation and learning (Linnenbrink-Garcia & Patall, 2016), and can provide new insights into the problem.

In addition, the study sample came mostly from one Indiana university that has a top teacher education program in the country. Preservice teachers in this university engage in coursework that addresses autonomy support and gain relatively rich practicum experience before graduation. The generalizability of the results to other preservice teacher populations is uncertain. Future studies could use more representative samples to validate the results. Meanwhile, subgroups of the participants could be examined to understand the results more in depth, such as preservice in their early years and final years of the program, in different fields or subjects. They may show differentiated intentions to enact autonomy support, and studying the subgroups can help validate the current results as well as generate more detailed implications for teacher education targeting specific groups.

Finally, the scale measuring beliefs about autonomy support and the scale measuring autonomous orientation had a relatively low reliability. Reeve and colleagues' (2014) beliefs about autonomy support measure included three types of beliefs which were treated as separate beliefs in analyses. As we only kept the effectiveness and ease-of-implementation beliefs that were most relevant to our context, and as each belief type only included two items, we were unable to treat the effectiveness beliefs and ease-of-implementation beliefs as two different constructs in our model. Although treating the two types of beliefs as altogether representing a latent construct, beliefs about autonomy support, was supported in our analysis (each indicator had significant factor loadings), the overall scale reliability is relatively low. In the alternative model, we were also only able to create two indicators for the net beliefs about autonomy support. As beliefs about autonomy support is the most immediate and strong precursor to intentions to enact autonomy support, future studies might examine each type of belief more closely to understand preservice

teachers' intentions and practices to enact autonomy support. In addition, the scale measuring autonomous orientation did not have a very high reliability in our study. Few instruments measuring general causality orientation are available. Compared to the original measure *The General Causality Orientation Scales* (GCOS; Deci & Ryan, 1985b), the *Index of Autonomous Functioning* (Weinstein et al., 2012) that we used had better reliability and validity. Nonetheless, the Susceptibility to Control subscale had a relatively low reliability and unexpectedly had positive correlations with the Self-Congruence and Interest-Taking subscales, consistent with some prior studies that used this scale. This suggests measurement improvement is further needed. Future analyses may try testing the model with the Susceptibility to Control subscale removed from the measurement of autonomous orientation.

Conclusion

The study responds to teacher education researchers' proposition that examining preservice teachers' beliefs and motivations should be a central concern of teacher education (Levin, 2015), and the recent call in educational psychology for multifaceted models of motivation from complementary perspectives (Linnenbrink-Garcia & Patall, 2016). The combined perspective of SDT and mindset theory provides new insights into understanding preservice teachers' intentions to enact autonomy support. The study also has practical implications for cultivating the beliefs and motivations that can contribute to preservice teachers' autonomy support practices for their future students.

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STUDY 2. PRESERVICE TEACHERS' MINDSETS AND INTENTIONS TO ENACT AUTONOMY, STRUCTURE, AND INVOLVEMENT

Introduction

According to Self-Determination Theory (SDT: Deci, 1975; Ryan & Deci, 2018), effective teaching that benefit student motivation, learning, and development can be categorized as having the following three components: autonomy (autonomy supportive), structure (competence supportive), and involvement (relatedness/relational supportive). Teachers tend to either engage in autonomy as well as competence and relatedness supportive teaching practices, or controlling teaching practices. To prepare future teachers who engage in autonomy, structure and involvement supportive teaching, it is vital to study preservice teachers' intentions to enact autonomy, structure, involvement, and the sources contributing to such intentions. As preservice teachers are generally not practicing yet, studying their intentions to enact autonomy, structure, and involvement most closely mirror the actual enactment of these practices they are likely to engage in when they start inservice teaching (Ajzen, 2002).

However, various sources of external and internal pressure often pull out teachers' controlling teaching practices which is common in K-12 classrooms (Reeve, 2009). Teachers tend to be controlling, provide less autonomy and relatedness support, and enact structure in a controlling rather than autonomy supportive way (Grolnick et al., 2014; Reeve, 2009). The pressure can be particularly overwhelming for novice teachers who just enter the teaching field (Schmidt, Klusmann, Lüdtke, Möller, & Kunter, 2015), hence preservice teachers transitioning to real world teaching may often resort to controlling teaching (Leory, Bressoux, Sarrazin, & Trouilloud, 2007; Wolff, Van Den Bogert, Jarodzka, & Boshuizen, 2015).

SDT suggests that reasons for autonomy supportive and controlling teaching include (a) "factors from below," concerning student motivation, behavior, ability issues, (b) "factors from above," concerning national standards, school requirements, standardized testing, principal support, and (c) "factors from within," including autonomous/controlled orientation and beliefs about autonomy support/control, namely teachers' propensities to orient towards interests, growth, values, or towards external pressure and contingencies, and beliefs about whether autonomy supportive/controlling teaching is effective, easy, and a norm of their schools (Hornstra, Mansfield,

van der Veen, Peetsma, & Volman, 2015; Reeve, 2009; Reeve et al., 2014). It is important to help teachers work with their "factor from within," especially when "factor from below" and "factor from above" are less controllable. Helping preservice teachers work with "factors from within" and reduce internal pressure allows them to be better prepared for meeting the complex real-world teaching challenges, refraining from controlling teaching, and engaging in autonomy, structure, involvement practices.

Motivation theory integration has become a trend recently, which allows better explanations of education outcomes and motivation phenomena (Linnenbrink-Garcia & Patall, 2016). Besides the two "factors from within" that SDT specified (i.e., autonomous/controlled orientation and beliefs about autonomy support/control), drawing from Dweck's Self-Theories or the mindset theory (Dweck, 1986, 2000), another "factor from within" that explains autonomy supportive/controlling teaching might be growth and fixed mindsets (Koestner & Zuckerman, 1994; Leory et al., 2007; Moorman & Pomerantz, 2010; Muenks, Miele, Ramani, Stapleton, & Rowe, 2015). Growth and fixed mindsets refer to the beliefs that individuals' intelligence, ability, talent, or other attributes are malleable and incremental, or innate and fixed. Teachers with a fixed mindset tend to experience high internal pressure and ego-involvement, and prefer quick easy solutions when facing difficulties and external pressure. Teachers with a growth mindset, however, are more resilient, persistent, and focus on the learning process and strategies to solve problems when facing difficulties (Dweck, 2000).

The study aims to examine preservice teachers' intentions to enact autonomy, structure, and involvement, and if their mindsets as a "factor from within" could explain these intentions. The study compares the intentions to enact autonomy (v.s. control), structure (v.s. chaos), and involvement (v.s. low involvement) practices of preservice teachers with different mindsets. Although structure and involvement are constructs under the broader umbrella of autonomy (Ryan & Deci, 2018), in this work, structure and involvement were conceptualized separately from autonomy to highlight practices that specifically support basic psychological needs for competence, relatedness, and autonomy respectively. We also focus on intended practices under "pressure from below" (i.e., student motivation, behavior, ability problems), the most pervasive source of pressure in daily teaching that induces control (Hornstra, et al., 2015) and where the differentiated impact of mindsets is most likely to be unveiled.

Autonomy, structure, and involvement

SDT is a theory of human motivation and development widely applied in education research and practices. SDT particularly focuses on the social contextual influences on human motivation, and emphasizes the dialectic between the growth-oriented human organism and the social environments that support or thwart human growth through the basic psychological needs (BPN) of autonomy (behaving with a sense of volition), competence (mastering one's environment), and relatedness (feeling connected with others). SDT categorizes the social context in three dimensions centered around need-supportive teacher practices: autonomy versus control (i.e., autonomy supportive), structure versus chaos (i.e., competence supportive), and involvement versus low involvement (i.e., relatedness/relational supportive). SDT posits that when teachers are autonomy supportive, they are typically also supportive of the students' needs for competence and relatedness (Ryan & Deci, 2018). Hence, a more general way SDT categorizes the social contexts/environments includes two broad dimensions: autonomy supportive environment versus controlling environment. The autonomy supportive environment supports needs for autonomy, competence, and relatedness, while the controlling environment thwarts these basic psychological needs. In addition, the autonomy supportive environments are also those that provide structure and involvement. In other words, structure and involvement are specific categories of autonomy supportive practices.

One critical contribution of SDT is the emphasis on teachers' autonomy support. This finding is validated with robust evidence, and with students of all developmental levels and across cultures (Ryan & Deci, 2018). Autonomy support is characterized as welcoming students' perspectives and feelings, nurturing students' inner motivational resources, providing explanatory rationale, and engaging in informational noncontrolling communications (Reeve, 2009). Autonomy support practices greatly impact students' satisfaction of basic psychological needs, as well as autonomous motivation (i.e., intrinsic motivation and more fully internalized extrinsic motivation; Ryan & Deci, 2018). Autonomy support also contributes to student engagement, psychological wellness, positive emotions, development in self-worth, persistence, preference for optimal challenges, creativity, deeper thinking, improved learning strategies, and academic achievement (Benita, Roth, & Deci, 2014; Reeve, 2002, 2009; Vansteenkiste et al., 2010).

Noticeably, autonomy supportive teachers typically also engage in structure practices and involvement practices. Structure practices are characterized as facilitating student capacities to develop competence and mastery, which supports student basic psychological need for competence. Involvement practices are characterized as providing relational and emotional support to students, showing attention, caring, and concerns, which supports student basic psychological need for relatedness. When teachers are autonomy supportive, they understand the students' perspectives, therefore they understand student needs for competence and relatedness and when to attend to these needs (Ryan & Deci, 2018). Abundant evidence has revealed that the outcomes associated with assessments of autonomy support are very similar to the outcomes associated with assessments of autonomy, competence/structure, and relatedness/involvement altogether, as the three basic psychological needs are interdependent and facilitate each other in most cases (Ryan & Deci, 2018). Meanwhile, research has also revealed the unique importance of structure (Jang, Reeve, & Deci, 2010) and involvement (Grolnick & Ryan, 1989; Klassen, Perry, & Frenzel, 2011) because of the specific emphasis on needs for competence and relatedness, which are complementary to the support of autonomy needs afforded by autonomy support practices. For example, Jang and colleagues (2010) argued that autonomy support and structure complement each other, and students' engagement would be highest when teachers provided both autonomy and structure. Grolnick and Ryan (1989) also commented that all three dimensions including involvement are important and each plays a meaningful role in supporting basic psychological needs.

Most SDT research focuses on autonomy-control practices, as in general autonomy support is considered an overarching practice that encompasses structure and involvement. However, researchers have also engaged in explicitly assessing autonomy, structure, and involvement in studying teacher practices matching the autonomy, competence, and relatedness dimensions. For example, studies using the *Teacher as Social Context Questionnaire* (TASCQ; Wellborn, Connell, Skinner, & Pierson, 1988) and *The Physical Educators' Motivating Styles Scale* (PEMOS; Richards & Washburn, 2017) have assessed all three teacher practices. In this paper, we also assess all three practices. Namely, we assess preservice teachers' intentions to enact autonomy versus control, structure versus chaos, and involvement versus low involvement separately. Each dimension is placed on a continuum.

Examining "factors from within" to reduce control

Given the importance of autonomy, structure, and involvement, it is critical that teacher educators prepare preservice teachers to engage in autonomy, structure, and involvement practices in their future classrooms. However, various sources of pressure can easily pull out controlling teaching in real world classrooms (Reeve, 2009). The controlling as opposed to autonomy, competence, and relatedness supportive practices undermine student basic psychological needs, motivation, achievement, and well-being (Reeve, 2002; Ryan & Deci, 2018).

SDT researchers (e.g., Hornstra et al., 2015; Reeve, 2009) suggest that reasons for autonomy support (which typically indicates structure and involvement) and control include (a) "factors from below" (student motivation, behavior, ability issues), (b) "factors from above" (school requirements, principal support, national standards, etc.), and (c) "factors from within" (teachers' internal and intrapersonal influences, including beliefs about whether autonomy supportive or controlling teaching is optimal, and autonomous/controlled personality dispositions to organize behaviors by orienting towards interests, values, supports in the social context or towards social controls and external judgments/contingencies). Correspondingly, controlling teaching is often pulled out by "pressure from below," "pressure from above," and "pressure from within." The most pervasive source of pressure in the classroom that pulls out controlling teaching is "pressure from below," namely the pressure from student misbehavior, low motivation and engagement, bad attitudes, and ability problems.

It is particularly important to examine preservice teachers' "factors from within" and help them reduce "pressure from within" to reduce controlling teaching, as "pressure from below" and "pressure from above" can be overwhelming and unavoidable in daily teaching. The external pressure could exert more internal pressure on teachers especially for those who already experience "pressure from within" (Ryan & Deci, 2018). Reducing "pressure from within" helps teachers reduce the overall level of pressure, and is something they can manage and control when it is difficult to change the social environment and the external pressure. For example, autonomous orientation could buffer against the negative influence of the controlling environment and allows individuals to still experience autonomy and to provide autonomy support to others (Ryan & Deci, 2018). From the mindset theory's perspective, growth mindset could also reduce the social environment pressure and help reduce "pressure from within." Reducing "pressure from within"

does not only help reduce controlling teaching, but also mitigate teacher burnouts, emotional exhaustion, stress, anxiety, and dropouts of the teaching profession which are serious problems for beginning teachers (Bottiani, Duran, Pas, & Bradshaw, 2019; Fives, Hamman, Olivarez, 2007; Schmidt et al., 2015).

Mindset as a "factor from within"

In addition to SDT specified "factors from within," drawing from the mindset theory, growth/fixed mindset could be another factor for autonomy support and control. The mindset theory, self-theories, or implicit theories of intelligence (Dweck, 1986, 2000) is concerned with people's implicit beliefs about the malleability of intelligence and other individual attributes. The theory posits that people generally hold two types of beliefs about intelligence: A growth mindset or an incremental belief about intelligence (a belief that intelligence is malleable and can be developed over time), and a fixed mindset or an entity belief about intelligence (a belief that intelligence is fixed and cannot be changed). These beliefs are coherent with other beliefs and values in one's "meaning system" and are key to one's personality and sense of self (Dweck, 2000; Molden & Dweck, 2006). People who view intelligence as malleable also tend to view personality, talent and other individual attributes as malleable. People have one dominant type of mindset, but may also hold the opposite type of mindset in certain domains. The theory posits that mindset is the underlying mechanism and determining force for various goals, beliefs, values, motivations, and behaviors (Dweck & Leggett, 1988).

Mindset and internal pressure

Growth mindseted individuals attend to more process-oriented information in their social environment, attribute failures and success to something they can control and believe they can improve and achieve desired outcomes through time and effort, and tend to experience lower internal pressure, or "pressure from within" (Dweck, 2002). Fixed mindseted individuals, on the other hand, tend to experience higher internal pressure. This is because they often notice the negative, evaluative, trait-oriented, and outcome and ego centered information from their social environment, attribute failures and success to innate ability/intelligence, and believe desired outcomes are not controllable, which makes them vulnerable (Dweck, 2000). The differences

between growth and fixed mindsets are most salient when individuals face difficulties, setbacks, and failures (Dweck & Leggett, 1988). Growth mindseted individuals embrace challenges with confidence and persistence, but fixed mindseted individuals are discouraged and easily give up. For example, when there is "pressure from below" and "pressure from above" in their social environment, growth-mindseted individuals are more resistant, making low helpless attributions, focusing on efforts and positive strategies, but fixed-mindseted individuals tend to be more vulnerable, helpless, self-defeating, seeking an easy quick solution, or persisting in a rigid ego-involved way (Dweck, 2000).

Mindsets, autonomy, and control

Growth/fixed mindsets as "factors from within" may explain autonomy supportive and controlling practices. In fact, SDT researchers Koestner and Zuckerman (1994) argued that causality orientations function in much the same way with Dweck's patterns of mindsets and achievement behaviors. For example, similar with autonomous orientation, the low internal pressure of growth mindset may allow individuals to experience less external pressure that pull out control; similar with controlled or impersonal orientation, the high internal pressure of fixed mindset may orient individuals towards control or giving up (Ryan & Deci, 2018).

When growth mindseted teachers face student behavior, motivation, and ability problems, although the external pressure may still make them controlling, they are also likely to involve in a process-focused approach that autonomy support practices entail. This is because they experience less "pressure from within," feel less frustrated, and have higher self-efficacy which is key to lowering burnouts (Dweck, 2000; Fives et al., 2007). Also, growth mindseted teachers focus on the learning process to help students improve, giving process-focused feedback such as providing motivational rationales, understanding students' problems and offering specific strategies, encouragement and support (Rattan, Good, & Dweck, 2012), which are characteristics of autonomy support. In addition, as mindset represents a core, global, personality related belief, and is central in one's meaning systems of beliefs, goals, and values (Dweck, 2000), it is likely that growth mindset contributes to more positive beliefs about autonomy support, higher self-efficacy beliefs, learning goals, etc., which in turn promote autonomy support practices (Reeve et al., 2014; Ryan & Deci, 2018).

Fixed mindseted teachers, however, may experience higher "pressure from within" further worsened by the external pressure, like those with controlled and/or impersonal orientation, which increases chances of control (Ryan & Deci, 2018). They are also more likely to be controlling than growth mindseted teachers due to their tendency to seek easy quick solutions in face of difficulties and focus on performance and outcomes as opposed to the learning process (Dweck & Leggett, 1988). When there is external pressure, such as when students fail a task or misbehave, they are more likely to avoid these challenges, feel helpless, and seek easy and quick solutions. Control is often an easier and quicker solution to problems and to achieve teachers' desired outcomes. For example, demands and surveillance can shut down student low engagement and misbehavior, and immediate intervening and giving the right answers when students struggle makes students "achieve competence" quickly rather than continue to struggle. Meanwhile, when the external pressure and difficulties are too overwhelming, fixed mindseted teachers may also make no efforts to intervene since the desired outcome is perceived unattainable (Dweck, 2000). It is possible they give up on some students because they attribute the students' problems to unchangeable traits, and they believe the situation is out of their control. For example, they might give comfort feedback ("It's ok, not everyone is good at math.") rather than focusing on helping the students improve if they believe the students have limited fixed ability in a subject (Rattan et al., 2012). Overall, admittedly, when there is low pressure from their social environment, fixed mindseted teachers could be as autonomy supportive as growth mindseted teachers are. Nonetheless, when there is "pressure from below" or "pressure from above," fixed mindseted teachers are more likely to resort to control practices and strategies.

In addition, some empirical evidence also suggests positive association between growth/fixed mindset and autonomy support/control. A small number of recent studies have investigated antecedents to autonomy support, and have indicated that mindset might be an underlying mechanism that directly or indirectly predicts autonomy support and/or control (e.g., Hornstra et al., 2015; Grolnick, Gurland, DeCourcey, & Jacob, 2002; Grolnick, Price, Beiswenger, & Sauck, 2007; Leory et al., 2007). For instance, in their path analysis with 336 teachers, Leroy and colleagues (2007) found that teachers believing academic ability can be improved through efforts reported favoring autonomy supportive climate, while a fixed mindset predicted a drop in teachers' support of autonomy. From early on, another line of research investigating the impact of teachers' or parents' mindsets on their practices has also indicated a potential link between mindset

and autonomy support, such that the practices influenced by mindsets shared key characteristics with autonomy support or control (Dweck, Chiu, & Hong, 1995; Muenks et al., 2015; Trouilloud, Sarrazin, Bressoux, & Bois, 2006). For example, Dweck and colleagues (1995) found that adults' growth mindset was associated with trying to understand children's reasons for disruptive behaviors (i.e., autonomy supportive) rather than giving commands and punishments (i.e., controlling). Muenks and colleagues (2015) found that the more parents believed abilities were fixed, the more they endorsed controlling and performance-oriented behaviors and the less likely they endorsed autonomy-supportive and mastery-oriented behaviors in their interactions with children.

Mindsets, structure, and involvement

Extending to the structure and involvement dimensions, it is likely that teachers with a strong growth mindset tend to engage in autonomy as well as structure and involvement practices as opposed to control practices, given the high correlations among autonomy, structure, and involvement (Ryan & Deci, 2018). Growth mindseted teachers focus on the process of student learning and growth, which allows them to be student-centered and sensitive to what students need.

Mindset research has shown that growth-mindseted teachers and parents engage in structure practices by having a mastery goal for kids that focuses on improving and developing competence, by praising efforts and hard work, giving strategy feedback and constructive criticism, emphasizing mistakes are opportunities for learning, and encouraging and supporting students to embrace challenges (Dweck, 2000, 2006; Rattan et al., 2012). They also have little gender bias and stereotypes, treat students equally instead of giving up on students who mess up or do not care, give love and support no matter students succeed or fail, which supports students' needs for relatedness (Dweck, 2006). On the other hand, although teachers with a fixed mindset can also give good structure to the classroom and genuinely care about students, their performance goal, praising for intelligence, low tolerance for mistakes, criticism when students fail (Dweck, 2000, 2006) in general make them more controlling and harm students' needs for competence and relatedness. Their comfort feedback when students fail (Rattan et al., 2012) supports needs for relatedness, but at a greater cost of thwarting needs for competence. They may also give up and

do nothing in the face of difficulties rather than actively engage in structure and involvement practices to solve problems (Dweck, 2000).

The added value of studying mindsets

It is meaningful to examine the relation between preservice teachers' mindsets or personal beliefs about intelligence and autonomy, control, structure, and involvement practices. Attending to personal beliefs should be a central concern of teacher education (Levin, 2015); examining preservice teachers' mindsets helps preservice teachers develop growth mindset that benefits their future teaching.

Mindset adds to the examination of the "factors from within" different from the factors for autonomy support/control SDT has specified. SDT places basic psychological needs as the key to motivation, well-being, and achievement, and SDT places central importance on the autonomy dimension and autonomy support as essential in supporting all three needs. In SDT, personal autonomous orientation and beliefs about autonomy, as opposed to personal competence beliefs, are most important individual level factor influencing provision of autonomy support. Mindset aligns with the competence dimension of basic psychological needs in SDT. Both needs for competence or perceived competence in SDT and the implicit theories of intelligence in the mindset theory belong to educational psychologists' inquiries of what Usher (2016) termed "personal capability beliefs," while mindset foregrounds competence or capability beliefs but from a different angle. Mindset theory posits that it is not the perceived competence per se, it is growth mindset that enables individuals to have positive beliefs, goals, values, motivations, achievement, and well-being, namely the personal capability beliefs that desired outcomes are controllable no matter the current individual competence (e.g., intelligence, ability) are high or low. For example, even if teachers' needs for competence is thwarted in a controlling environment (e.g., "pressure from below"), a malleable view of competence (i.e., growth mindset) may still allow the teachers to experience the environment as less controlling and refrain from controlling practices. The mindset theory contends that the confidence of having smartness and competence is not enough, it is the confidence that they can achieve desired outcomes through efforts and strategies that yields optimal outcomes (Dweck, 2000). Drawing from the mindset theory adds to our understanding of teacher autonomy, structure, and involvement practices complementary to SDT's perspectives. A

fixed mindset might add "pressure from within," while a growth mindset might reduce the "pressure from within" to help teachers cope with the "pressure from below" and "pressure from above" in real world classrooms, and refrain from controlling teaching.

Present study

Taken together, it is important to investigate preservice teachers' intentions to enact autonomy, structure and involvement, and to examine preservice teachers' "factors from within" to help them reduce controlling teaching. The present study aims to investigate in depth preservice teachers' intentions to enact autonomy (v.s. control), structure (v.s. chaos), involvement (v.s. low involvement), and the dynamics between these intentions and preservice teachers' mindsets as a "factor from within." Specifically, we investigate these intentions in preservice teachers with growth, mixed, and fixed mindsets, especially when facing "pressure from below." We used a qualitative case study approach to understand what and how preservice teachers within and across mindset cases talk about their intentions to enact autonomy, structure, involvement. This approach allows a close examination of the nuanced perspectives of "an individual unit/multiple individual units" (i.e., a case/multiple cases) in a context through detailed data collections with multiple data sources (Denzin & Lincoln, 2018). For comparisons of the role of mindset, the sample preservice teachers who were classified into a growth-mindset group, a mixed-mindset group, and a fixed-mindset group formed the cases. It is expected that preservice teachers with a growth mindset may have highest intentions to enact autonomy, structure and involvement, and lowest intentions to enact control, while preservice teachers with a fixed mindset may have highest intentions to enact control, especially when facing "pressure from below."

The focus of the study is on the autonomy support and control practices that are central in SDT discussions. The study also extends to structure and involvement practices—conceptualized separately from autonomy as three dimensions of the overarching construct of autonomy support—to provide a holistic picture of the relation between mindset and teaching practices characterized in SDT. Intentions to enact autonomy, structure, involvement are operationalized as proxy constructs of preservice teachers' actual enactment of these practices in their future classrooms, as intentions represent an immediate antecedent to behaviors (Ajzen, 2002). Some preservice teachers in their junior, senior, and post-baccalaureate years may have gained relatively rich experience

from field teaching, hence their intentions to enact autonomy, structure, involvement would mirror their actual practices more closely.

The study includes a mixed-mindset group besides a growth- and a fixed-mindset groups. It has been a common practice to only examine growth mindset and fixed mindset and compare the differences. Although this practice clearly demonstrates the differentiated functions of growth and fixed mindsets, this dichotomy could reduce variance and present only a partial picture of the problem (Tan, Yough, Desmet, & Pereira, 2019). Dweck (2015) recently suggested that mindset follows a continuum, although we may have one dominant type of mindset, we all have mixed mindset to an extent that we may hold growth mindset in one situation and fixed mindset in another. Therefore, we also include preservice teachers with a mixed mindset who score in the middle besides those who score on the two ends of the growth mindset score range.

We investigate intentions to enact autonomy, structure, involvement focusing on the "pressure from below" situations specifically. "Pressure from below" is often a more direct and pervasive trigger in daily teaching that pulls out controlling teaching (Hornstra et al., 2015). Compared to general situations or low pressure situations, "pressure from below" is also when teachers with different mindsets tend to demonstrate different motivating practices. Moreover, compared to "pressure from above," preservice teachers may have more experience with "pressure from below" in their teaching experiences, as most of them should have not started systematically teaching in a formal school context. Based on Reeve's (2009) and Hornstra and colleagues' (2015) studies, we define "pressure from below" as when teachers face students' behavior (e.g., misbehavior), motivation/engagement (e.g., low engagement), and ability issues (e.g., lower ability, low achieving, at-risk). Specifically, we manipulate the focus on "pressure from below" by presenting three scenarios of students who had behavior, motivation, and/or ability problems to participants in semi-structured interviews.

Theoretically, this study helps advance our understanding of the mechanisms or sources underlying autonomy support beyond what SDT explains. Practically, this study addresses preservice teachers' mindset personal beliefs that potentially contribute to autonomy, competence, and relatedness supportive teaching, which has implications for teacher educators. By focusing on the "pressure from below" situations, the study has implications for helping preservice teachers refrain from controlling teaching in their future classrooms.

Methods

Methodological approach

This study follows a case study methodological approach. The drawing of boundaries for the individual unit of analysis determines what is the case and what is the context/environment to the case; the bounded systems are the cases (Cresswell, 2007). The cases in the current study are preservice teachers with different beliefs types: those who hold a growth mindset belief, those who hold a fixed mindset belief, and those who hold a mixed belief. The boundaries among those different types of beliefs constitute the boundaries for the cases. Each case is a group of preservice teachers sharing a belief of a particular type. Participants should also have similar viewpoints towards the issues under study within their case and different viewpoints across cases.

Participants and context

The participants were preservice teachers enrolled in the teacher education program from a large Midwestern university. The main data source was interviews from a total of 17 preservice teachers who were selected from a mass interview measuring their mindset. The interviewees included five males and 12 females. Their age ranged from 18 to 42, with an average age of 21.82. Thirteen of them self-identified as White, one as Black, one as Hispanic, one as Asian, and one as biracial. Six were freshman, three were sophomore, three were junior, three were senior, two were graduate students. Six majored in elementary education, three in social studies, two in engineering technology teacher education, two in English education, two in family and consumer science, one in agriculture education, one in math education. On a 5-point scale of teaching experience (1= no experience at all, 5 = a lot of experience), four participants self-rated 2, three self-rated 3, six self-rated 4, and four self-rated 5, with an average score of 3.59. Based on their mindset profiles, six were assigned to a growth-mindset group (two freshmen, one sophomore, two juniors, one senior; average self-reported teaching experience scored 3.33). Five were assigned to a mixed-mindset group (four freshmen, one sophomore; average self-reported teaching experience scored 3). Six were assigned to a fixed-mindset group (one sophomore, one junior, two seniors, two graduate students; average self-reported teaching experience scored 4.33). Some participants reported they have heard about autonomy support or learned about it in class, and some reported they knew nothing about the concept.

In addition, field journal data from preservice teachers who enrolled in a foundational educational psychology class ($N = 103$) were also collected as a complementary data source. The majority of the students taking the class enrolled or planned to enroll in the teacher education program, and were freshman and sophomores. Autonomy support was one key concept addressed in the class. The field journal was an assignment about applying the concepts of autonomy support to practicum experiences where students briefly discussed if they would adopt autonomy supportive or controlling practices, hence the field journal was collected to validate findings from interviews. The educational psychology class also took a survey measuring their mindset, and to be consistent with the interview participants' mindset profiles, 14 of the students were classified into a growth-mindset group, 70 were classified into a mixed-mindset group, and 19 were classified into a fixed-mindset group.

At the broader university contextual level, students from various majors enroll in the teacher education program, including early childhood education, elementary education, special education, and secondary education in various subjects such as social studies, agriculture, English, art, mathematics, biology. Students enrolled in the teacher education program were predominantly white, female, undergraduate students. Course work and practicum are both important elements of the program. Students may gain clinical experiences as early as from their first year through field teaching or practicum involving observing the class, helping the teacher, and sometimes teaching a lesson. Student teaching starts in junior year in the local area. There are also opportunities to teach in other parts of the state, the country or the world. Students earn a bachelor's degree and a teacher licensure of the state upon completing all requirements.

Instrumentation

Surveys

Survey measures were used to classify participants into the three mindset groups. The surveys included Dweck's (2000) *Theories of Intelligence Scale* (TIS) that is commonly used to identify participants' mindset. This 6-point scale had six items, such as "You have a certain amount of intelligence and you can't do much to change it," and "You can always substantially change how intelligent you are."

The surveys also included a complementary measure to validate the TIS scores used to select participants—four statements regarding teacher implicit beliefs about student intelligence to which participants were prompted to write short open-ended responses, briefing what they think about the statements. The four statements were from Shim, Cho, and Cassady's (2013) scale of *Teachers' Implicit Theories of Intelligence* that they adapted from Dweck's original scale. One sample statement was "There isn't much I can do to make my students smarter as their intelligence was fixed at birth." This measure provided additional information regarding participants' implicit beliefs about students' intelligence as opposed to the general implicit beliefs about intelligence measured by TIS. Participants were selected based on the TIS scores, the open-ended responses were used to make sure the mindset scores make sense.

Semi-structured interviews

A semi-structured interview protocol was developed to elicit preservice teacher's preferred motivational and management practices, with a subsection of the interview focusing participants on "pressure from below" situations (Appendix A for full interview protocol). Participants were encouraged to draw from their teaching experience throughout the interview to more closely match their intentions to reality. The protocol was piloted with four undergraduate and graduate students in the field of education but not in the current sample to ensure the questions work well and to enhance the validity of the protocol. One student used to enroll in the teacher education program.

Section one of the protocol generally prompts motivational and management practices participants did and want to continue to do, after participants introduced themselves and their teaching experiences. Two sample questions are "What strategies did you use and want to continue to use to motivate your students?" and "What strategies did you use and want to continue to use to manage your class?"

In the second section, questions were used to specifically and implicitly prompt for the autonomy and/or control practices participants used and want to continue to use for students with ability, motivation, and behavior issues that would create "pressure from below." Participants reflected on three scenarios of students with ability v.s. motivation-behavior variations: Tom/Tina with lower ability low motivation misbehavior (same scenario, names of Tom and Tina alternatively used to balance gender), Clyde with high ability, low motivation, and misbehavior,

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and Bonnie with lower ability, high motivation and good behavior. The ability-motivation-behavior variations allowed us to hold ability and engagement/motivation constant as the manipulating variables (engagement/motivation generically represented by motivation-behavior here). Gender of the students in the scenarios was balanced to reduce bias. The Tom/Tina scenario representing highest "pressure from below" and was therefore afforded more time to discuss in depth, but it was assumed that patterns of participants' responses would share commonality across the three scenarios. Participants reported how they perceived the students, what they would do with students in each scenario, reflected on their practicum and teaching experience to identify students similar to those in the scenarios, and reported what they did and want to continue to do with those students. A sample question was "Tom is often off-task, what would you do to help him stay on task?" In addition, follow-up questions implicitly prompted controlling practices and participants reported if they would adopt those practices. A sample question is "To motivate this student, would you offer little incentives and privileges?" Questions implicitly prompting control were designed based on Reeve and colleagues' (2014) autonomy support and controlling teaching scenarios. The scenarios featured commonly-encountered daily teaching tasks, namely, planning and preparing a lesson, starting the class, motivating students, keeping students on task, providing help when students encounter difficulties, dealing with complaints, and teachers' communication styles.

Section three asks about intentions to enact autonomy supportive and controlling teaching explicitly. Reeve and colleagues' (2014) autonomy and control teaching scenarios were presented to help participants understand the two teaching approaches. Participants reflected on whether they would adopt an autonomy or a control approach in general, and for students in the section two scenarios. Those who learned about autonomy support in class were also encouraged to draw from what they learned when answering the questions. Two sample questions are: "Based on your understanding of autonomy supportive and controlling teaching, do you think you would engage in autonomy supportive teaching at times and controlling teaching at other times?" and "Would you use this approach for Tom?"

Field journals

The field journals were a class assignment to help students reflect on knowledge of autonomy support that they learned in class. The prompt was modified to serve for the current study's purpose. The prompt reads: "Describe an example of teacher autonomy supportive communication or controlling teaching that you observed in your practicum. Describe the outcomes of the observed practice. Evaluate this practice, discuss pros and cons. Discuss how you would enact the practice, any modifications and what you would do differently. Please address each point."

The assignment required students to provide clear descriptions and examples, make their observations come alive, and make their readers see the educational psychology concept in action through their eyes. Discussions of pros and cons of the teaching approach they observed required them to be more objective and reflexive than to hold a simplistic view that autonomy support is always good and controlling is always bad. The last part regarding what they would do explicitly targeted their intentions to enact autonomy or control. Because only the last part of the field journals explicitly talked about intentions to enact autonomy or control, the field journals were used as a complementary data source.

Codebook and coding procedure

A codebook was developed for general categories and codes based on the SDT literature that described key characteristics of autonomy/control, structure, and involvement or provided sample codes (e.g., Jang et al., 2010; Reeve, 2009; Reeve et al., 2014; Rogat, Witham, & Chinn, 2014; Wellborn et al., 1988). The codebook included four major categories placing autonomy, structure, and involvement on a continuum, that is, autonomy versus control, structure versus chaos, and involvement versus low involvement. Because we focus particularly on autonomy and control, they were divided into two big categories. Each category included several codes and subcodes with definitions and examples from the literature and our data, new codes were added during data analysis. A new category "beliefs" was also added during data analysis because participants often talked about why they would do or would not adopt a practice, such as control is not effective, autonomy is loose, there are practical constraints making autonomy difficult (See Reeve et al.'s

[2014] beliefs about autonomy/control). The sample codebook with examples from data is presented in Appendix B.

Specifically, the autonomy category included the following codes. Organizational/procedural autonomy: Give students choice over class procedures, organizations, and task requirements (e.g., students are given opportunities for choosing group members, materials to use for projects). Rationale/relevance: Introduce lesson or task purpose and connect to values, goals, everyday experience; provide explanatory rationale for learning activities and for requested and required behaviors (e.g., "Doing this activity has been shown useful because…"). Inner motivation: Nurture inner motivational resources including attending to interests and curiosity, and providing optimal challenges (e.g., challenging activity, engaging questions). Content responsiveness: Take students' perspectives, acknowledge students' experiences and the importance of their agendas (e.g., carefully and fully attend to students' speech, restate students' points and use their own phrases prior to teacher elaboration, elicit clarification from students to ensure teacher understanding). Cognitive autonomy: Elicit and build on students' ideas, give students time to work out problems in their own ways, display patience and pace instruction to allow self-regulated learning (e.g., give opportunities to discuss multiple strategies and solutions to problems, and opportunities for self-direction, independent thinking and decision-making, encourage explanation, justification, evaluation).

The control category included the following codes. External motivation & contingencies: Rely on extrinsic sources of motivation, such as offer incentives, rewards, use competitions, consequences, punishment/discipline (e.g., stickers, competitions with pressure to win). Internal contingencies: Provide attention, affection, recognition, praise contingent upon if students act as directed or desired, including using peer pressure to get desired behaviors (e.g., smile and praise when students follow directions and produce right answers, especially if the students don't get smile and praise when not following directions). Demands, directives, surveillance: Pressure students to think, feel, or behave in specific ways, close surveillance of student compliance with what to do, command students to follow directions and obey assignments (e.g., assure authority through directives when students don't do what was told to do or misbehave). Controlling language: Rely on pressuring language, like "should," "must," "have to" (e.g., "You must do it now"). Imposed/strict schedules & plans: Strictly follow established schedules and plans, impose

established goals, control pace with little flexibility and emphasis on no time to waste (e.g., pace is strictly controlled, limited time emphasized). Negative feedback: Harsh verbal and non-verbal negative feedback with the intent of being critical, rather than towards learning (e.g., "Your idea is meaningless"). Blocking negative affect: Block student expressions of negative affect, assert power to overcome students' complaints (e.g., Think negative affect is unacceptable and should be changed/fixed). Low rationale/relevance: Neglect explanatory rationales and relevance of lessons and required tasks, comments diminish interest or devalue content (e.g., "This is boring content, but we have to learn it").

The structure category included the following codes. Instruction: Use different instructional strategies, approaches, methods, adjust teaching strategies to help students achieve competence (e.g., multiple modes of representations, adjust task difficulty levels for different students). Guidance & scaffold: Guide students through ongoing activities and provide a program of actions throughout, which include scaffolding, demonstrating, modeling when needed (e.g., Step by step guidelines, model/demonstrate behaviors). Feedback & recognition: Provide rich informational feedback to build skills, competence; encourage, recognize, and praise efforts and mastery (e.g., Couple informational feedback with a task focus and potential for improving, recognize contributions and student comments that advance class discussion). Encouragement of competence: Encourage students who are not confident and have self-doubt to be more confident, encourage and support competence motivation (e.g., "She needs to be more confident, I will tell her I believe in you, you can do this"). Clear expectations: Give clear, understandable, and consistent directions and expectations so that students know what are expected, what to do, limits, and consequences of behaviors (e.g., What to do is clear and well organized, clarity and consistency of rules). Monitor progress & understanding: Monitor if students are understanding the materials and making progress; check on students to make sure they are on the right track (e.g., Informal formative assessment of student understanding in class). Monitor/manage behaviors: Monitor if students are doing requested behaviors with a general (somewhat loose) purpose of ensuring learning and competence; ensure effective learning environment for all learners, classroom management that does not meet the bar of control (e.g., Make sure students stay on task, not misbehave in a non-controlling way). Chaos/permissiveness: Low structure, such as absence of clear directions, strong guidance, and constructive feedback and recognition, that students have trouble identifying

patterns of anticipated actions and developing competence (e.g., What to do is absent, confusing, little guidance, no action plans).

The involvement category included the following codes. Social emotional responsiveness: Positive relationship with students through attention, warmth, concerns, caring, trust, respect, empathy, understanding; responsive to student social emotional affect, attend to their negative affect, have one-on-one conversations with students understanding their problems and struggles (e.g., Responsive to frustration, boredom, confusion, joy, appreciation and enjoyment of students). Dependability: Be available to students when needed, make students understand they can depend on the teacher for problems and concerns (e.g., Make sure students can count on the teacher to be there for them). Time: Spend significant time, energy, or invest personal time to help students (e.g., Spend time getting to know students well). Resources: Invest resources to help students, provide extra resources (e.g., Out of school resources to help students with their needs). Caring climate: Encourage students to support each other socially through working together, helping each other, connecting with each other (e.g., Encourage students to help each other and applause for peers). Low involvement: Low responsiveness, dependability, absence of investing time, resources, and building a caring climate (e.g., Does not care about students' concerns, ignore their feelings and thoughts).

In addition, the codebook listed a coding procedure, including reading and getting familiar with the whole interview before coding, selecting the entire excerpts after a prompt as a coding unit, applying multiple codes to an excerpt with the format "category-code-line number," signaling examplars, suggesting revision to existing codes and additions of new codes when preexisting codes fail to work well, and providing a summary of each primary category with quality ratings and rationale.

Researcher as the instrument

The researcher is also an instrument for qualitative study. The researcher is like a quilt maker, he or she stitches, edits, and puts slices of reality together to an interpretive experience (Denzin & Lincoln, 2011). It is important that we stay objective, and we examined our preexisting biases and stayed reflective throughout the research process. To ensure trustworthiness, the first author who conducted the interviews was particularly careful not to attempt to "lead" participants during the

interview and to avoid having participants say what they think the researchers want to hear. A research journal was written through the entire process to maintain reflexivity. The research journal served as a mechanism to eliminate bias and to confirm the neutral stance of the researcher. To minimize biases, the interview protocol, the field journal prompt, and the codebook were also revised by all authors, and part of the data were coded by two authors.

Procedures

Surveys and mindset classifications

A total of 254 participants took the mindset survey. First, 108 students recruited from a foundational educational psychology class took a brief survey of mindset using Dweck's TIS scale (no missing data). The students' field journals were collected later. Meanwhile, a mass electronic survey was sent to all students enrolled in the teacher education program to select interview participants, excluding the students who enrolled in the foundational educational psychology class. The survey included both Dweck's TIS scale and the open-ended responses to the four statements of teacher beliefs about student intelligence to facilitate selection of interviewees. A total of 146 participants took the survey after deleting cases with more than 50% missing data (Tabachnick & Fidel, 2007).

All 254 participants were classified based on their survey scores into a growth-mindset group, a relatively mixed-mindset group (hereinafter refers to as mixed-mindset group), and a relatively fixed-mindset group (hereinafter refers to as fixed-mindset group). Dweck and colleagues' (1995) cut-off scores were used as a reference for the classification: On a 6-point Likert Scale, 1-3 points represent the lower end and a fixed mindset, 4-6 points represent the higher end and a growth mindset, and points above 3 and below 4 represent a mixed mindset. However, the sample ($N = 254$) predominantly reported more of a growth mindset with a mean score of 4.52 (the 108 field journal participants had a mean score of 4.46, SD = .761; the 146 participant sample poll for interviewee selection had a mean score of 4.55, SD = .917), which is consistent with literature findings that the teacher population may tend to have a growth mindset compared with the general population (Fang, 2017; Gutshall, 2014; Jones, Bryant, Snyder, & Malone, 2012). Therefore, participants in the interview sample poll ($N = 146$) were also classified based on quartile scores: Those scored above 5.25 (75%) represent those who had strongest growth mindset in the sample,

those scored below 3.94 (25%) represent those who had the weakest growth mindset and more of a fixed mindset in the sample, those who scored in between represent a middle group who had weakly growth mindset and relatively mixed mindset in the sample (a score of 4.62 represents 50%). The field journal participants ($N = 108$) were also classified into the three mindset groups using the same cut-off scores consistent with the interview. As a limitation of the study due to the sample's mindset score range, a proportion of students in the fixed-mindset group were not "truly" fixed mindseted but rather mixed mindseted, and a proportion of students in the mixed-mindset group were not "truly" mixed mindseted but rather growth mindseted.

Interviews

Combing the two criteria of cut-off scores, we selected 17 participants for interviews. We identified (a) a growth-mindset group including six participants that scored between 5.25 to 5.75 with an average score of 5.46, (b) a fixed-mindset group, including six participants that scored between 2 to 3.63 with an average score of 2.96 (five scored below 3 and slightly above 3, hence more representative of fixed mindset than the overall sample's fixed-mindset group), and (c) a mixed-mindset group, including five participants that scored between 3.94 to 4.88 with an average score of 4.50 and whose open ended responses more or less indicated mixed mindset. The growth-mindset group represented those who had a strong growth mindset, the fixed-mindset group represented those who had a relatively fixed mindset (and slightly mixed mindset), and the mixed-mindset group represented those who had a relatively mixed mindset (and weak growth mindset). The open-ended responses were used as complementary information to validate mindset scores and to facilitate selection of interview participants. Participants were selected based on mindset scores, and their open-ended responses were checked to make sure the mindset scores make sense; those whose open-ended responses showed clear misalignment from their mindset scores would be excluded.

After interviewees were selected, semi-structured interviews were conducted in a safe, private place on campus. Participants were asked to work with the researcher together to reduce social desirability and report their genuine thoughts. Each interview lasted about one hour, and was audio recorded. When the three scenarios used in the interview were presented to different interviewees, their order was randomized.

Field journals

Meanwhile, the field journals of students enrolled in the foundational educational psychology class were also collected. Field journals reported observations of teacher autonomy or control practices from practicum and intentions to enact same or different practices. Among the 108 students recruited from this class, 103 submitted field journals, and 14 were classified into a growth-mindset group with an average mindset score of 5.63, 19 were classified into a fixed-mindset group with an average mindset score of 3.38, and 70 were classified into a mixed-mindset group with an average mindset score of 4.52. Compared to the 17 interview participants, the field journal fixed-mindset group was more mixed-mindseted.

Data analysis

Interviews

The interviews were transcribed verbatim. Using our codebook and a pre-defined coding procedure, two researchers coded three transcripts together. The three transcripts selected balanced interviewees' teaching experience reported in the beginning of each interview (see Appendix A). The codebook was checked and revised after each coding, new codes emerging from the data were added, unused codes were removed (e.g., structure: chaos/permissiveness), and new rules of coding were established as part of the coding procedure. The new coding rules mainly included only coding the response as control if multiple points were made in a single move (e.g., control, structure, autonomy) while control was the major point, but autonomy, structure, and involvement reported in a single move can be double coded. This is to avoid ambiguity, and because control creates a salient psychological impact that suppresses the impact of additional practices. Another important rule was coding responses as "beliefs" rather than "intentions" when participants explained why they would or would not do certain practices, so that intentions and beliefs were clearly distinguished. After coding three transcripts, we reached a satisfactory reliability of agreement above 80% (Miles & Huberman, 1994). Agreement was defined as applying the same primary codes to the same segment (Cresswell, 2007). We also agreed that the codebook and coding rules were sufficiently improved. I then coded the remainder of the data, and consulted other authors whenever a coding question arose.

Data were coded first with researchers blind to participants' mindsets. Intended practices were coded for each section of the interview for each participant. Meanwhile, intended practices were separately coded for each student in the "pressure from below" scenarios in section two and one part of section three of the interview where participants talked about intended practices for students with ability/motivation/behavior issues (i.e., Tom/Tina, Clyde, Bonnie cases and similar students), as well as combined and merged across the three scenarios.

For each interview, I prepared a summary of the major practices participants intended to use in terms of the primary categories of autonomy, control, structure, and involvement. In the summary, we assigned a summative/holistic rating of the level of intentions as low, moderate, and high for each primary category with rationale (i.e., autonomy, control, structure, involvement). The ratings were based on salience and meaningfulness of the category for the participants' overall reported intentions across the interview and relative to the enactment of other primary practices, while considering the context for the intended practice (e.g., participant reported use of control but emphasized it would be the last option). Responses from section three of the interview was given less credit due to potential influence of social desirability (i.e., autonomy supportive teaching approach was introduced as the better approach theoretically). Criteria for a high rating included being the primary intended practice in a single move/situation and across moves/interview relative to other intended practices, high frequency of the intended practice, wide range of codes applied for the intended practice, high quality of codes (i.e., elaborations of the codes were rich and well aligned with literature definitions), and being self-initiated than repeatedly prompted (i.e., central points that came first and naturally to participants, rather than peripheral points that were reported only after repeated prompts that aimed to exhaust ideas). Criteria for a low rating included being a peripheral intended practice in a single move/situation and across moves/interview, low frequency, narrow range of codes applied, low quality of codes (i.e., elaborations of the codes were generic, brief, and loosely aligned/misaligned with literature definitions), and being repeatedly prompted than being self-initiated (i.e., peripheral points only reported due to repeated prompts after ideas were exhausted). Criteria for a moderate rating included being a secondary intended practice in a single move/situation and across moves/interview, neither high or low frequency, neither wide or narrow range of codes applied, moderate quality of codes (i.e., elaborations of the codes were between rich and brief, and basically aligned with literature definitions), and could be self-initiated or prompted but reflects secondary points after primary ideas were exhausted.

Moreover, because we had a special focus on "pressure from below," we prepared separate summaries for section two and one part of section three of the interview that elicit responses to "pressure from below" situations (i.e., Tom/Tina, Clyde, Bonnie cases and similar students). We also gave separate ratings for autonomy, control, structure, and involvement for "pressure from below" situations. In addition, each participant's response was also rated on level of consistency across three sections of the interview. A sample summary for interview 10 is presented in Appendix C.

After the first round of coding and preparations of summaries, the coding and ratings of autonomy, control, structure, and involvement were re-checked and revised to ensure consistency across participants. Then three cases were created based on mindset group assignment for subsequent analysis. The coding and summaries for each interview within a mindset group were further reduced to patterns and themes for each case. I prepared a brief summary of the profile of the four practices for each mindset group for across interview patterns and "pressure from below" patterns, following the criteria for the summative ratings of levels of intentions in the individual-interview summaries. Particularly, Tom/Tina's scenario that represents a most typical and clear "pressure from below" case was the focus of the "pressure from below" section and was expected to reveal most salient differences across mindset groups for intended practices. Hence, the intended practices for Tom/Tina of each mindset group were summarized in detail. The profile of each mindset case was mainly determined by (a) ranking the four practices for each group, that is, by comparing the numbers and percentages of participants who received high, moderate, and low summative ratings in the group for each practice, (b) comparing the frequency counts for each practice when two practices had about similar levels of ratings, and (c) checking and comparing the qualitative elaborations of each practice for saliency and meaningfulness. For example, structure for the mixed-mindset group across interview had a higher percentage of participants receiving a high rating with a higher frequency count and richer elaborations, hence structure ranked more primary than other three practices, which suggests the mixed-mindset group's higher intention for this practice than the other three practices.

For across case comparisons, the profile summaries of the intended practices for each mindset group were compared to generate patterns and themes across cases, both for across interview and for "pressure from below." The comparisons among three mindset groups for each

practice were mostly determined by the following. First, how each practice ranked for a mindset group in terms of saliency and meaningfulness relative to other two groups was synthesized, by comparing the percentages of participants who received high, moderate, and low summative ratings, reasons for these ratings, and relative elaborations for the practice in each mindset group. This basically shows the similarities and differences for each primary practice across the three mindset groups. Second, the profile of each practice relative to other three practices from the profile summary of a mindset group was used as reference information to facilitate comparisons across groups. For example, involvement ranked as more salient and meaningful for the growth-mindset group than the fixed-mindset group across interview, then basically the growth-mindset group demonstrates higher intentions for involvement than the fixed-mindset group. Involvement ranked as a primary practice in the growth-mindset group's profile but a secondary practice in the fixed-mindset group's profile, so growth-mindset group's higher intentions for involvement was further confirmed. For "pressure from below" comparisons, Tom/Tina's scenario was compared in depth across groups based on the intended practices for Tom/Tina synthesized in the profile summary of each mindset group.

Field journals

Subsequently, the filed journal data were analyzed using the same codebook and similar coding procedure. New codes were created based on the field journal data. Responses were coded into three categories: observed practices (about half of the participants reported observations of controlling teaching, half reported observations of autonomy supportive teaching), intended practices, and beliefs about autonomy and control. The responses reflecting participants' intentions/intended practices were central to the analysis. The responses touching upon beliefs about autonomy support and the practices participants observed from practicum were coded as complementary information. To avoid ambiguity and to distinguish from beliefs, intentions were only coded when students specifically stated "I would…." Beliefs were coded when students explained their opinions of autonomy and control, usually when they interpreted the observed practice, explained why they preferred certain practice, and practical constraints. The fields journal prompt was about autonomy support and control, thus participants' intended practices were phrased as either autonomy support or control, but some of the practices were coded as either structure or involvement from our lenses using our coding framework.

Similar to the interview coding, field journals were coded blindly first, and then participants were assigned to three mindset cases and were compared. Different from interviews, the responses about intended practices were often the last few sentences in the field journals, tied to the observed practices and sometimes only briefly elaborated (e.g., participants first reported observations of controlling teaching, evaluated it was ineffective, and lastly stated would not use the same approach; no mention of intentions to enact autonomy, structure, involvement). Hence, summative ratings for intended practices for each participant were unnecessary and inappropriate. For the whole sample, the salience of intended practices and codes was mostly determined by frequency counts and percentages of participants receiving the codes. Case comparisons were mostly based on the percentages of participants receiving the codes for the intended practices in each case, facilitated by the matrix coding query function in Nvivo.

Interview and field journal synthesis

Finally, results from the interview and field journal were synthesized. The major patterns and themes for the whole samples and case comparisons were compared for convergent and divergent findings.

Results

This study examines intentions to enact autonomy, control, structure, and involvement in preservice teachers with growth, mixed, and fixed mindsets, as well as when they were faced with "pressure from below" that would potentially induce intentions to enact control. First, I present results from the interviews, organized by themes for the similarities across three cases and themes for the differences across three cases, focusing on comparisons of differences. The comparisons of similarities addressed the similar profiles of the three mindset groups across the whole interview, first presenting themes on intentions to enact autonomy, control, structure, involvement practices across interview, second some emergent themes on similar intended practices for students with motivation-behavior v.s. ability variations (i.e., Tom/Tina, Clyde, Bonnie scenarios and similar students who created "pressure from below"), and then some emergent themes on beliefs about autonomy support/control. The comparisons of differences focused on Tom's scenario for "pressure from below," where the differences across mindset cases were mostly revealed. Each

mindset group was described in depth, highlighting the fixed-mindset group that demonstrated a clear shift to high control. Minor differences in intentions to enact autonomy, control, structure, involvement and beliefs about autonomy support/control across interview and under "pressure from below" were briefly presented at the end of this section. Subsequently, I present results from the field journals, organized by themes for the whole sample across cases, and themes for comparisons of the three cases. Each part was further organized by major themes about intentions to enact autonomy, control, structure, involvement, and the emergent themes on beliefs about autonomy support/control. Finally, I present the synthesized results from both the interview and the field journal data sources with a summary table.

Interviews

Tables 5 through 8 present results for the three mindset cases by autonomy, control, structure, and involvement practices, including the frequency of codes applied and ratings for each practice across the whole interview and under "pressure from below," showcasing similarities and differences across mindset groups. Table 9 presents specific intended practices for the three students in "pressure from below" scenarios for the three mindset cases. Table 10 presents synthesis of the rankings of each practice for each mindset case and across three cases across interview and under "pressure from below." Table D.1. presents results for the whole sample and is presented in Appendix D for readers' reference. All participants had relatively consistent responses across all three sections of the interview.

Overall, the three mindset cases demonstrated similar patterns of intended practices, both across interview and even specific to "pressure from below" situations. All mindset groups demonstrated relatively high intentions to enact various aspects of structure and involvement, and relatively moderate to low intentions to enact some aspects of autonomy across interview and under "pressure from below." All groups relatively demonstrated moderate to low intentions to enact some aspects of control across interview; this pattern shifted under "pressure from below" where the fixed-mindset group demonstrated high intentions to enact control, particularly when handling Tom/Tina's scenario that created the highest pressure.

Table 5. Frequency and ratings for autonomy support across interview and under "pressure from below" for each case

Case	Codes	Frequency		Ratings	
		Frequency of codes	Number/percentage of participants	Ratings	Number/percentage of participants
Growth-mindset (*n* = 6)	Organizational/procedural autonomy	20 (8)	5, 83.33% (5, 83.33%)	High	1, 16.67% (0, 0%)
	Rationale/relevance	10 (7)	6, 100% (5, 83.33%)	Moderate	3, 50% (3, 50%)
	Inner motivation	21 (12)	5, 83.33% (5, 83.33%)	Low	2, 33.33% (3, 50%)
	Content responsiveness	4 (0)	1, 16.67% (0, 0%)		
	Cognitive autonomy	3 (0)	3, 50% (0, 0%)		
	Autonomy generic	2 (29)	2, 33.33% (2, 33.33%)		
	Total	**60 (29)**	6 (6)		
Mixed-mindset (*n* = 5)	Organizational/procedural autonomy	10 (6)	5, 100% (5, 100%)	High	0, 0% (1, 20%)
	Rationale/relevance	13 (7)	4, 80% (3, 60%)	Moderate	2, 40% (4, 80%)
	Inner motivation	20 (10)	3, 60% (3, 60%)	Low	3, 60% (0, 0%)
	Content responsiveness	2 (0)	2, 20% (0, 0%)		
	Cognitive autonomy	0 (0)	0, 0% (0, 0%)		
	Autonomy generic	4 (3)	4, 80% (3, 60%)		
	Total	**49 (26)**	5 (5)		
Fixed-mindset (*n* = 6)	Organizational/procedural autonomy	14 (4)	6, 100% (4, 66.67%)	High	1, 16.67% (2, 33.33%%)
	Rationale/relevance	16 (8)	6, 100% (5, 83.33%)	Moderate	3, 50% (1, 16.67%)
	Inner motivation	21 (10)	5, 83.33% (4, 66.67%)	Low	2, 33.33% (3, 50%)
	Content responsiveness	6 (2)	4, 66.67% (2, 33.33%)		
	Cognitive autonomy	6 (1)	3, 50% (1, 16.67%)		
	Autonomy generic	2 (1)	1, 16.67% (1, 16.67%)		
	Total	**65 (26)**	6 (6)		

Note. Numbers and percentages in parentheses represent frequency and ratings for "pressure from below" situations (i.e., coding for Tom/Tina, Bonnie, and Clyde). A few segments were coded generically as autonomy, control, structure, involvement as they cannot be classified into a specific code

Table 6. Frequency and ratings for control across interview and under "pressure from below" for each case

Case	Codes	Frequency		Ratings	
		Frequency of codes	Number/percentage of participants	Ratings	Number/percentage of participants
Growth-mindset (*n* = 6)	External motivation/contingencies	20 (12)	6, 100% (6, 100%)	High	2, 33.33% (2, 33.33%)
	Demands/directives/surveillance	15 (9)	4, 66.67% (4, 66.67%)	Moderate	0, 0% (1, 16.67%)
	Controlling language	3 (2)	2, 33.33% (2, 33.33%)	Low	4, 66.67% (3, 50%)
	Internal contingencies	5 (3)	4, 66.67% (2, 33.33%)		
	Negative feedback	1 (1)	1, 16.67% (1, 16.67%)		
	Strict schedules/imposed goals	5 (0)	2, 33.33% (0, 0%)		
	Block negative affect	0 (0)	0, 0% (0, 0%)		
	Low rationale/relevance	1 (0)	1, 16.67% (0, 0%)		
	Control generic	2 (2)	1, 16.67% (1, 16.67%)		
	Total	**52 (29)**	6 (6)		
Mixed-mindset (*n* = 5)	External motivation/contingencies	23 (9)	5, 100% (5, 100%)	High	1, 20% (2, 40%)
	Demands/directives/surveillance	7 (5)	3, 60% (3, 60%)	Moderate	2, 40% (0, 0%)
	Controlling language	3 (1)	1, 20% (1, 20%)	Low	2, 40% (3, 60%)
	Internal contingencies	2 (0)	2, 40% (0, 0%)		
	Negative feedback	1 (0)	1, 20% (0, 0%)		
	Strict schedules/imposed goals	2 (1)	2, 40% (1, 20%)		
	Block negative affect	0 (0)	0, 0% (0, 0%)		
	Low rationale/relevance	0 (0)	0, 0% (0, 0%)		
	Control generic	3 (3)	3, 60% (3, 60%)		
	Total	**41 (19)**	5 (5)		
Fixed-mindset (*n* = 6)	External motivation/contingencies	31 (17)	6, 100% (6, 100%)	High	2, 33.33% (5, 83.33%)
	Demands/directives/surveillance	12 (8)	6, 100% (5, 83.33%)	Moderate	2, 33.33% (0, 0%)
	Controlling language	7 (3)	5, 83.33% (2, 33.33%)	Low	2, 33.33% (1, 16.67%)
	Internal contingencies	4 (2)	2, 33.33% (2, 33.33%)		
	Negative feedback	2 (2)	2, 33.33% (2, 33.33%)		
	Strict schedules/imposed goals	3 (0)	1, 16.67% (0, 0%)		
	Block negative affect	2 (1)	2, 33.33% (1, 16.67%)		
	Low rationale/relevance	1 (0)	1, 16.67% (0, 0%)		
	Control generic	3 (3)	3, 50% (3, 50%)		
	Total	**65 (36)**	6 (6)		

Note. Numbers and percentages in parentheses represent frequency and ratings for "pressure from below" situations (i.e., coding for Tom/Tina, Bonnie, and Clyde). A few segments were coded generically as autonomy, control, structure, involvement as they cannot be classified into a specific code

Table 7. Frequency and ratings for structure across interview and under "pressure from below" for each case

Case	Codes	Frequency		Ratings	
		Frequency of codes	**Number/percentage of participants**	**Ratings**	**Number/percentage of participants**
Growth-mindset (*n* = 6)	Instruction	34 (20)	6, 100% (5, 83.33%)	High	5, 83.33% (5, 83.33%)
	Guidance	27 (20)	6, 100% (5, 83.33%)	Moderate	1, 16.67% (1, 16.67%)
	Monitor/manage behaviors	23 (16)	6, 100% (6, 100%)	Low	0, 0% (0, 0%)
	Feedback/recognition	6 (1)	5, 83.33% (1, 16.67%)		
	Encouragement of competence	10 (9)	5, 83.33% (5, 83.33%)		
	Monitor understanding	12 (9)	6, 100% (5, 83.33%)		
	Clear expectations	4 (3)	2, 33.33% (2, 33.33%)		
	Structure generic	1 (1)	1, 16.67% (1, 16.67%)		
	Total	**117 (79)**	6 (6)		
Mixed-mindset (*n* = 5)	Instruction	21 (14)	5, 100% (5, 100%)	High	5, 100% (4, 80%)
	Guidance	19 (16)	5, 100% (5, 100%)	Moderate	0, 0% (1, 20%)
	Monitor/manage behaviors	11 (5)	4, 80% (3, 60%)	Low	0, 0% (0, 0%)
	Feedback/recognition	8 (7)	4, 80% (4, 80%)		
	Encouragement of competence	9 (8)	3, 60% (2, 40%)		
	Monitor understanding	4 (3)	2, 40% (2, 40%)		
	Clear expectations	8 (2)	3, 60% (2, 40%)		
	Structure generic	0 (0)	0, 0% (0, 0%)		
	Total	**80 (55)**	5 (5)		
Fixed-mindset (*n* = 6)	Instruction	21 (12)	6, 100% (6, 100%)	High	4, 66.67% (4, 66.67%)
	Guidance	19 (11)	6, 100% (5, 83.33%)	Moderate	1, 16.67% (1, 16.67%)
	Monitor/manage behaviors	20 (8)	6, 100% (4, 66.67%)	Low	1, 16.67% (1, 16.67%)
	Feedback/recognition	7 (4)	4, 66.67% (3, 50%)		
	Encouragement of competence	5 (5)	2, 33.33% (2, 33.33%)		
	Monitor understanding	8 (7)	2, 33.33% (2, 33.33%)		
	Clear expectations	9 (1)	4, 66.67% (1, 16.67%)		
	Structure generic	1 (1)	1, 16.67% (1, 16.67%)		
	Total	**90 (49)**	6 (6)		

Note. Numbers and percentages in parentheses represent frequency and ratings for "pressure from below" situations (i.e., coding for Tom/Tina, Bonnie, and Clyde). A few segments were coded generically as autonomy, control, structure, involvement as they cannot be classified into a specific code

Table 8. Frequency and ratings for involvement across interview and under "pressure from below" for each case

Case	Codes	Frequency		Ratings	
		Frequency of codes	Number/percentage of participants	Ratings	Number/percentage of participants
Growth-mindset ($n = 6$)	Social emotional responsiveness	44 (36)	6, 100% (6, 100%)	High	5, 83.33% (5, 83.33%)
	Time	6 (6)	4, 66.67% (4, 66.67%)	Moderate	1, 16.67% (1, 16.67%)
	Dependability	7 (6)	5, 83.33% (4, 66.67%)	Low	0, 0% (0, 0%)
	Resource	2 (1)	2, 33.33% (1, 16.67%)		
	Caring climate	2 (2)	2, 33.33% (2, 33.33%)		
	Involvement generic	1 (1)	1, 16.67% (1, 16.67%)		
	Low involvement	*0 (0)*	*0, 0% (0, 0%)*		
	Total	**62 (52)**	6 (6)		
Mixed-mindset ($n = 5$)	Social emotional responsiveness	40 (22)	6, 100% (6, 100%)	High	4, 80% (4, 80%)
	Time	9 (9)	4, 80% (4, 80%)	Moderate	1, 20% (1, 20%)
	Dependability	7 (5)	2, 40% (2, 40%)	Low	0, 0% (0, 0%)
	Resource	2 (2)	2, 40% (2, 40%)		
	Caring climate	1 (1)	1, 20% (1, 20%)		
	Involvement generic	0 (0)	0, 0% (0, 0%)		
	Low involvement	*0 (0)*	*0, 0% (0, 0%)*		
	Total	**59 (39)**	5 (5)		
Fixed-mindset ($n = 6$)	Social emotional responsiveness	42 (26)	6, 100% (6, 100%)	High	3, 50% (5, 83.33%)
	Time	10 (7)	4, 83.33% (3, 50%)	Moderate	3, 50% (1, 16.67%)
	Dependability	7 (4)	3, 50% (2, 33.33%)	Low	0, 0% (0, 0%)
	Resource	4 (3)	3, 50% (2, 33.33%)		
	Caring climate	2 (2)	1, 16.67% (1, 16.67%)		
	Involvement generic	0 (0)	0, 0% (0, 0%)		
	Low involvement	*3 (2)*	*3, 50% (2, 33.33%)*		
	Total	**65/68 (42/44)**	6 (6)		

Note. Numbers and percentages in parentheses represent frequency and ratings for "pressure from below" situations (i.e., coding for Tom/Tina, Bonnie, and Clyde). A few segments were coded generically as autonomy, control, structure, involvement as they cannot be classified into a specific code, the frequency for those generic codes were not included in the table. For involvement and the fixed-mindset case, the total counts of 65 and 42 represent counts excluding low involvement, the counts of 68 and 44 represent the total counts for the involvement category as a whole including low involvement

Table 9. Frequency and percentages of participants for each mindset group by Tom/Tina, Clyde, Bonnie in the "pressure from below" scenarios

Category	Code	Tom/Tina Frequency of codes			Tom/Tina Percentage of participants			Clyde Frequency of codes			Clyde Percentage of participants			Bonnie Frequency of codes			Bonnie Percentage of participants		
		G	M	F	G	M	F	G	M	F	G	M	F	G	M	F	G	M	F
Autonomy	Organizational autonomy	8	3	1	50%	60%	17%	5	2	3	50%	20%	50%	0	2	2	0%	40%	33%
	Rationale/relevance	4	5	5	50%	60%	50%	1	3	3	17%	40%	50%	2	1	0	33%	20%	0%
	Inner motivation	4	5	5	50%	60%	50%	8	7	4	83%	60%	50%	1	0	1	17%	0%	17%
	Content responsiveness	0	0	0	0%	0%	0%	0	0	2	0%	0%	33%	0	0	0	0%	0%	0%
	Cognitive autonomy	0	0	1	0%	0%	17%	0	0	0	0%	0%	0%	0	0	1	0%	0%	17%
	Mindset group total	16	16	12	83%	100%	66%	15	16	13	100%	100%	100%	5	6	5	83%	60%	50%
	Whole sample total	44			82% (14/17)			44			100% (17/17)			16			59% (10/17)		
Control	External contingencies	10	6	14	100%	100%	100%	2	3	3	33%	40%	33%	0	0	0	0%	0%	0%
	Demands/directives	7	4	8	83%	60%	83%	2	1	0	33%	20%	0%	0	0	0	0%	0%	0%
	Controlling language	1	1	3	17%	20%	33%	1	0	0	17%	0%	0%	0	0	0	0%	0%	0%
	Internal contingencies	1	0	1	17%	0%	17%	1	0	1	17%	0%	17%	0	0	0	0%	0%	0%
	Negative feedback	0	0	1	0%	0%	17%	1	0	1	17%	0%	17%	0	0	0	0%	0%	0%
	Strict schedules	1	1	0	17%	20%	0%	0	0	0	0%	0%	0%	0	0	0	0%	0%	0%
	Block negative affect	0	0	0	0%	0%	0%	0	0	1	0%	0%	17%	0	0	0	0%	0%	0%
	Mindset group total	21	14	29	100%	100%	100%	9	6	8	83%	60%	50%	0	0	0	0%	0%	0%
	Whole sample total	64			100% (17/17)			23			59% (10/17)			0			0% (0/17)		
Structure	Instruction	11	5	6	83%	40%	83%	5	7	1	50%	60%	17%	5	6	5	67%	80%	50%
	Guidance	9	8	5	50%	60%	67%	1	0	0	17%	0%	0%	10	8	6	83%	100%	67%
	Monitor behaviors	11	4	8	100%	60%	67%	4	1	0	67%	20%	0%	1	0	0	17%	0%	0%
	Feedback/recognition	1	4	3	17%	40%	33%	0	1	0	0%	20%	0%	0	2	1	0%	40%	17%
	Encouragement of competence	6	6	4	67%	60%	33%	0	0	0	0%	0%	0%	3	3	1	50%	60%	17%
	Monitor progress	6	1	3	67%	20%	33%	0	0	1	0%	0%	17%	3	2	3	33%	40%	33%
	Clear expectations	2	1	1	33%	20%	17%	0	0	0	0%	0%	0%	1	1	0	17%	20%	0%
	Mindset group total	47	29	30	100%	100%	100%	10	9	2	67%	80%	33%	23	22	17	100%	100%	100%
	Whole sample total	116			100% (17/17)			21			59% (10/17)			62			100% (17/17)		
Involvement	Social emotional responsiveness	20	15	19	100%	100%	100%	7	4	3	50%	60%	50%	9	3	4	67%	20%	67%
	Time	3	4	2	50%	33%	17%	1	0	0	17%	0%	0%	2	5	5	33%	60%	50%
	Dependability	3	3	2	50%	20%	17%	0	0	1	0%	0%	17%	1	2	0	17%	40%	0%

Table 9 continued

	G	M	F	%	%	%	G	M	F	%	%	%	G	M	F	%	%	%
Resource	0	1	1	0%	20%	17%	0	0	0	0%	0%	0%	1	1	2	17%	20%	33%
Caring climate	1	1	2	17%	20%	17%	0	1	0	0%	20%	0%	1	1	0	17%	20%	0%
Low involvement	*0*	*0*	*1*	*0%*	*0%*	*17%*	*0*	*0*	*1*	*0%*	*0%*	*17%*	*0*	*0*	*0*	*0%*	*0%*	0%
Mindset group total	27	24	25	100%	100%	100%	9	5	3	66%	80%	66%	14	12	11	83%	60%	83%
Whole sample total	76			100% (17/17)			17			71% (12/17)			37			76% (13/17)		

Note. G represent growth-mindset group (*n* = 6), M represents mixed-mindset group (*n* = 5), F represents fixed-mindset group (*n* = 6); to save space, percentages of participants receiving the codes were rounded up without decimals; the frequencies of codes generically coded for autonomy, control, structure, involvement were not included in this table; involvement total counts did not include low involvement

Table 10. Rankings of practices for each mindset case and across three cases across interview and under "pressure from below"

		Autonomy	Control	Structure	Involvement
Within case	Growth-mindset group	Tertiary (Tertiary/quaternary)	Tertiary/quaternary (Tertiary)	Primary (Primary)	Primary/secondary (Primary/secondary)
	Mixed-mindset group	Tertiary/quaternary (Tertiary)	Tertiary (Tertiary/quaternary)	Primary (Primary)	Primary/secondary (Primary/secondary)
	Fixed-mindset group	Tertiary/quaternary (Quaternary)	Tertiary (Primary)	Primary (Primary/secondary)	Secondary (Primary)
Across cases	Growth-mindset group	1 (2/3)	2 (2)	1 (1)	1 (1)
	Mixed-mindset group	2 (1)	1/2 (2)	1 (1)	1 (1)
	Fixed-mindset group	1 (2)	1 (1)	2 (2)	2 (1)

Note. Within case rankings should be read horizontally from left to right, four practices were compared in terms of relative primacy for each mindset group; across cases rankings should be read vertically from top to bottom, each practice was compared in terms of relative saliency for three mindset groups; rankings of practices were presented in parentheses

Case comparisons on similarities

Intentions to enact autonomy, control, structure, involvement

As shown in Tables 5 to 8 summative ratings, participants in all mindset groups had relatively high intentions for structure and involvement and relatively low to moderate intentions for control and autonomy across interview. Combing summative ratings, frequency counts, and participants' elaborations for each practice in each mindset group's profile summary, for all mindset groups, structure was the primary practice, involvement was relatively secondary, and autonomy and control were tertiary.

Structure

All groups demonstrated relatively high intentions for structure. For the growth-mindset group, 83.33% and 16.67% of participants received a high and a moderate summative rating for structure respectively. For the mixed-mindset group, all participants were rated as high for structure. For the fixed-mindset group, 66.67%, 16.67%, and 16.67% of participants were rated as high, moderate and low for structure respectively (Table 7). All groups had relatively high intentions to enact structure practices featuring the whole range of seven structure practices, there were no salient difference across groups, and no one demonstrated chaos and permissiveness.

The most salient structure practices for all cases included instruction, guidance scaffold, and monitor/manage behaviors (see Table 7 frequency across interview as a reference). All participants in all groups frequently and richly elaborated on instructional strategies to motivate students and sometimes facilitate their achievement of competence and cater for their struggles. The strategies mainly included having collaborative learning, using multiple representations (e.g., visual, auditory, hands-on), and using technology and educational games. For example, one participant stated, "I want kids to realize that learning is fun, so finding fun ways to do lessons. Make sure it's not just lecturing, have something for kids who are more visual learners or learners who are more doers" (interview 15 mixed-mindset). Another participant said, "Have them partner up and fill out a study guide together, maybe one kid remembers more and another kid doesn't; also put kids into positions and have them role play and act the whole thing out" (interview 16 growth-mindset). Participants also talked about having flexible lessons and adjusting challenges for students in

instruction, such as "maybe the students are struggling with a lesson, so give more time for that. Change around what your schedule a little bit there or things like that" (interview 15 mixed-mindset).

All participants in the three groups also saliently intended to provide guidance and scaffold to engage students and help them learn, especially for students who struggle (i.e., Tom/Tina and Bonnie scenarios). For example, one participant talked about scaffolding by explaining materials in multiple ways and work back on a problem step by step, "You can't explain everything in the same way to every student, if you change things up and explain in different ways, it will be easier for the students to understand" and "I would ask her [Bonnie] how she got the final conclusion, then we work from there step by step to see where it went wrong" (interview 12 mixed-mindset). Two participants talked about guidance in terms of pressing for understanding to engage students in deeper thinking and achieve competence. For instance, "I started asking questions about Martin Van Buren's actual life outside of being president. Some students couldn't answer me, some were like, 'Wait a second. I'll look it up.' Doing stuff like that to remind them you need to know more about this topic. Doing research like that in class and learning a little more" (interview 16 growth-mindset).

A third most salient practice for participants in all groups was monitor and manage behaviors, usually when handling misbehaviors and enacting established rules. For example, one participant mentioned, "I would allow a little freedom so that it's still their learning, just general guidelines so that they are on task, not goofing off, or rules for bathroom, or the teacher says 'class, class' the students say 'yes, yes' just to get their attention" (interview 14, mixed-mindset). This classroom-management related code demonstrated structure, although sometimes the responses bordered on control. For example, one response showed managing behaviors that started as giving structure, which turned into a little harsher management close to control when milder management did not work, "If there was a single student who started yelling at me for whatever reason, my first step is always ask them politely. Hey, we can talk this through, calm down a moment. If they begin cursing yelling obscenities at me, I would pull them out of the room. We'd have a little talk" (interview 1 fixed-mindset).

A fourth most salient practice for participants in all groups was feedback and recognition for students' work, progress, and behaviors. For example, one participant talked about giving feedback

recognition for students' independent work, "I really like telling kids what a good job they are doing for the specific things they are doing, like with the fifth graders voice I'm really proud you went and did this on your own" (interview 3 growth-mindset). Another participant talked about giving very specific feedback for recognizing students' work, "I always whenever I'm giving feedback try to find a couple of good things to point out. I really like how clear and specific your thesis was and how it foreshadowed the main points more. So anything really specific" (interview 4 fixed-mindset).

In addition, all participants in the growth-mindset group talked about monitor progress/understanding to ensure students' understanding of class materials, both growth- and mixed-mindset groups often talked about encouragement of competence for students who fall behind, struggle, and feel frustrated to enhance their competence motivation, and clear expectations was a practice mixed- and fixed-mindset participants frequently mentioned to help enact classroom rules and facilitate learning. For example, one growth-mindset participant talked about monitor understanding, "I would observe and see which students are struggling and I would come to them" (interview 3 growth-mindset). Another growth-mindset participant talked about encouraging competence for those who struggle, "To help her [Tina] with her negative abilities, it's just counteracting that by trying to remind her she can do it. Even as a class, telling them, 'This information may be difficult to take in, but you all have the abilities. I know you do.'" (interview 16 growth-mindset). Two fixed- and mixed-mindset participants elaborated on establishing clear expectations, "Having a clearly laid out system of rules, these are the consequences. This is when you turn in homework. This is how you ask for an extension" (interview 11 fixed-mindset), and "It's important to just have a mentality or environment in your class, where you expect them to do their best, you expect all your students to work towards their potential and not just like glide through" (interview 13 mixed-mindset).

Involvement

All groups demonstrated relatively high intentions for involvement. For the growth-mindset group, 83.33%, and 16.67% of participants received a high and a moderate summative rating for involvement respectively. For the mixed-mindset group, 80% and 20% of participants were rated high and moderate for involvement respectively. For the fixed-mindset group, 50% and 50%

participants were rated as high and moderate for involvement respectively (Table 8). All groups had relatively high intentions to enact involvement practices featuring the whole range of five involvement practices.

The most salient involvement practices for all cases included social emotional responsiveness, time, and dependability (see Table 8 frequency across interview as a reference). All participants in all groups very frequently and richly elaborated on responsiveness as their general approach as a teacher and as their specific ways of handling students' issues, namely building a good teacher-student relationship by being responsive to student social emotional needs, showing attention, warmth, cares, and concerns. They frequently talked about having one-on-one conversations listening to student struggles and problems when they had low motivation or misbehave, and figuring out a way to help them, as well as attending to their negative affect such as frustrations and boredom. For instance, "When she's [Tina] experiencing feelings of doubt, or she's mad, maybe ask why. And just asking what the issue is. And then from there, you can address the problem" (interview 2 fixed-mindset). Participants also mentioned building personal relationships with students, building rapport, trust, respect, and friendship. For example, one said, "It's really important to build trust in your classroom very early on. When problems arise if you have that trust built already, the students feel comfortable coming to you about things" (interview 17 mixed-mindset), and "It is very hard for them to keep up with the rest of students but I think to motivate them you have to be close friends to show you really care" (interview 6 fixed-mindset). Additionally, participants often showed empathy and avoided embarrassing students when handling students' lack of motivation, struggles and misbehaviors. For instance, one stated, "It doesn't work for me to be like you were doing bad, I think it works a lot better if I come from a place of empathy, even if they don't respond well like 'yeah, whatever,' they know I'm there for them paying attention" (interview 4 fixed-mindset), and "Especially with middle school students [who] are already uncomfortable, like they already are trying to figure out who they are and stuff so as a teacher, I don't necessarily want to call any students out to make them feel uncomfortable in front of their peers" (interview 7 growth-mindset).

A second relatively most salient involvement practices for all groups was time for all groups. They talked about investigating sufficient time to understand and help students either during normal class hours or spending extra time after school, especially for those who struggle ("pressure

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from below" students). For example, "The best thing I can do is just offer her [Bonnie] help and offer her after school assistance" (interview 1 fixed-mindset), and "Student X hates math, but I kept pursuing him, I asked him to tell me about math, how I struggled in math as well, I constantly encouraged him to keep trying" (interview 17 mixed-mindset).

Dependability was a third relatively salient involvement practices for all groups, especially the growth-mindset group. Participants talked about making themselves available and dependable whenever students need them. For example, one growth-mindset participant mentioned, "I would ask her what specific additional help she needs, what kind of help she prefers, and really make myself available to her" (interview 7 growth-mindset). Another participant explained, "I would make myself clear that I welcome students to come to me for help, I would tell Tom he can always come to me if he needs extra help" (interview 17 mixed-mindset).

Additionally, a few participants in all groups also mentioned providing resources to meet students' needs and creating a caring climate in the classroom by encouraging student-student relatedness. For resources, one participant mentioned, "I donate some books or money or even my own personal time to help them" (interview 6 fixed-mindset). For caring climate, one participant said, "All the time we clap for each other. So, it's not just me telling them good job I tell their friends I tell the whole class" (interview 10 fixed-mindset). Another said, "She knows she's behind and she would feel embarrassed about that, so I would try to find common ground with other students for her…and then she probably get more self report from having friends. So, her motivation is low and that's how I would build it" (interview 8 growth-mindset).

Autonomy

All groups had relatively low to moderate intentions to enact autonomy. In both the growth- and fixed-mindset groups, 16.67%, 50% and 33.33% of participants were rated as high, moderate, and low respectively. For the mixed-mindset group, 40% were rated as moderate and 60% were rated as low (Table 5). All three groups were similar in areas of autonomy, featuring organizational procedural autonomy, rationale relevance, and inner motivation (see Table 5 frequency across interview as a reference)

A first most salient autonomy practice across three groups was organizational and procedural autonomy, including providing choices for tasks or class procedures, having flexible

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schedules/plans for autonomy purpose, welcoming student suggestions for lesson materials/activities seeking what works best for them. For example, participants stated, "I'm giving some sort of agenda like on the board like here's what you're working on. Here's what you can do if you finish early here's options of what you can do afterward. So then, like having choice would help them and her feel like they're not just being told what to do" (interview 8 growth-mindset), and "You listen to what it is that they don't like about the lesson and why they aren't engaged, so you can change up your lesson plan a little bit to engage them more" (interview 15 mixed-mindset).

A second most salient autonomy practice across three groups was providing rationale for required tasks and building relevance to student life and goals. One participant said, "You have to tell them why they need to concentrate and why they need to know, why it's a way for them to understand, it is important that we're not doing this just for them not to be on free ipad time" (interview 10 fixed-mindset). Another articulated, "Have them find more meaning to the work they are doing, how would you apply this to life outside school, how would you use this information later, kind of help them find the connections" (interview 7, growth-mindset).

A third most salient autonomy practice across three groups was inner motivation, through attending to student interests, curiosity, and providing optimal challenges, although most time they talked about finding something students enjoy generically. Two examples are: "One kid was really interested in something astronomy related. So I was like 'OK so we can use math to understand that.' So we spent like five minutes on google and look some stuff up and he was immediately a lot more interested in a lot more willing to put in that work to go through the problem" (interview 4 fixed-mindset), and . "I would give them challenges. Instead of giving them extra busy work, if we're learning about motion, and the rest of the class is focusing on the basic foundational stuff, then I would try to help him [Clyde] apply that to some cool project that he could do" (interview 14 mixed-mindset)

A few participants in all groups also briefly mentioned some forms of content responsiveness, by being responsive to student thoughts and questions, taking their perspectives and acknowledging their ideas and the importance of their agendas. For example, "I think my main thing is to get to know what their ideas are what their strategies is and then oh 'OK, that's how you learn?Let's look. Let's do it your way then' and then help them in that way" (interview 10 fixed-

mindset). Another said, "I would check with them, I understand not every subject is their cup of coffee, as long as they don't slip behind let them do their own things" (interview 1 fixed-mindset).

In addition, a few participants in the growth- and fixed-mindset groups briefly touched upon cognitive autonomy, namely giving students time to self-express, to independently work on problems in their own ways and displaying patience and pacing instruction to allow self-regulated learning. For example, "Motivating students to learn beyond what you're teaching them and do the work themselves, researching beyond what your assignment requires" (interview 16, growth-mindset), and "My first question would usually be 'what are your thoughts on that? What jumped out at you?' And that's super open ended and I'll get a few hands and a few responses then I can kind of zero in on. 'What about when they said this, did you feel positively or negatively about this?'" (interview 4 fixed-mindset).

Control

All groups had relatively moderate to low intentions to enact control. In the growth-mindset group, 33.33% of the participants were rated as high while 66.67% were rated as low. For the mixed-mindset group, 20% of participants were rated as high, 40% were moderate, and 40% were low. For the fixed-mindset group, 33.33% were rated as high, moderate, and low respectively (Table 6). The most salient practices for all groups were external contingencies and demands directives surveillance. The growth-mindset also featured internal contingencies, and the fixed-mindset group also featured controlling language (see Table 6 frequency across interview as a reference).

All participants in all three groups intended to motivate students upon different forms of external contingencies which is not uncommon in schools, mostly through using rewards, incentives, privileges, discipline, punishment, consequences, and seeking compliance, and a few mentioned using competitions and behavior chart. For rewards and incentives, one example is "Maybe it's candy, extra credit, a lot of times if a student is struggling and doesn't want to participate, if there's a physical reward it does help" (interview 12 mixed-mindset). They also mentioned reward tickets (interview 10 fixed-mindset), stickers, and recess time (interview 8, growth-mindset). For discipline and punishment, one participant elaborated, "When I saw students similar to Tom, the only thing that get them through was goofing off with their friends, and they

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need some discipline to get them back on track" (interview 1 fixed-mindset). Another said, "If a student makes a mess in the classroom, let's say because they're angry. 'Well, here's the consequences, you have to clean up.'" (interview 11 fixed-mindset). Others also commonly mentioned for example sending students to the principal's office (e.g., interview 1 fixed-mindset), and isolating a student from others (e.g., interview 15 mixed-mindset).

A second relatively salient control practice for all groups was demands directives surveillance for off-task, disruptive behaviors, and disobedience. Participants talked about keeping a balance between being nice and firm, supportive and stern, and giving demands, directives and keeping surveillance when needed, mostly when facing "pressure from below." One participant articulated, "The student would ignore me and be like I don't know who you're talking to, and I said 'Are you ignoring a direct command that I gave you?'" (interview 11 fixed-mindset). Another explained, "I would use my loud voice. I would kind of be a hawk. I would be very much keeping students on task. I'd always be watching around making sure students aren't messing around and if they are messing around, I would be stern with them" (interview 5 growth-mindset).

A third relatively salient control practice for the growth-mindset group was motivating students through internal contingencies, and a third relatively salient control practice for the fixed-mindset group was using controlling language. One example for internal contingencies demonstrated giving more praise and affection when students had desired behaviors while being stern with those who did not, that is, the recognition is contingent on showing good behaviors/outcomes defined by the teacher, "I'm always stern to them, but always nice to the other students. The students that are understanding the material or not having these conversations I would give them more praise" (interview 5 growth-mindset). Controlling language participants mentioned included for example "Most of the time I will be like 'you need to practice, you really need to focus right now.'" (interview 10 fixed-mindset).

In addition, a few participants across groups also touched upon giving negative feedback, following a strict schedule and imposing teacher goals, and very infrequently low rationale/relevance for required tasks. An example for negative feedback is, "He would be like 'Do I have to do that? That's really stupid.' And we finally told him in front of the class that 'You think you're too cool for school and you're not, you have good grades on some things and you have bad grades in other things.'" (also coded as block negative affect; interview 10 fixed-mindset). An

example for strict schedule is "Keeping her on task would help you stick to the schedule. If you let her keep distracting others, it will really mess up the schedule" (interview 15 mixed-mindset).

Intended practices for students with motivation-behavior v.s. ability variations

As shown in Table 6 coding for each student in the "pressure form below" scenarios, in general, the three mindset groups showed similar responses to Clyde's and Bonnie's scenarios, featuring autonomy for Clyde and structure for Bonnie. Three mindset groups also had overlaps when responding to Tom/Tina's scenario featuring structure, involvement, and control. Three specific noticeable patterns of similarities for the three students across mindset cases emerged. The first pattern of intended practices for "pressure from below" was that control was only intended for students having motivation-behavior problems (Tom/Tina and Clyde, not Bonnie). Although many participants from different mindset groups demonstrated high intentions for control, all participants only intended to adopt control practices for Tom/Tina and Clyde but not Bonnie. Participants were most troubled by the low motivation and behavior problems of Tom/Tina, Clyde and similar students, and chose a control approach to handle these cases, featuring external contingencies and demands/directives/surveillance (and they did not intend to handle other issues like Tom/Tina's experience of setbacks and negative feelings with control). On the other hand, participants respected and admired Bonnie's high motivation and effort, although a few participants thought Bonnie's case was difficult. Overall, it seemed Bonnie' case exerted the least pressure and participants did not see a necessity to motivate her externally or give demands, and would not adopt a control approach to handle her struggles and lower ability. Akin to this pattern, when explicitly prompted about whether and when they would adopt control practices, participants reported they would be most likely to use control in "pressure from below" situations such as student continuous misbehaviors and having too many students (64.71% of participants; 58.82% of participants also mentioned "pressure from above" situations such as schedule pressure and meeting standard testing and outside standards, which makes it necessary to take a control approach when there is "pressure from below").

Another specific pattern was that highest control was intended for students with both motivation-behavior and ability problems (Tom/Tina). Participants were mostly inclined to adopt control for Tom/Tina and similar students who had motivation, behavior and ability problems that

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would create the highest "pressure from below." Ten participants across mindset groups chose control for Clyde, but all participants more or less chose control for Tom/Tina. Comparatively, although the scenarios almost presented Tom/Tina's and Clyde's motivation and behavior problems identically, participants tended to associate Tom/Tina's struggles and lower ability with their low motivation and not doing what is required in class, but they perceived Clyde as having high ability and were less troubled by Clyde's problems. For Clyde, control mostly featured some forms of external contingencies such as rewards and discipline. While for Tom/Tina, besides external contingencies, control also featured demands/directives/surveillance and controlling language.

Related to the second pattern, a third pattern was that autonomy was most intended for students with high ability (Clyde), while structure was most intended for students with lower ability (Tom/Tina and Bonnie). Considering frequency and participants' elaborations, although many participants chose control for Clyde and similar students who had high ability, autonomy was the primary practice all participants chose ($n = 17$; frequency: 44). Participants frequently perceived Clyde as bored and not challenged enough, and some associated him with gifted students. Hence they intended to enact the whole range of autonomy practices, mostly inner motivation relating to Clyde's interests and providing challenges. Control ($n = 10$; frequency: 23), involvement ($n = 12$; frequency: 17), and structure ($n = 10$; frequency: 21) were relatively secondary. Comparatively, structure was the primary practice all participants chose for Tom/Tina and Bonnie whose ability was at the lower end. For Bonnie, structure ($n = 17$; frequency: 62) featured the whole range, mostly guidance/scaffold, instruction, monitor understanding, and encouragement of competence. For Tom/Tina, structure ($n = 17$; frequency: 116) also featured the whole range, while monitor/manage behaviors was most salient. Involvement was relatively important for Tom/Tina ($n = 17$; frequency: 76) and Bonnie ($n = 13$; frequency: 37) as well and featured high responsiveness, especially empathy and attentive to negative feelings. Participants frequently associated Tom/Tina with some students they met in their practicum who often experience home issues (e.g., parents died or in jail) that made them frustrated and not motivated, and they empathized with these students and would support them emotionally. They also empathized with Bonnie's struggles and would spend a lot of time attending to her frustrations and helping her through her setbacks. Control ($n = 17$; frequency: 64) and autonomy ($n = 14$;

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frequency: 44) were relatively tertiary for Tom; no participants chose control for Bonnie but autonomy ($n = 10$; frequency: 16) also ranked the last compared to structure and involvement.

Beliefs about autonomy support/control

Participants across mindset groups often stated that they did not prefer control but would still use control because they believe control was ineffective in general (above 80% of participants in all mindset groups expressed this belief) but still necessary, sometimes due to practical constraints (above 50% of participants in all mindset groups expressed this belief). Sixteen participants talked about different aspects of control as being ineffective, including teachers should not be dictators, yelling and directives frustrate students and make them hate the teacher and learning, and rewards hinder intrinsic motivation. On the other hand, sometimes participants confused control with structure and thought "tough love" was needed. Nine participants across mindset groups expressed that control was necessary and can be effective in managing behaviors, giving the classroom structure, and establishing teacher authority (e.g., interview 3 [growth-mindset] mentioned Tom "needs the structure that comes out of control"). Although a few participants across mindset groups specifically stated they would not want to use rewards and would prefer to motivate students internally first, they believed external motivators could be useful. For instance, one participant explained, "These days in the education world a consensus is external incentives are not good, they're just going to reinforce you should have an external motivation and we want students to have an intrinsic motivation. But when you are faced with the practicality of a student who's not doing any work, you need to get the heart down in order to pass a class and graduate. I think to an extent you can incentivize that, like if you can get your homework turned in on time I'll let you go to the library and choose a different book when we have our free reading time" (interview 4 fixed mindset).

Furthermore, thirteen participants self-reported they would prefer an autonomy approach (66.67%, 80%, and 83.33% of participants from the growth-, mixed-, and fixed-mindset groups respectively), but some across mindset groups also believed that autonomy can be ineffective and difficult. Five participants believed autonomy did not handle behavior problems well, it was somewhat loose and permissive, and students may take advantage of the teacher. Five participants also believed autonomy can be difficult because it is time consuming and because of various

practical constraints. Two participants also believed that for the autonomy approach and the control approach, no one is better than the other

Case comparisons on differences

As shown in Tables 5 to 8 ratings for each primary practice, under "pressure from below," all mindset groups in general still had high intentions for structure and involvement, similar to the across interview patterns and themes. The growth-mindset group still had relatively low to moderate intentions for autonomy and control, similar to the across interview patterns (although control very slightly increased and autonomy very slightly decreased). The mixed-mindset group's intentions for autonomy enhanced to moderate to high levels (mostly moderate); a few participants had high intentions for control and a few had low intentions (with the level of control increased for some participants and decreased for others). The fixed-mindset group had relatively low to moderate intentions for autonomy, relatively similar to the across interview patterns (with the level increased for some participants and decreased for others), but they clearly shifted to high intentions of control.

The most salient differences across three groups under "pressure from below" were demonstrated in the control practice. Noticeably, although all groups intended to enact control when attending to behavior and motivation issues (Tom/Tina and Clyde scenarios), control became a primary practice relative to other practices for the fixed-mindset group, while control was more well balanced out with other practices and had less dominance for the growth- and mixed-mindset groups. There were no clear differences across mindset cases in their responses to Clyde's and Bonnie's scenarios (see previous section on case similarities), but clear differences were demonstrated in participants' responses to Tom/Tina's scenario which represented a low motivation, misbehavior, and lower ability student profile and a situation of highest "pressure from below" (hereinafter refers to as Tom's scenario in this section). This section describes in detail each mindset group's responses to Tom's scenario.

Overall, the major differences across groups were revealed in how each group handled Tom's low engagement and misbehavior issues. The growth- and mixed-mindset groups were similar, and they were different from the fixed-mindset group in (a) their less negative and more growth-mindset related perceptions of Tom's motivation, behavior, ability; (b) lower level of

control for engaging Tom and using rewards; (c) lower relative saliency of control compared to other practices for handling Tom's misbehaviors (off-task, cross talking, joking with other students, ignoring requirements, disobeying assignments). The differences were most clear between growth- and fixed-mindset groups.

Additionally, differences in structure, involvement, and autonomy practices across three groups under "pressure from below" were generally not salient, showed similar patterns with the across interview patterns, and hence were not repeatedly elaborated here. At the end of this section, I present briefly the minor differences in intentions for structure, involvement, control, and autonomy practices and beliefs about autonomy support/control across mindset groups across interview and under "pressure from below."

Fixed-mindset group

The fixed-mindset group showed clear high intentions to use control for Tom and similar students under "pressure from below." First, control was a relatively primary practice compared to other practices for this group. Control was a dominant practice for two participants (interviews 1, 10), and equally primary or slightly less primary than other practices for three participants (interviews 2, 6, 11). One exception was interview 4 who demonstrated minimal control throughout the interview. Second, high frequency and wide range of control codes were applied to this group's responses, featuring various ways of external motivation/contingencies, demands directives surveillance for students' motivation and behavior issues. Third, these codes were well elaborated with concreate examples aligning with literature (e.g., demands surveillance and controlling language are typical control practices to handle misbehaviors, rewards are typical external contingency strategies to tackle low engagement). In addition, the control practices were mostly self-initiated or simply prompted responses illustrating important points rather than representing repeatedly prompted peripheral points.

Specifically, in response to the first few open-ended questions of how they perceived Tom, what they would do to help Tom, and what they did and would continue to do with students they met similar to Tom, this group affirmatively perceived Tom as having low motivation low ability misbehavior issues, but their first reaction was to enact autonomy, structure, involvement strategies and only one participant self-initiated clear control strategies (interview 10). The fixed-mindset

group participants expressed negative perceptions towards Tom, thinking he had very low motivation and "there was some problems with him" (interview 1), was a "fun" student to have with sarcasm (interview 2), was "the worst type of student teachers not looking forward to have" (interview 4), and was "showing bad behaviors to get others' attention" (interview 6). All participants thought Tom had low motivation which really stood out to them. All participants thought he was on the lower end struggling and four explicitly said he had low ability or disability.

To address these problems they perceived, four participants' first reactions were to use autonomy by working with inner motivation and providing rationale. Interview 1 thought Tom was the "prisoner" type of student with very low motivation, and he would ask Tom what subjects he enjoyed and relate to those subjects as much as possible. Interview 2 thought Tom clearly did not want to be in the class, and for these types of students a first thing was to find something that could pique some interest to get them a little motivated and start from there, by consulting other teachers. Interview 4 also mentioned addressing the motivation issue would be the first step, which would help solve the ability performance issues. The teacher gave concrete examples from his teaching experience for how to connect to students' interests, one was connecting a student's interest in astronomy to the math problem they were working on. Interview 10 also mentioned providing rationale for why students need to concentrate and understand the knowledge. Moreover, relating to Tom's struggles and frustration, participants talked about using structure strategies with guidance scaffolding and monitoring understanding, as well as involvement strategies being responsive to Tom, spending significant time with and providing resources to him. For example, interview 10 mentioned "patience is the key in all of that" and spending time with Tom breaking down the information together was really important. Interview 11 mentioned spending one-on-one time with Tom really trying to understand his struggles, emotions, helping him practically to tackle the emotions building a good relationship with him. Whenever Tom feels he cannot do a good job nothing makes sense, he can look at a resource card teacher prepared for him reminding he could succeed in this class, he has clear expectations and a teacher who is on his side wanting to help him succeed. Interview 11 also mentioned teaching learning skills to Tom such as how to take good notes and figure out where they need to put an effort. Additionally, only interview 10 stated if her other strategies did not work as her general way to approach Tom, she would use her "teacher voice and tough love," giving directives to Tom with controlling language, "You really need to focus right now, don't focus on that group, look over here, tell me what this is".

Furthermore, when they reflected on the scenarios one piece at a time, and what they would do when Tom "encounters setbacks and difficulties and expresses negative feelings," four participants who provided answers also demonstrated structure and involvement practices instead of control practices (this question was skipped for two participants due to time limit or they had talked about this issue in previous responses). For example, interview 1 mentioned asking leading questions that would guide Tom towards the solutions to tackle Tom's experiences of setbacks. Interview 2 mentioned needing to break down the information and trying different ways of teaching and explaining the problem, interview 6 also briefly mentioned needing to encourage Tom to try. Interview 2 stated needing to understand why Tom is experiencing the negative feelings and ignoring the feelings like saying "Don't be mad" would not work. Interview 4 also elaborated showing empathy was important, showing "I feel you, I know what it feels like to be frustrated." They did not use quick intervention, or internal contingency praising and smiling when students give right answers, the typical control strategies literature described when teachers handle the struggle and emotion problems.

However, when they reflected on what they would do for Tom's low engagement, and whether they would use rewards, privileges, incentives, all participants demonstrated relatively salient external motivation/contingency strategies. The controlling levels varied, some rewards were not too controlling but four participants also talked about highly controlling rewards that raised red flags. Interviews 2, 4, 11 talked about rewards that are not too much controlling but still undermines intrinsic motivation. Specifically, interview 2 talked about task completion contingent rewards, reminding Tom the task is worth points, providing extra credit to the whole class. Interview 4 talked about would use external motivators due to practicality to move things fast although he did not like this "cheap and easy way out." Interview 11 acknowledged teachers would want to work with intrinsic motivation, but illustrated four ways of offering "small incentives that do not really change the course or affect students too much," namely the winning team from a recitation activity receives extra credit, candy, does not need to clean up or can choose the topic for class presentations first. Those incentives are expected, contingent, outcome-based, adding another layer of control to the competition's pressure to win, which undermines autonomy but may compensate students' likely lack of intrinsic motivation for recitation with relatively small functional significance of control. Meanwhile, highly controlling ways of using rewards were reflected in interviews 1, 6, 10, and 11's responses. Specifically, interview 1 would give big

rewards to teams or individuals who can do the best for a big project and who "know it upfront they can get like a huge bag of candy at the end of semester." This performance based, contingent, expected, salient reward is highly controlling; those who get the reward would experience undermining of intrinsic motivation for the project as they would start to work for the reward, those who did not get the reward would experience even more undermining of competence and autonomy. Similarly, interview 10 stated would follow the reward strategies she mentioned earlier and thought really worked well: Students win tickets along the semester for behaving or performing well, and at the end of the semester those getting a good number of tickets get a big recognition from the school and can trade in the tickets for a big prize they want. Interview 6 mentioned rewarding students who "do the best (in terms of grades) and deserve it" and students know the reward policy "very clearly in the beginning." When interview 11 talked about using competition in her classroom activities in ways that "students would be really motivated by trying to win and not participating hurts the team," especially when the activities per se were fun (e.g., role playing for a stick figure making factory assembly line), this competition based reward is expected and contingent on performance/outcomes with pressure to win and pressure from peers, which undermines students' intrinsic motivation and motivates students mostly through external and introjected regulations. In addition to these controlling rewards, some participants also reflected on structure, involvement, autonomy strategies to engage Tom, which in a way balanced out the use of control. For example, interviews 1, 2, 4 repeated would work on Tom's inner motivation, and interviews 2, 6 repeated talking to Tom one on one to understand his concerns, as they talked about earlier. New elaborations included interview 2's mentioning of bringing chocolate in the first class (not as a reward) to build rapport with students, interview 10's encouragement of competence by being excited to Tom's success showing him he can do it, and interview 11's instructional strategies like role play, and involvement strategies of allowing late homework for those who experience home issues.

Meanwhile, when they reflected on what they would do when Tom "ignores your requirements, does not focus on tasks, cross talks over you, makes jokes with other kids, and doesn't finish assignments or turn them in late," all participants demonstrated salient control in various ways, again with interview 4 as an exception. For off-task issues and in response to the prompt if they would monitor students' progress closely making sure they must follow directions and do what they should be doing, five participants who provided answers chose control strategies

featuring external contingency and surveillance demands. For interviews 1 and 6, control was the only practice they reflected on. Interview 1 illustrated, "Again, it comes down to some hard discipline, I'm in favor of that, there is some motivation in not wanting to get sent to the principal's office or pulled off class and talked to by the teacher" and he would "absolutely" monitor students closely and "focus hard" on his class. Interview 6 also confirmed the students "must" focus on what they should be doing, and indicated would not offer help but instead show indifference to the kids who "cannot excel in other things and try to get teacher's attention by doing bad things like disrupting the class," which leaned towards internal contingency. Other participants mentioned use of external contingency and/or demands surveillance, but balanced with structure and involvement practices. Interview 2 would remind Tom the assignments worth points, and if "he's working on something else like playing a video game, then you need me like 'Hey, shut off the video game, you need to be taking notes." He also mentioned structure practices of monitoring behavior and understanding, by walking around the class checking on how students are doing, reminding them to focus. Interview 10 also confirmed surveillance strategy to keep students on task, but also would talk to the students showing some concern and openness to help (involvement). Interview 4 again talked about the empathy strategy he always used with students (involvement) and quietly reminding Tom to focus (structure), but if those strategies did not work and the issue was "chronic," he would rely on external contingency by making a deal with Tom to practically get him pay attention.

For cross-talking, making jokes, assignments issues, the use of control was even more clear for all participants, again except interview 4 who would use control as his last option. Control was their dominant or primary practice, sometimes balanced with other practices. The control practice featured external contingency, demands directives surveillance, and controlling language. Interview 1 emphasized his discipline strategy again, "my eating in the process is they need to have discipline to get them back on back." He also negatively judged students' not turning in homework, assuming they "have poor excuses at best" and would get zeros in grades, he would try to help by showing "this is where you currently are and you're currently failing in these aspects", and he "would not tell them per se that they must follow my requirements" but would give negative feedback by saying "If you don't follow the requirements, you will see a repeat of what's been happening, you'll fail assignments and get zeros." Interview 2 stated if Tom continues the behavior, he would say "Tom, stop, we need to work on this now", or ask Tom to go to the

hallway and say, "You can't do this." He also acknowledged "you have to have authority" and would emphasize Tom must follow the requirements. The control was balanced with structure and autonomy strategies a little by giving feedback on grades and explaining the point of having a good GPA. Interview 6 stated Tom would need discipline to understand his behavior was not acceptable, and focus on what he should be doing, but meanwhile teacher needed to figure out the reasons causing the behaviors. Interview 10 talked about using strategies from her student teaching, that they would have a bad seat for one student and a bad table that loose points for misbehaviors, and use the peer pressure where students gain social acceptance and recognition at their tables that was contingent on behaving well and not loosing points (external and internal contingencies). Similarly, students would be praised, allowed to run errands for her or have other responsibilities if they have "been the good person today." To further elaborate her group work and recognition strategies, the teacher talked about encouraging and praising students' work (structure recognition) and making peers applause for and encouraging each other (involvement caring climate). Interview 11 talked about a mixture of structure (manage behaviors) and control practices (punishment), by first reminding Tom the expectations and consequences of his behavior, and then having him sit by himself socially isolated from others, and assigning him some quick responsibilities to keep him from disrupting the class. For the exception interview 4, he talked about assuming he had tried empathy and other strategies that did not work, his last option would to "bring out my 'I'm your teacher do what I'm telling you.' which I really don't like to do that."

In addition, in section three of the interview when they were explicitly asked if they would consider the controlling teaching approach for Tom as their general approach to teach Tom, five participants acknowledged would use control for Tom (interviews 1, 2, 4, 6, 11), and the one who did not give a clear answer actually demonstrated very clear control for Tom in the previous section (interview 10). For example, interview 2 said, "I would take an overall controlling approach to Tom, he's just not engaged and has many problems." This information should be interpreted with caution, as not all participants had sufficient time to elaborate, and some were reminded at this point that the controlling approach was not the best approach theoretically. However, their responses still provided some hints for their general approach towards students like Tom.

In summary, this group was in general not tolerant with Tom's low motivation misbehavior issues, and demonstrated clear intentions to use control as a primary strategy, including external internal contingencies, demands directives surveillance, controlling language, and negative

feedback. Comparatively, structure and involvement practices were also emphasized in addressing all areas of problems, when Tom struggles (feature guidance; emotional responsiveness empathy dependability invest time), have frustrations (feature encouragement of competence; attending to negative affect), not engaged (feature instruction), and have behavior issues (feature monitor manage behavior). Autonomy was mainly used for low motivation issue, often in the form of working with inner motivation.

Growth-mindset group

The growth-mindset group showed relatively moderately low intentions to use control for Tom and similar students under "pressure from below." First, control was not a primary practice compared to other three practices for this group. Control was a tertiary/quaternary practice for four participants who demonstrated relatively low levels of control (interviews 3, 7, 8, 9), one participant showed a moderate level of control (interview 16) and one showed relatively high level (interview 5) but control was still secondary to other practices. All participants well balanced out control with other practices. Second, this group's responses had lower frequency of control codes applied compared to the fixed-mindset group, featuring external motivation/contingencies, demands directives surveillance for students' motivation and behavior issues. In addition, the quality of codes aligned with literature and areas of control were similar to the fixed-mindset group, but the elaborations were often brief and deemphasized control relative to other practices.

Specifically, in response to the first few open-ended questions of how they perceived Tom, what they did and would do with Tom and similar students, comparing with the fixed-mindset group, fewer participants in this group expressed negative perceptions of Tom, and they used less affirmative judgmental tone for Tom's ability motivation problems showcasing growth-mindset perspectives, which seemed to indicate a lower level of perceived pressure from Tom. Two out of the six participants expressed negative perceptions that "Tom was a 'bad' student for his disruptive behaviors" (interview 3) and "a difficult student to work with" (interview 7). Five participants thought Tom had lower ability or disability, but elaborated "everyone has high ability including Tom" (interview 3), "he has the potential to have very high ability" (interview 16), "current ability was low not reaching full potential" (interviews 5, 16), "not unable" (interview 7), and used the language of "struggling performance at lower end" (interview 8) and "not able to understand due

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to motivation" (interview 9) instead of using "low ability". Four participants commented on motivation, two thought Tom demonstrated amotivation (interviews 8, 9), one used the language "motivation was not so good" (interview 3), and one thought he had "middle level of motivation" (interview 7).

Similar to the fixed-mindset group, this group's initial open-ended practices to help Tom and their responses to Tom's experiencing setbacks and negative feelings featured structure, involvement, and autonomy. Only two participants elaborated use of control which was peripheral in their overall practices. Particularly, structure and involvement practices were primary for all participants, covering a relatively wide range of aspects, and well elaborated. Interview 3 mentioned spending time really trying to get to know Tom better through various ways, such as having personal conversations with him, observing him, and talking to parents, other teachers or counselors to understand him, as well as empathizing with Tom helping him to "relieve frustrations whether it's talking a walk down the hallway, going to the bathroom, getting a drink, whenever he needs a reset" (involvement—responsiveness, time). She also talked about managing Tom's behaviors such as giving him independent activities to keep him from disrupting others (structure monitor behaviors). Interview 5 talked about being patient and nice, letting Tom know it is okay he struggles and making sure he understand not everything is learned right away and the importance of putting in the time and effort, spending extra time to help Tom in class or in office hours whenever needed in ways he feels comfortable, monitoring his understanding and going through the problems step by step helping him to relearn the materials (involvement responsiveness, time, dependability; structure encouragement of competence, guidance, monitor understanding). Interview 7 mentioned connecting with Tom showing empathy and understanding to his frustrations and doubts (involvement responsiveness) and guiding him through the setbacks boosting his self-esteem (structure encouragement of competence). Interview 8 reported monitoring Tom's behavior by using a self-assessment sheet, and monitoring his understanding by having students using whiteboards and tallies, and going back to the basics breaking down the information for Tom (structure monitor behavior and monitor understanding, guidance), as well as helping her find common grounds with other students and feel less embarrassed by falling behind (involvement responsiveness caring climate). Interview 16 would spend a lot of time talking to Tom (involvement time), giving extra time at the end of lesson or shortening assignments if Tom expressed the need, and giving a lot of praise and encouragement for good work and effort,

reminding students they all have the abilities and can succeed (structure instruction flexible lesson time, scaffold, encouragement of competence). In addition, interviews 3, 8, and 16 mentioned channeling something Tom is really interested in to their lessons (autonomy inner motivation), and interview 5 mentioned organizational procedural autonomy by giving options for extra practices that cater for Tom's needs. The brief control practices participants mentioned were intended for misbehaviors. Interview 5 very peripherally mentioned being stern with Tom for not paying attention, and interview 8 very briefly mentioned having Tom siting in the corner by himself for distracting others.

However, the growth-mindset group showed differences for control from the fixed-mindset group when they reflected on what they would do for Tom's low engagement, use of rewards, and for Tom's off-task, disruptive, not following requirements and not turning in assignments behaviors. First, in terms of engagement and reward, although all six participants talked about using rewards that are controlling, the level remained relatively low and rewards were deemphasized by (a) more frequent and stronger expressions of the belief of rewards' negative effect, such as hindering intrinsic motivation, and (b) elaborations of making rewards small, unexpected, temporary, for everyone instead of for particular individuals/groups, for behavior or task completion/engagement more than for performance or outcomes, which decreased the rewards' functional significance of control. This pattern contrasted with the fixed-mindset group's reward strategies where four participants would use performance/outcome based rewards, all six would use expected contingent rewards, four demonstrated highly controlling rewards that raised red flags. Specifically, interview 3 would consider giving unexpected behavior reward when students like Tom show initiation to turn homework on time. Similarly, interview 5 would consider "surprise" (unexpected) reward when Tom stays on task to show Tom "Wow, I was doing a good job, I'm going to start doing this more often." Interview 5 would also consider "small rewards such as five minutes free time for the whole class for putting in the work" or "a very small amount of extra credit points to help them out wherever they need." The other four participants explicitly expressed that they would first work with students' intrinsic motivation and rewards hinder intrinsic motivation (interview 7, 8, 9, 16). Interview 8 first reaction was "I wouldn't [give rewards], because I would try to do intrinsic motivation instead of giving something physical," and when repeatedly prompted she mentioned would consider setting up stickers in the beginning of semester for everyone and not to single Tom out. Interview 9 also richly elaborated that "Not

[to give rewards] at first, it's a toxic thing where he is always expecting a reward for something not just doing it because he wants to do it. You want to start with the good channel, the intrinsic, not to basically have a carrot on a stick in front of the entire time." In the meantime, interview 9 also would consider rewards, but "it's definitely not the most ideal thing, they'd be like slapping on a Band-Aid for something that would hold things for a short time while you have time to come up with something that could help them be intrinsically motivated. You want to be fast and convenient so you say, 'I'll give you a reward if you get better on this'." Meanwhile, interviews 7 and 16 also specifically talked about other practices when they were prompted to reflect on rewards. Interview 7 explicitly stated first rewards are extrinsically motivating and he obviously wanted Tom to be intrinsically motivated, but he would consider behavior reward allowing kids to run errands such as going to the office grabbing things for students turning in homework on time, which kids loved. Then he mentioned a structure strategy for clear expectations and managing behaviors in his lab classes that students need to turn in their pre-lab assignments before they can cook in the lab. Interview 16 was very against individual incentives "because other students get angry or quit trying." An "incentive" she would consider for Tom reflected a structure strategy—giving Tom a shorter assignment with easier and different questions that he probably needs. She would also consider giving candy to students for completing tasks but "only if it's the only thing they'll function with, if they'll only do the work if they get candy afterwards, I don't think it's the right way to approach it" and "it needs to be class wide, one team wins a quiz game, half of the class gets it." In addition, four participants talked about additional general engagement strategies besides rewards. Interviews 5 and 8 elaborated on structure strategies, including encouraging students to participate, use different teaching strategies like group work (instruction), formative assessment of students' progress in class (monitor understanding), and starting from where students succeed rather than where they fail to work from there and remind students of their growth (encouragement of competence). Interviews 7 and 8 talked about involvement strategies, including being responsive to Tom's needs figuring out where he needs help and providing additional help whenever needed (responsiveness, dependability), and providing resources to Tom for his struggles (generic, resource). Interviews 3 and 7 mentioned autonomy strategies, including relating lesson to students' passion such as giving students a book about cars if they are really into card (inner motivation), seeking students' input for their learning involving them in the decision-making of where they would benefit (organizational procedural autonomy).

Second, for Tom's off-task issues, only two out of the five participants who responded indicated control, in contrast to the fixed-mindset group where all five participants who responded would use control. Interview 5 demonstrated a profile of high control throughout the interview for his low tolerance of misbehaviors low engagement. For off-task behaviors, he repeated his previous point of using a "hawk strategy" where he would hover over students being very strict about them doing what is required. Interview 9 first mentioned involvement strategy for not criticizing Tom for "bad behaviors" emphasizing teachers would always need to take into consideration of their relationships with students, and secondarily mentioned a strategy leaning towards control for using peer pressure for requested behaviors such that Tom would lose social acceptance from peers for disruptive behaviors. Other participants focused on structure strategies, such as instruction (involving older students to help and mentor due to teacher's limited availability for a big class, interview 3; flexible adaptable schedule of class if they need more time to go over a topic, interview 7), monitor manage behaviors (stand beside Tom as a reminder to focus, interview 3; asking questions to Tom to help him refocus, interview 7), monitor understanding (interview 7, keeping notes of Tom's progress in a binder; walking around class checking on students, interview 8), and guidance (offering an agenda and a program of actions to take on board, interview 8). A few also talked about involvement strategies (being social emotionally responsive not to single Tom out to embarrass him and spending time with him, interview 3), and organizational procedural autonomy strategies (providing a list of options for what students can do next if they finish early, interview 8).

Third, for disruptive behaviors and not following requirements, unlike the fixed-mindset group where five participants demonstrated salient control, although all six participants in the growth-mindset group demonstrated control featuring external contingency and demands directives surveillance, control was only salient in a degree to three participants among whom two also balanced control with other practices (interviews 3, 5, 16), and for the other three participants control was briefly mentioned as a peripheral option and well balanced out with other practices (interviews 7, 8, 9). Specifically, interview 3 would use candy or other rewards if students can stay quiet and listen, and in response to the prompt "would you assure your authority, make sure students must follow your instruction focus on what they should be doing?", she confirmed "I'd have to." But in the meantime she emphasized she would not yell at students or single them out. For interview 5 who had a high control profile across interview, he elaborated on enforcing

demands directives and strict schedule, "If it continues to happen, like the cross talking jokes, obviously I would try to shut that down as quickly as possible. I would tell them there is a time and place for fun, and there is a time and place to learn and now it would be the time for learning." Nonetheless, he also mentioned some structure and involvement strategies by talking to Tom after class discussing why this behavior should not be happening and making sure he understands the homework, and avoiding talking to him in front of other students to embarrass him. Interview 16 would ask Tom to sit in a corner, and acknowledged "I'd have to say that [emphasize students must follow requirements focus on what they should be doing]" when prompted, which has relatively high functional significance of control. However, she also balanced the control strategy with structure and involvement strategies, including monitoring behavior talking to Tom one on one reminding Tom how his behaviors hinders his own and other students' learning, and showing concerns and being careful about relationship with Tom not to embarrass him and discourage him to try as hard. Interview 7 briefly mentioned would send Tom to the principal's office and tell him "You can't push me around." However, this practice is well balanced by her rich elaboration of involvement and structure strategies, attending to Tom's negative feelings showing empathy, having one-on-one conversations showing concern and understanding his situation, showing respect and being there to help and support him whenever needed (involvement responsiveness, dependability), as well as adjusting the difficulty level of assignments, giving extra time and extending deadlines for assignments, and giving help and breaking down the assignments to help Tom with his struggles (structure instruction guidance). Similarly, interview 8 briefly mentioned giving Tom a teacher look, a brief warning, having him sit in a corner, and specifically mentioned would not tell students "you should follow my directions and do what I asked you to do, because it would shut students out, make them feel frustrated, and students like ownership of what they're learning, they need to be given choice." This brief mention of control was also well balanced out with autonomy and structure strategies, including allowing students to do what they do in learning, giving them choices (organizational procedural autonomy), and establishing rules in the beginning and reminding students to behave as a first step to manage behaviors (structure expectations, monitor behaviors). Interview 9 also very briefly talked about using internal contingency for telling students "Your peers will see you as a better person if you are able to stay on task," which was balanced with a general monitor behavior strategy.

In addition, in section three of the interview when they were explicitly asked if they would consider the controlling teaching approach for Tom, two of the six participants chose the controlling approach for Tom but also mentioned would use the autonomy supportive approach (interview 5, 16), two chose the controlling approach but their responses actually demonstrated intentions to use structure (interviews 3, 8), and the rest two participants emphasized would not use the controlling approach which was more harmful (interview 7, 8). This is different from the fixed-mindset group where all five participants who answered the question chose control for Tom and did not mention use of autonomy.

In summary, the growth-mindset group in general would resort to control strategies for Tom's low motivation misbehavior issues, but different from the fixed-mindset group, control was not a primary practice they chose relative to other practices. They demonstrated lower level of control for using rewards to engage Tom, and lower relative saliency of control to handle Tom's misbehaviors (off-task, cross talking, disobeying assignments, etc.) which were better balanced out with other practices. The areas of control included external internal contingencies, demands directives surveillance, controlling language, strict schedules, and internal contingency. Comparatively, structure and involvement practices were more emphasized and well elaborated in addressing all areas of problems, when Tom struggles and have negative affect (feature encouragement of competence, guidance, monitor behaviors; responsiveness, dependability), not engaged (feature instruction, monitor understanding, monitor behavior, encouragement of competence; responsiveness, dependability, time), and have behavior issues (feature monitor manage behavior, instruction, monitor understanding, guidance; responsiveness, dependability). Autonomy was less elaborated and emphasized comparatively, but also used for motivation/engagement issues (feature organizational autonomy, inner motivation) and for Tom's behaviors issues (organizational autonomy).

Mixed-mindset group

The mixed-mindset group's responses to Tom's scenarios were largely similar with the growth-mindset group, and somewhat demonstrated an in-between profile of control compared with the fixed- and growth-mindset groups. Control was not a primary practice compared to other three practices for this group and the relative saliency of control varied for different individuals.

Control was a tertiary/quaternary practice for two participants who demonstrated relatively low levels of control (interviews 14, 17), one participant showed a moderate level of control (interview 13) and two showed relatively high level (interviews 12, 15) but control was still secondary to other practices. All participants balanced out control with other practices (esp., interviews 14, 17). Second, this group's responses had lower frequency of control codes applied compared to the fixed-mindset group, featuring external motivation/contingencies, demands directives surveillance for students' motivation and behavior issues. In addition, the quality of codes aligned with literature and areas of control were similar to the growth- and fixed-mindset groups, but control was often brief and secondary relative to other practices for some participants while some participants had richer elaborations and examples.

Similar to the growth-mindset group and different from the fixed-mindset group, only one of the four participants who gave clear responses in the mixed-mindset group expressed negative perceptions towards Tom (interview 13, "awful" student for misbehaviors), and the four participants perceived Tom as having lower motivation/lacking motivation had used less affirmative tone to describe Tom's lower ability with growth-mindset perspectives (interview 12 "endless ability"; interview 13 "lower ability motivation but temporary having the potential to improve"; interview 14 "cannot tell ability because he has not given the opportunity to show his ability"; interview 15 "everyone has high ability"). Akin to the other two groups, this group's open-ended responses to help Tom and responses to tackle his setbacks and negative affect also featured involvement, structure, autonomy and no one mentioned control, and like the growth-mindset group, their involvement and structure practices were salient and well elaborated. For example, interview 13 elaborated on her involvement strategies, including keeping pursuing students who do not care about school at all and really showing teacher's cares and concerns with a concrete example from her student teaching, offering office hours and extra study groups after school making students feel they can ask for help whenever needed, and emphasized instead of commanding students to do things, showing teacher cares and how students would benefit work much better (responsiveness, time, dependability). Interview 15 elaborated on structure strategies, using a variety of teaching strategies, really having one-on-one time with Tom guiding him through setbacks and emphasizing he is struggling does not mean he cannot do it, teacher affirmatively believes in him and encouraging him to take the time and effort.

Regarding handling engagement issues and using of rewards incentives, similar to the growth-mindset group and different from the fixed-mindset group, the mixed-mindset participants also demonstrated lower level of control where their use of controlling rewards were more balanced out with structure autonomy involvement practices and does not raise red flags, the elaborations of rewards were generally brief, and the rewards mentioned were generally small and behavior or engagement based. Interview 12 would give candy extra credit to encourage participation, but acknowledged it would not be the best way, giving feedback and recognition would be better to encourage students. Interview 13 mentioned "verbal rewards" which meant structure recognition strategies, and she would consider recording participation points to push participation where "it's not anything extra, they're just working towards that." She would also explain the reason why getting a good grade is helpful for students' future (autonomy), arranging weekly check-up meetings with Tom spending additional time to ensure his understanding and making sure his awareness of opportunities and resources to get help (structure, involvement). Interview 14 talked about making lessons interesting for Tom and how he would feel more comfortable in his place in the classroom (autonomy, involvement), and if he is into cars and computers, giving him a car toy when he finishes an assignment or allowing computer game in his free time (control). Interview 15 did not want to use rewards which "are easy and students can just fake engagement," instead she talked about teaching Tom a different learning technique adjusting her teaching strategy (structure) and incorporate what he likes into the lesson such as doing a project about a specific period of history he is interested in (autonomy). Interview 17 stated that making students feel they are important to the teacher, their opinions matter, and really listening to students and making them know they can always come to teacher for help (involvement), sending them to the principal's office when they act up would make students think they are not important. However, external motivators like candy for "positive reinforcement" would be used.

Regarding Tom's issues of being off-task, cross-talking, joking, and ignoring requirements assignments, four out of five participants in the mixed-mindset group demonstrated salient/somewhat salient use of control but three of these participants balanced control with other practices or reported using some forms of control but not using other forms (interviews 12, 13, 14). The other participant only very briefly mentioned control which was well balanced out by other practices. The mixed-mindset group in a way displayed a middle ground between the other two groups for use of control—less than the fixed-mindset group (control was salient for five out

of the six participants), but more than the growth-mindset group (control was salient for three out of the six participants). The major areas of control were similar to the other two groups. Specifically, interview 15 demonstrated the most salient control, by keeping a strict schedule not allowing Tom to mess up it due to practicality like standard testing (strict schedule), separating Tom from the rest of class always keeping an eye on him, not putting him back only if he proves willingness not to distract, otherwise it would be "a permanent seating situation." (external contingency, surveillance). Interview 12 would "put my foot down" when Tom is affecting others, and telling him "You can't be acting like that" (external contingency, controlling language), but also briefly mentioned would have a private conversation with Tom asking what is going on and if he needs help (involvement). Interview 13 reported would not yell at Tom, teacher should not lose temper and students' respect, but would tell him with controlling language "I don't know why you are acting up, but I need you to pay attention. And if you don't want to pay attention, at least just like sit in class and don't distract the other students from their learning." Interview 14 would put Tom closer to her so that he would pay attention, and confirmed would use the surveillance strategy monitoring Tom closely when prompted; she would also giving students teacher responsibilities or free time if they are on-task, having a teacher talk with Tom when he cross talks telling him his behavior is not acceptable and he needs to engage in the tasks (external contingency, surveillance). But she also specifically emphasized she would not demand students to follow her directions, but instead would put meaning behind requested behaviors so they understand why, and "in order for students to be effectively taught, they have to be in control of their learning, that motivates them. Just by spewing directions at them, they won't want to do the assignments. By saying, 'Wow, this is really interesting, this really applies to your life,' then they'd want to be able to do it." (autonomy rationale, inner motivation, relevance). Her control strategy was also well balanced by structure practices of communicating the expectations clearly getting in the same page with Tom and guiding him through homework and extra practice with encouragement (expectations, guidance). Interview 17 talked about using involvement autonomy structure strategies first, by giving Tom breaks when he is bored to allow him to refocus, explaining why it is important to follow the requirements, and monitoring how his behaviors is affecting his understanding. Then she briefly mentioned control "if he doesn't care, I would monitor him closely a little bit on his back about things."

In addition, similar to the growth-mindset group and different from the fixed-mindset group, when explicitly reflected on if they would adopt a controlling approach for Tom in section three of the interview, three of the five mixed-mindset participants would adopt control (interviews 12, 13, 15) but two of them balanced with autonomy (interviews 12, 15), the rest two participants chose the autonomy supportive approach for Tom (interviews 14, 17) and one specifically emphasized would not chose control (interview 17).

In summary, the mixed-mindset group in general would resort to control strategies for Tom's low motivation misbehavior issues like the other two groups. However, similar to the growth-mindset group and different from the fixed-mindset group, control was not a primary practice they chose relative to other practices. They demonstrated lower level of control for using rewards to engage Tom, and lower relative saliency of control to handle Tom's misbehaviors (off-task, cross talking, disobeying assignments, etc.) which were better balanced out with other practices. The mixed-mindset group showed nuanced differences from the growth-mindset group, mainly for their relatively higher saliency of control used to handle misbehaviors, and in a degree represented a middle ground in terms of control between the growth- and the fixed-mindset groups. The areas of control they illustrated included external internal contingencies, demands directives surveillance, controlling language, and strict schedules. Comparatively, structure and involvement practices were more emphasized and well elaborated in addressing all areas of problems, autonomy was also relatively frequently mentioned, when Tom struggles and have negative affect (responsiveness; encouragement of competence, monitor understanding and feedback/recognition; organizational autonomy inner motivation), not engaged (feature responsiveness, time; instruction, guidance, monitor understanding, monitor behavior, feedback recognition), and have behavior issues (feature guidance, monitor behavior; responsiveness; rationale).

Minor differences

In addition, some minor differences across mindset groups included the following. First, both across interview and under "pressure from below," the growth- and mixed-mindset groups demonstrated slightly higher intentions to enact structure than the fixed-mindset group. As shown in Table 7, the only participant received a low summative rating for structure was from the fixed-mindset group who often did not mention structure practices with very brief elaborations, and

maintained a relatively "let go" style with her classroom management (interview 6). Additionally, the growth-mindset groups had higher frequencies for coded structure practices.

Second, the growth- and mixed-mindset groups demonstrated higher intentions to enact involvement than the fixed-mindset group across interview. As shown in Table 8, comparatively, lower percentage of participants in the fixed-mindset group received a high summative rating. Half of the fixed-mindset participants did not receive a high rating, for reasons such as involvement being a secondary intended practice without rich elaborations (interview 1), high frequency but very limited range of codes applied (interview 2), and involvement was emphasized but secondary and greatly undermined by control practices (interview 10). Moreover, only the fixed-mindset group received a few codes for low involvement when participants expressed negative attitudes towards and ways of handling student social emotional problems (e.g., interview 1). In contrast, under "pressure from below," the fixed-mindset group's involvement enhanced to similar levels with the other two groups. The fixed-mindset group frequently stated using involvement practices to help the students like Tom and Bonnie who expressed frustration and doubts in their ability and are struggling to learn, by showing cares, concerns, attention and investing time to help them. For example, one participant talked about showing cares instead of belittling students' struggles when responding to Tom's and Bonnie's scenarios, "A good teacher can obviously get through a lot better than a teacher who doesn't care or a teacher who is belittling. I had a teacher who lost sight of what it meant to be a student who struggles and he just made me feel real small, real dumb and real bad at the subject, and I'll never be like him" (interview 1, fixed-mindset).

Third, the growth- and mixed-mindset groups had lower intentions to enact control than the fixed-mindset group across interview and under "pressure from below." All groups had relatively moderate to low intentions to enact various aspects of control practices, with the growth-mindset group showing lowest intentions. As shown in Table 6, comparatively, relatively higher percentage of participants in the growth-mindset group had low intentions for control. For example, for the growth-mindset group, control was mostly limited to external contingencies and internal contingencies for interviews 3, 8, 9; control was very briefly mentioned and limited to external contingencies, directives, and strict schedules when running out of options for interviews 7. The differences between the mixed- and the fixed-mindset groups were mainly shown in the mixed-mindset group's relative briefer elaboration and lighter emphasis on control relative to other

practices. The mixed-mindset group demonstrated a relatively middle ground between the growth- and fixed-mindset groups; their intentions for control in general were slightly lower than the fixed-mindset group but much lower under "pressure from below," and slightly higher than the growth-mindset group in general and similar with the growth-mindset group under "pressure from below."

Fourth, the mixed-mindset group had relatively lower intentions to enact autonomy across interview but relatively higher intentions to enact autonomy under "pressure from below" than the growth- and fixed-mindset groups. As shown in Table 5, mixed-mindset group showing slightly lower intentions across interview, higher percentage of participants received a low rating for autonomy and none had a high rating. Reasons for the relatively lower ratings mainly included limited frequency of only two to three out of the five practices applied (interview 12, 13, 15). In addition, the growth- and fixed-mindset groups received codes for the whole range of autonomy practices but the mixed-mindset group was limited to four practices. Under "pressure from below," the mixed-mindset group was relatively highest in autonomy, with 20% participants rated high and 80% rated moderate. Compared with across interview, the growth- and fixed-mindset groups remained similar profiles for autonomy under "pressure from below," while the mixed-mindset group demonstrated an increase in autonomy. Two participants remained moderate (interview 15), while other three participants either became high from moderate (interview 14) or became moderate from low (interviews 12, 13). Compared to general situations where the mixed-mindset group's emphases were more on the structure, involvement and control practices, under "pressure from below," the mixed-mindset group demonstrated more attention to students' motivation problems, and they attempted to address the motivation problems by providing more autonomy such as organizational procedural autonomy and working with students' inner motivation. Although the attention to autonomy was still secondary to structure and involvement for the mixed-mindset group, it was relatively higher than the other two groups in terms of relative saliency compared with other practices for each group.

Finally, all mindset groups expressed similar beliefs about autonomy support and control, but the fixed-mindset group tended more to express the belief that motivating students is difficult. Nine participants more or less expressed that belief, while four were in the fixed-mindset group who sometimes appeared helpless. For example, one participant in the fixed-mindset group stated, "I think the hardest part with teaching is the motivation and management of my classroom. I think

that's the hardest the hardest part" (interview 10 fixed-mindset). Another mentioned, "I'm only human. I can only teach things so many ways and at a certain point if I've taught it and taught it and they've taken notes and they've really tried…sometimes my frustration with that situation gets the better of me and you know I sometimes give up to some students" (interview 4, fixed-mindset).

Field journals

About half of the participants reported they observed autonomy practices ($n = 50$), while some of the practices from our lens would be classified as structure or involvement. The other half of the participants reported observing control practices ($n = 51$). Overall, the largest number of participants intended to enact structure and autonomy and the smallest number of participants intended to enact control, and the growth-mindset group was most frequently coded for intentions to enact autonomy and not using control. Participants in all three mindset groups tended to believe control is ineffective but needed, and some believed autonomy is effective but can be ineffective and difficult.

Whole sample

Table 11 presents the codes applied, and frequency counts and percentages for the whole sample for observed practices, intended practices, and beliefs about autonomy support/control. Overall, structure and autonomy were the most frequently coded intended practices, while control was the least frequently coded intended practice. Thirty-seven participants reported intentions in all areas of what we categorized as structure, featuring monitor behaviors, monitor progress, guidance, instruction, and clear expectations. Thirty-four participants reported intentions in all areas of what we categorized as autonomy, featuring rationale relevance and organizational procedural autonomy. Seventeen participants reported intentions for what we categorized as involvement, featuring responsiveness and a few also mentioned time and dependability. Only 10 participants reported intentions for what we categorized as control, featuring external contingency (punishment, rewards, grades, teacher rules), while 17 explicitly reported intentions for not doing control, including refraining from using controlling language and external motivators.

Compared to intended practices, participants frequently talked about beliefs about autonomy support and control. Forty-seven participants believed that control is ineffective, it frustrates

students, motivates students through fear and external regulation, makes students hate the teacher and learning, results in low-quality engagement, causes students to act out more, and jeopardizes achievement. Thirty participants also believed control has some pros, including for example directing students to behave properly and do the work, giving immediate solutions to some problems, and extrinsic motivators works for some students. Twelve participants also believed control is necessary or unavoidable due to practical constraints, mainly due to "pressure from below," such as student low motivation low engagement, behavior and attitude problems, large class size, and students' not understanding instructions and making mistakes. A few also mentioned "pressure from within" such as teachers' feeling the pressure to do well, bad mood or frustration, and valuing disciplines and quiet classroom.

Meanwhile, thirty-nine participants reported the belief that autonomy is effective, it promotes internal motivation, learning and success, engagement and hard work, as well as supports students' needs for autonomy, competence, and relatedness. An example for autonomy is "Students need to feel in control of their own learning/work at their own pace/hate being told what to do" (field journal 54, fixed-mindset). An example for competence is "It makes students feel confident when answering or giving ideas in the future" (field journal 58, mixed-mindset). An example for relatedness is "It shows she understands the students and it is a way she can get close to her students and make them feel comfortable in the classroom" (Field journal 89, growth-mindset). On the other hand, 18 participants believed autonomy can be ineffective and difficult. Some reported that autonomy may not work best in classroom management, can cause chaos, students may take advantage of the teacher, and give too much freedom. Some also reported that autonomy can be time consuming and difficult due to practical constraints.

Table 11. Codes applied, frequency and percentage for observed practices, intended practices, and beliefs about autonomy support/control for the whole field journal sample ($N = 103$)

Category	Sub-category	Codes	Frequency	
			Frequency of codes	Number and percentage of participants receiving the codes
Observed practices	Autonomy	NA	111	50, 49.50%
	Control	NA	110	51, 50.50%
		Total	221	101
Intended practices	Autonomy	Rationale relevance	14	14
		Organizational procedural	14	13
		Inner motivation	5	5
		Content responsiveness	5	5

Table 11 continued

		Cognitive autonomy	2	2
		Total	41	34, 33.01% (34/103)
	Control	External contingencies	7	7
		Strict monitoring/surveillance	2	2
		Tight expectations/requirements	1	1
		Total	10	10, 9.71% (10/103)
	Involvement	Responsiveness	16	16
		Time	4	4
		Dependability	2	2
		Caring climate	1	1
		Total	24	17, 16.50% (17/103)
	Structure	Monitor/manage behaviors	9	9
		Guidance scaffold	9	9
		Monitor progress	8	8
		Instruction	7	7
		Clear expectations	7	7
		Feedback recognition	4	4
		Encouragement of competence	3	3
		Encouragement of effort/engagement	3	3
		Total	52	37, 35.92% (35/103)
	No control	No controlling language	12	11
		No external motivators	5	5
		No demands	2	2
		Total	23	17, 16.50% (17/103)
Beliefs about autonomy support/ control	Control is ineffective	Frustrates students; harm motivation; students hate teachers and learning; students rebel and act out more; engagement is low quality, etc.	115	47
	Autonomy is effective	Promotes internal motivation; supports needs for relatedness, autonomy, competence; engagement is high quality; promotes learning	75	39
	Control has pros	Make students behave properly and do work; give immediate solution to problem; extrinsic motivator works for some students, etc.	40	30
	Autonomy can be ineffective or difficult	Ineffective in classroom management; can cause chaos; time consuming, etc.	22	18
	Control is needed due to practical constraints	"pressure from below"; "pressure from within"; "pressure from above"	16	12
	Other codes	e.g., autonomy is easy	7	7
	Total	NA	276	87

Note. A total of 99 participants reported observed practices were clear, some reported both observations of autonomy and control, 4 participants' responses were unclear and not coded; "No control" for intended practices were coded when participants stated explicitly would not use control; some responses were generic and coded into the primary codes instead of their subcodes; the percentages of participants receiving the codes for each sub-category was calculated by using the number of participants receiving the codes for the sub-category divided by the number of field journal participants ($N = 103$)

Case comparisons

Table 12 presents case comparisons, showing numbers and percentages of participants for observed practices, intended practices, and beliefs about autonomy support/control within each case. The differences across cases were mostly demonstrated by the quantitative differences.

Comparing the three mindset groups, larger percentages of participants reported intentions for autonomy and for not using control were from the growth-mindset and mixed-mindset groups, especially the growth-mindset group and the mixed-mindset group showed a relative middle ground (Autonomy: growth-mindset group 42.86%; mixed-mindset group 34.29%; fixed-mindset group 26.32%; No control: growth-mindset group 35.71%, mixed-mindset group 18.57%, fixed-mindset group 5.26%). All group had similar percentages of participants having intentions for control (around 10%). For autonomy, all groups featured organizational procedural autonomy and rationale relevance, with rationale relevance more salient for the growth-mindset group. Organizational procedural autonomy included giving students options for activities/class procedures/assignments (e.g., field journal 79, 90, mixed-mindset), and flexible lesson plans to support autonomy involving students in the decision-making of materials, activities, time needed (e.g., field journal 48, 75, fixed-mindset; field journal 98, mixed-mindset). Rationale relevance included giving rationale for required tasks/activities (e.g., field journal 37, growth-mindset) and making connections to students' life (e.g., field journal 19, mixed-mindset). For "No control," the growth- and fixed-mindset groups featured refraining from using controlling language, and the growth-mindset group also featured refraining from using external contingencies. For example, one mixed-mindset participant talked giving students options for class activities, "If I was to enact this practice, I would allow my students to choose their activity as Mrs. [practicum teacher] does, she goes through the list of activities and acknowledges suggestions from students and adds to the list if they are appropriate to the objectives she has set for the day" (field journal 102, mixed-mindset). One growth-mindset participant talked about giving rationale for required activity and not using controlling language, "One thing I would change is the language she uses, instead of saying 'You should be reading right now,' I would say 'Just think of how much cool information you could be learning by reading now!'" (field journal 109, growth-mindset). Another growth-mindset participant talked about giving rationale and not using external motivators for required activities, "I would first lessen the amount of rewards given to students, and I would address the issue of demanding students to do this and that and not give a reason, and explain to students why

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things are the way they are so that they fully understand" (field journal 52, growth-mindset). In addition, when participants talked about intentions for control, the intentions mostly limited to using external contingencies, such as stickers/reward tickets, punishment (e.g., field journal 6, mixed-mindset), seeking compliance with teacher rules (e.g., field journal 26, growth-mindset), discipline (field journal 85, fixed-mindset).

Moreover, higher percentage of participants in the mixed-mindset group reported intentions for structure (41.43%) while the growth- and fixed-groups had similar percentages (28.57% and 31.58% respectively). The structure practices had a wide range, and there were no clear differences across groups for the types of practices. The mixed-mindset group's most frequently coded structure practices were guidance, monitor behavior, and clear expectations. The growth-mindset group's most frequently coded practice was monitor behavior, and the fixed-mindset groups' most frequently coded practices were instruction and monitor progress. Comparatively guidance and monitor behavior were relatively most frequently coded practices across three groups. For example, one mixed-mindset participant talked about guiding and helping struggling students, "If I noticed the students were struggling with the same types of problems, I would call everyone together and relate to something they can all relate to and understand and get the proper time they need to solve the problem" (interview 50, mixed-mindset). Another mixed-mindset participant talked about monitor students' behavior without being controlling, "The thing I would change is her tone of voice, you could tell a student to be quiet in a nice way which gets your points across without making the students feeling bad about themselves, no one responds well to being yelled at" (interview 57, mixed-mindset).

Furthermore, the largest percentage of participants reporting intentions for involvement was from fixed-mindset group (31.58%), followed by the growth-mindset group (21.43%), then the mixed-mindset group (12.86%). All groups' involvement practices featured social emotional responsiveness covering aspects like showing caring, friendship, rapport, respects and understanding (e.g., field journal 103, 113, fixed-mindset), attending to negative affect (e.g., field journal 109, growth-mindset), and having one-on-one conversations with students understanding their problems and struggles (field journal27, mixed-mindset). The fixed-mindset group also featured time. For example, one fixed-mindset participant talked about caring and building rapport with students by being "very enthusiastic about students' interests and excitement" (field journal

113, fixed-mindset). Another fixed-mindset participant talked about caring students and spending time with students for what's important for them, "The teacher was willing to help with a task [job application] that's not school related, the student was very grateful. I would gladly take this practice into my classroom as I have seen firsthand this builds positive relationships" (field journal 103, fixed-mindset).

In addition, all mindset groups similarly tended to believe control is ineffective (growth-mindset group 57.14% of participants; mixed-mindset group 55.71%; fixed-mindset group 52.63%) but necessary (growth-mindset group 42.86%; mixed-mindset group 28.57%; fixed-mindset group 26.32%) or chosen because of practical constraints. For example, one growth-mindset participant reported observing the practicum teacher yelling at students to have them behave properly and do work, and believed "this practice is able to address the students' problems immediately, however, students could start to harbor negative feelings if this continues and it could affect how they act in the long run" (field journal 12, growth-mindset). This response showed the belief that control can be necessary or useful but ineffective. Moreover, of those who reported autonomy is effective, the largest percentage of participants were from the fixed-mindset group (63.16%; growth-mindset group 14.29%; mixed-mindset group 47.14%). Only a few and about equal percentages of participants from each group reported autonomy can be ineffective or difficult. For example, one fixed-mindset participant reported that the observed autonomy support practice is effective, "There is so many pros of this practice, the students understand why it is important and feel comfortable around the teacher" (field journal 3, fixed-mindset).

Table 12. Number and percentage of participants for observed practices, intended practices, and beliefs about autonomy support/control within each field journal case

Category	Sub-category	Case	Most applied codes	Number and percentage of participants receiving the codes within case
Observed practices	Autonomy	Growth-mindset	NA	5, 35.71% (5/14)
		Mixed-mindset	NA	42, 60.00% (42/70)
		Fixed-mindset	NA	11, 57.89% (11/19)
	Control	Growth-mindset	NA	12, 85.71% (12/14)
		Mixed-mindset	NA	36, 51.43% (36/70)
		Fixed-mindset	NA	7, 36.84% (7/19)

Table 12 continued

Intended practices	Autonomy	Growth-mindset	Rationale relevance	3, 21.43% (3/14)
			Organizational procedural	2, 14.29% (2/14)
			Total	**6, 42.86% (6/14)**
		Mixed-mindset	Organizational procedural	10, 14.29% (10/70)
			Rationale relevance	9, 12.86% (9/70)
			Total	**24, 32.29% (24/70)**
		Fixed-mindset	Organizational procedural	2, 10.53% (2/19)
			Rationale relevance	2, 10.53% (2/19)
			Total	**5, 26.32% (5/19)**
	Control	Growth-mindset	External contingency	2, 14.29% (2/14)
			Total	**2, 14.29% (2/14)**
		Mixed-mindset	External contingency	4, 5.71%(4/70)
			Total	**6, 8.57% (6/70)**
		Fixed-mindset	External contingency	1, 5.26% (1/70)
			Total	**2, 10.53% (2/19)**
	Involvement	Growth-mindset	Responsiveness	3, 21.43% (3/14)
			Caring climate	1, 7.14% (1/14)
			Total	**3, 21.43% (3/14)**
		Mixed-mindset	Responsiveness	8, 11.43% (8/70)
			Time	2, 2.86% (2/70)
			Total	**9, 12.86% (9/70)**
		Fixed-mindset	Responsiveness	5, 26.32% (5/19)
			Time	2, 10.53% (2/19)
			Total	**6, 31.58% (6/19)**
	Structure	Growth-mindset	Monitor behavior Guidance, monitor progress, clear expectations, encouragement (equal frequency)	2, 14.29% (2/14)
			Total	**4, 28.57% (4/14)**
		Mixed-mindset	Monitor behavior, feedback recognition, clear expectations (equal frequency);	6, 8.57% (6/70)
			Instruction, monitor progress (equal frequency)	5, 7.14% (5/70)
			Total	**29, 41.43% (29/70)**
		Fixed-mindset	Monitor progress	2, 10.53% (2/19)
			Instruction	2, 10.53% (2/19)
			Total	**6, 31.48% (6/19)**
	No control	Growth-mindset	No controlling language	3, 21.43% (3/14)
			Total	**5, 35.71% (5/14)**
		Mixed-mindset	No controlling language	9, 12.86% (9/70)

Table 12 continued

				Total	13, 18.57% (13/70)
		Fixed-mindset	No external contingency		1, 5.26% (1/19)
				Total	**1, 5.26% (1/19)**
Beliefs about autonomy support/control	Control is ineffective	Growth-mindset	Total		8, 57.14% (8/14)
		Mixed-mindset	Total		39, 55.71% (39/70)
		Fixed-mindset	Total		10, 52.63% (10/19)
	Autonomy is effective	Growth-mindset	Total		2, 14.29% (2/14)
		Mixed-mindset	Total		33, 44.14% (33/70)
		Fixed-mindset	Total		12, 63.16% (13/19)
	Control has pros	Growth-mindset	Total		6, 42.86% (6/14)
		Mixed-mindset	Total		20, 28.57% (20/70)
		Fixed-mindset	Total		5, 26.32% (5/19)
	Autonomy can be ineffective or difficult	Growth-mindset	Total		2, 14.29% (2/14)
		Mixed-mindset	Total		15, 21.43% (15/70)
		Fixed-mindset	Total		2, 10.53% (2/19)
	Control is needed/ unavoidable due to practical constraints	Growth-mindset	Total		3, 21.43% (3/14)
		Mixed-mindset	Total		7, 10% (7/70)
		Fixed-mindset	Total		3, 15.79% (3/19)

Note. Growth-mindset case $n = 14$; mixed-mindset case $n = 70$; fixed-mindset case $n = 19$. For intended practices, "control" and "no control" had narrow range of applied codes and for one or two cases only had one applied code, hence only one mostly applied code was presented here; beliefs about autonomy support/control were frequently coded, but considering this category is not the focus of the study, only total frequencies of codes applied for each case were presented here

Results synthesis

Table 13 summarized the main findings. Both interviews and field journals suggest overall, participants demonstrated high intentions to enact structure and relatively low intentions to enact control. For case comparisons, first and most importantly, both data sources suggest that the growth- and mixed-mindset groups had relatively lower intentions to enact control than the fixed-mindset group. Although field journals showed that intentions for control across groups were

similar, the growth- and mixed-mindset groups also reported much more frequently than the fixed-mindset group for intentions of not enacting control. Related to this pattern, both data sources suggest participants tended to believe control was ineffective but necessary, and no salient differences existed among the belief patterns across mindset groups. Third, a minor similarity across data sources is that the mixed-mindset group had higher intentions to enact structure than the fixed-mindset group.

The differences are that overall, the interview participants demonstrated high intentions to enact involvement while this pattern was not salient for the field journal participants; likewise, the field journal participants demonstrated relatively high intentions to enact autonomy while this pattern was not salient for the interview participants. However, interview participants well demonstrated autonomy support practices overall as well, when autonomy, structure, involvement were combined into the umbrella construct of broad autonomy support. For case comparisons, first, the three interview mindset groups demonstrated similar levels of intentions to enact autonomy (narrow conceptualization), while field journal growth- and mixed-mindset groups demonstrated higher intentions. Second, the interview growth-mindset group had higher intentions to enact structure than the fixed-mindset group, the field journal did not support this result. Third, the interview growth- and mixed-mindset groups had higher intentions to enact involvement, despite that under "pressure from below" the fixed-mindset group showed similar levels of intentions. However, the field journal fixed-mindset group showed higher intentions to enact involvement than the growth- and mixed-mindset groups.

In general, the two data sources are highly convergent regarding control. Participants had relatively low intentions for control and holding negative beliefs about control, and the growth- and mixed-mindset groups had lower intentions for control than the fixed-mindset group. The data sources were relatively convergent for structure that participants had high intentions for structure and the growth- and mixed-mindset groups having relatively higher than or at least equal intentions to enact structure with the fixed-mindset group. The data sources were relatively divergent for autonomy and involvement. The field journal participants showed high intentions for autonomy while interview participants showed moderate to low intentions when autonomy was conceptualized separately from structure and involvement; the field journal participants showed relatively low intentions for involvement while interview participants showed high intentions.

These results were understandable given the field journal's prompt was about autonomy support and thus participants focused on discussing autonomy. Field journal growth- and mixed-mindset groups also showed higher intentions for autonomy and lower intentions for involvement, while interview groups did not show salient differences for autonomy when it was conceptualized separately from structure and involvement, but fixed-mindset group showed relatively lower intentions for involvement.

Table 13. Summary of main results from interviews and field journals

		Whole sample		Case comparison	
		Interview	Field journal	Interview	Filed journal
Intentions to enact autonomy, control, structure, involvement	**Across interview**	*All participants had high intention for structure involvement, moderate-low intentions for autonomy control;	*Largest number of participants intended autonomy structure, smallest number of participants intended control (Structure autonomy most frequent, involvement second, not using control third, control last)	*All groups had high intentions for structure (primary practice) involvement (secondary practice), moderate-low intentions for autonomy control (tertiary practices); **Growth- & mixed-mindset groups slightly higher intention for structure than fixed-mindset group; **Growth- & mixed-mindset groups higher intention for involvement than fixed-mindset group; **Growth- & mixed-mindset groups lower intentions for control than fixed-mindset group, esp. growth-mindset group; **Mixed-mindset group slightly lower intention for autonomy than growth- & fixed-mindset groups; *Differences among groups not salient;	*Larger percentages of participants in growth- & mixed-mindset groups reported intentions for autonomy and not using control than the fixed-mindset group, esp. the growth-mindset group; *Similar percentages of participants in all groups reported intentions for control; *Larger percentage of participants in mixed-mindset group reported intentions for structure than growth- & fixed-mindset groups who had similar percentages; *Larger percentage of participants in fixed-mindset group reported intentions for involvement than growth- & mixed-mindset groups who ranked second and third;
	Under "pressure from below"	*All participants had high intention for structure involvement, moderate-low intentions for autonomy control; *Participants demonstrated higher intentions for control under "pressure from below"; *Control only intended for low motivation/ misbehavior (Tom, Clyde); *Highest control intended for low motivation/ misbehavior low ability (Tom); *Autonomy most intended for high ability (Clyde), structure most intended for low ability (Bonnie, Tom);		*All groups had high intentions for structure involvement; *Growth-mindset group high intentions for structure (primary) involvement (primary/secondary), moderate-low intentions for autonomy control (tertiary/quaternary); *Mixed-mindset group high intentions for structure (primary) involvement (primary/secondary), moderate-high intentions for autonomy, a few high a few low intentions for control (tertiary/quaternary); *Fixed-mindset group high intentions for structure (primary/secondary) involvement (primary), moderate-low intentions for autonomy (quaternary); high intentions for control (primary, clear shift to high control under "pressure from below"); **Growth- & mixed-mindset groups slightly higher intentions for structure than fixed-mindset group (same with across interview; no clear differences for Tom Clyde Bonnie across groups); **All groups high intentions for involvement, fixed-mindset group involvement enhanced under "pressure	

Table 13 continued

			from below" (no clear differences for Tom Clyde Bonnie across groups); **Growth- & mixed-mindset groups lower intentions for control than fixed-mindset group, pattern clear (most clear differences across groups showed for Tom, fixed-mindset group had control as primary practice, but growth-mixed-groups had control as secondary/tertiary; all groups had control as secondary/tertiary practices for Clyde; no group control for Bonnie); **Mixed-mindset group higher intentions for autonomy than growth- & fixed-mindset groups (opposite to across interview); *Differences in structure involvement not clear, groups mostly different in control autonomy, esp. control; *All participants intended structure involvement control for Tom, structure for Bonnie, autonomy for Clyde; *All participants in mixed-mindset group intended autonomy for Tom; *Growth- & mixed-mindset groups tended more to perceive all students having/can achieve high ability, fixed-mindset group tended more to perceive Tom Bonnie as low ability but Clyde as high ability;	
Beliefs about autonomy/ control	*Control ineffective; *Control necessary; *Most participants reported prefer autonomy;	*Control ineffective; *Control has pros; *Control necessary; *Autonomy effective; *Autonomy can be ineffective or difficult;	*All groups had similar beliefs; *Control ineffective; *Control necessary; *Fixed-mindset group more than growth- & mixed-mindset groups believed motivating students is difficult;	*All groups had similar beliefs; *Control ineffective; *Control necessary; *Autonomy effective (largest percentage of participants from fixed-mindset group, followed by growth- and then mixed-mindset groups); *Autonomy can be ineffective or difficult;

Note. Differences among mindset groups were marked with **

Discussion

The current study aimed to examine preservice teachers' intentions to enact autonomy/control, structure, and involvement, focusing on "pressure from below" situations, and compare the intentions of preservice teachers in growth-, mixed-, and fixed-mindset groups. The major findings for interviews are that first, participants in general had high intentions for structure and involvement, moderate to low autonomy when conceptualized separately from structure and involvement, and moderate to low control; they well demonstrated autonomy support practices as a whole when autonomy, structure, involvement were combined. As expected, they tended to be more controlling under "pressure from below," which primarily applied to the fixed-mindset group. Second, the growth- and mixed-mindset groups had higher intentions for structure and involvement, lower intentions for control in general, and the fixed-mindset group was highest in control when facing "pressure from below." The major findings for field journals are that first, largest percentage of participants intended to enact structure and autonomy and smallest percentage of participants intended to enact control. Second, higher percentages of participants from the growth- and mixed-mindset groups intended to use autonomy and not to use control. In addition, both interview and field journal participants tended not to prefer control believing it was ineffective but necessary mostly due to practical constraints and external pressure. The interview and field journal major findings are convergent and consistent with expectations overall.

Overall intentions and under "pressure from below"

Intentions for structure and involvement

Interview participants had high intentions for structure and involvement in general and even under "pressure from below." Field journal participants also frequently intended to use structure (which they reported as autonomy support). The high structure and involvement reflects perhaps what the teacher education has trained participants on, such as using various instructional strategies to motivate students, how to manage a class, the importance of scaffolding and setting expectations, building positive student-teacher relationship, promoting student social emotional development, and other pedagogical and psychological knowledge and education principles (van Driel & Berry, 2017; Voss, Kunter, & Baumert, 2011). Moreover, the high structure and involvement may relate to the nature of the interview. The interview's focus on students who struggle and have motivation-

behavior issues could induce responses for structure practices (e.g., guidance, monitor behavior). The scenarios presented students who had doubts and frustrations, which could induce involvement practices (e.g., attend to negative affect).

The importance of involvement could also relate to participants' experiences as students and their personal needs as teachers. Participants often talked about how when they were students the teacher relatedness support was important, while teacher-student relationship is an important source of teachers' happiness and concerns (Klassen et al., 2011). In addition, the high involvement could be a way to compensate for controlling practices under pressure. For example, Hornstra and colleagues (2015) found that teachers emphasized the importance of building good relationships with students as a way to compensate for their controlling practices when students were not intrinsically motivated, having behavior difficulties and low ability. Classroom management literature (e.g., Nie & Lau, 2009) also suggests that teacher care is needed for effective classroom management besides behavior control. Our interview focused on "pressure from below," involvement could be a way to compensate the control practices that many participants mentioned they had to take but not preferred. Finally, field journal participants' relatively lower intentions for involvement was probably because the prompt was about autonomy and control. While structure was conceptually related (Grolnick et al., 2014; Jang et al., 2010), involvement could be less relevant to the prompt.

Intentions for autonomy and control

Comparatively, participants had lower overall intentions for control, and lower intentions for autonomy when conceptualized separately from structure and involvement. Interview participants had moderate to low intentions for control and autonomy; autonomy practices were mostly captured by the participants intentions to provide organizational/procedural autonomy, rationale/relevance, and generically attending to inner motivation. Largest percentage of field journal participants intended to use autonomy and smallest percentage of participants intended to use control. Furthermore, both interview and field journal participants expressed the belief that control is ineffective, some reported the belief that autonomy is effective.

First, readers should note that the conclusion that our sample preservice teachers had relatively low to moderate intentions for autonomy was grounded in our separate

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conceptualizations of autonomy, structure, and involvement practices rather than incorporating all practices into an overarching autonomy support practice. If we collapse results for autonomy, structure, and involvement into an overarching autonomy support practice, then our sample would have demonstrated high intentions for this general autonomy support practice.

Many participants may have learned about autonomy support and control in class and understood the importance of providing choices, rationale, building relevance, and intrinsic motivation. Autonomy support was a key topic in the foundational educational psychology class, for instance. Even if participants had not learned about autonomy support specifically, a lot of teaching principles they learned could be relevant to autonomy support, such as attending to student interests and needs, promoting self-regulated learning. The training may have affected their intentions to enact autonomy and control, beliefs about autonomy and control, and a preference for the autonomy approach.

However, as novice or beginning teachers, they may still have not sufficiently acquired skills for high quality practices (van Driel & Berry, 2017) and knowledge for high quality autonomy support, which could limit their intentions for autonomy. Furthermore, the various practical constraints that participants took into consideration (e.g., "pressure form below" and "pressure from above") could also limit intentions for autonomy, although most participants had negative beliefs about control and preferred the autonomy approach. For example, some participants mentioned they did not like rewards but would still use rewards as it was a quick solution. This is consistent with prior findings that teachers' autonomy in the K-12 context with various sources of pressure is often limited and has a relatively narrow range (Reeve, 2009; Rogat et al., 2014).

Additionally, the lower autonomy—when narrowed down to its own dimension separate from structure and involvement—might be related to our ways of coding and the nature of our interview. For example, literature traditionally categorized feedback recognition (e.g., Reeve & Jang, 2006; Rogat et al., 2014), attentive to negative affect (Reeve, 2009; Jang et al., 2010) and some other practices as autonomy supportive, as most studies focused solely on autonomy and control, and as autonomy, structure, involvement are interdependent. However, we classified those practices as structure (feedback recognition) and involvement (attend to negative affect) respectively. A lot of literature on autonomy support is also grounded in traditional classrooms (Rogat et al., 2014) and did not highlight cognitive autonomy in their characterizations of

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autonomy support practices. Thus, our participants' lower intentions for autonomy partially reflected our way of coding. Meanwhile, our focus on "pressure from below" may limit autonomy. Under "pressure from below" such as when facing student behavior issues, struggles, and negative affect, structure and involvement as specific practices under the broad umbrella of autonomy might be more easily endorsed by preservice teachers who were generally most concerned about classroom management (Patrick & Pintrich, 2001) and teacher-student relationship (Hornstra et al., 2015) as discussed above.sSome forms of autonomy such as cognitive autonomy might also be easier to observe in ongoing classroom teaching.

Largest number of field journal participants intended to use autonomy and smallest number of participants intended to use control, and most participants had positive beliefs about autonomy and negative beliefs about control, which specifically suggest that teaching autonomy support and control can be helpful. Consistent with literature, explicitly teaching autonomy support and promoting positive beliefs about autonomy can help teachers raise awareness and mindfulness, and become more autonomy supportive and less controlling (Reeve, 2009). The effect of teacher education programs has been controversial, some researchers believe it exerts a weak influence on preservice teachers, while some are more positive (Richards, 1996). Richards (1996) suggested that preservice teachers may enact fewer positive practices when they face real world teaching stress and difficulties although they tend to express very positive intentions and beliefs in teacher education programs. He commented that however, many researchers also believe teacher education programs can be very helpful in laying a solid foundation, and that there might exist a time lag in terms of when the effect takes place. Whether participants would resort to more control approach and less autonomy-structure-involvement practices when they actually teach in real world classrooms is unclear, but our results suggest that at least the teacher education programs could help preservice teachers establish positive beliefs and intentions to refrain from control, which lays a good foundation for their future practices.

Higher intentions for control under "pressure from below"

As hypothesized, interview participants had higher intentions for control under "pressure from below" (which mostly applied to the fixed-mindset group), consistent with literature. Specifically, students' motivation behavior problems would pull out a more controlling approach

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(Tom/Tina and Clyde cases), and a controlling approach would be mostly induced when student ability, motivation, behavior problems are combined that create highest pressure (Tom/Tina; Hornstra et al., 2015). Indeed, motivation and behavior problems are the primary sources of "pressure from below" (Reeve, 2009), and novice teachers are often very concerned about management, discipline, and student behavior problems (Patrick & Pintrich, 2001; Wolff et al., 2015).

On the other hand, our participants admired students' high motivation and good behaviors, and ability issues alone did not induce control (Bonnie case; control was not used for Tom/Tina's struggles setbacks, either). Ability and motivation are often connected, low motivation misbehaviors often resulted in participants' negative perceptions of the students and a perception that the students' struggles were due to low motivation, hence the higher control demonstrated in Tom/Tina's case. However, it seems that lower ability alone in Bonnie's case does not necessarily pull out control. It seems teachers experience more pressure and tend to be controlling when students' lower ability is a chronic problem, when the whole class has lower ability students, and when the ability problem is coupled with other issues. Such issues include for example low motivation misbehaviors (Tom/Tina case), student backgrounds like low socioeconomic status, and having a low-achieving at-risk class which then often indicate the school types and a more stressing teaching environment (Hornstra et al., 2015). Moreover, in interviews rather than in naturally occurring teaching, it is difficult to detect the most likely forms of control teachers may adopt for students who struggle, such as quick intervention or low cognitive autonomy, and sometimes negative feedback criticism and internal contingency like coldness and withdrawing affection when students do not demonstrate desired qualities (Dweck, 2000).

Furthermore, participants mainly indented for structure practices for lower-ability students (Tom/Tina, Bonnie) and mainly intended for autonomy for high-ability students (Clyde). It is understandable as students like Tom/Tina and Bonnie need more help for improving competence, hence they need more structure. Meanwhile, students like Clyde need more help for boosting motivation for the class. Most participants perceived Clyde as not challenged enough and talked about motivating him intrinsically and providing challenges, which we coded as autonomy.

Misconceptions about autonomy and control

In addition, a few interview and field journal participants had misconceptions about autonomy and control. They believed autonomy could be "loose" and permissive, and control meant structure. Although this is not a key finding, it requires teacher educators' attention. SDT literature has also suggested that autonomy is sometimes conceptually confused with freedom (i.e., lack of constraints; Ryan & Deci, 2018), and control and structure sometimes have a muddy boundary (Grolnick & Pomerantz, 2009; Grolnick et al., 2014). Our finding suggests the need for teacher education programs to examine and address such misconceptions about autonomy and control, which is critical for conceptual change (Patrick & Pintrich, 2001) and endorsing autonomy.

Mindset and intended practices

Similar to the results for the overall sample, in general interview participants in all mindset groups had higher intentions for structure and involvement than autonomy and control, and largest number of field journal participants in all mindset groups intended to enact structure and autonomy and smallest number of participants intended to enact control, including the fixed-mindset group. However, the interview growth- and mixed-mindset groups were still slightly higher in structure and involvement in general (and slightly higher in broad autonomy as a whole when autonomy, structure, and involvement were combined); the participants coded for low involvement and rated as low structure were also from the fixed-mindset group. More importantly, the fixed-mindset group from interviews was higher in control overall, highest in control when facing "pressure from below" and particularly when facing the highest pressure when students' motivation, behavior, and ability problems are compared (Tom/Tina's scenario). Noticeably, the growth-mindset had relatively low intentions to enact control in general, and this profile almost remained the same even under "pressure from below" and when facing the highest pressure (Tom/Tina's scenario), with only slightly increased intentions, showing clear lower intentions than the fixed-mindset group. The mixed-mindset group showed a relative middle ground for control. The largest percentages of field journal participants intended for "no control" and autonomy was also from the growth-mindset group and the mixed-mindset group showed a relative middle ground.

Mindset and control

These findings are partially consistent with literature and expectations (e.g., Dweck et al., 1995; Leroy et al., 2007; Moorman & Pomerantz, 2010), suggesting that fixed mindset is associated with higher intentions for control in general and especially under "pressure from below," while the growth mindset had lower intentions and the mixed-mindset had a relative middle ground. The mindset theory suggests that fixed mindset often creates contingent self-worth, low self-efficacy, self-defeating thoughts and behaviors, helplessness, and even depression (Blackwell, Trzesniewski, & Dweck, 2007; Dweck, 2000; Leroy et al., 2007), which create higher "pressure from within," especially when facing difficulties and "pressure from below." Indeed, our results suggest the major differences across groups were unveiled in Tom/Tina's scenario; the fixed-mindset group had more negative perceptions and fixed-mindset perspectives towards Tom/Tina's motivation, behavior, and ability issues than the other groups, which seems to indicate higher perceived pressure. The high internal pressure may pull out a controlling approach from teachers (Ryan & Deci, 2018). The static view of student qualities, the tendency to perceive students as either having ability/motivation or not having them (Dweck, 2000), could also make them use control instead of working with student internal motivational resources when the resources were perceived lacking. Moreover, when facing difficulties, the belief that they cannot control desired outcomes and they can do little to help students improve make fixed mindseted teachers helpless, seeking an easy solution, or giving up (Dweck, 2000, 2002). Demands, directives, extrinsic motivators, immediate intervention intended by participants with fixed mindset, for example, are often easier and quicker solutions that address low motivation, misbehavior, and student struggles. In addition, the goals and motivations associated with a fixed mindset, such as a performance goal and extrinsic motivation (Dweck & Leggett, 1988; Muenks et al., 2015), may also make participants more controlling.

Meanwhile, the mindset theory suggests a growth mindset leads teachers to believe student competence and improvement is controllable and can be achieved through time and effort, hence they look for potential in others, focus more on the process to work towards and control the desired outcomes, and to take actions and use concrete strategies to actively solve difficult problems and help students improve (Dweck, 2000, 2002). Our mixed- and growth-mindset groups were more likely to perceive Bonnie and Tom/Tina as having high ability or could achieve high ability and less likely to believe motivating students is difficult, which could reduce the pressure they

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experience and the intentions for control (Ryan & Deci, 2018). They also focused more on the learning process to help Tom/Tina and Bonnie and similar students to improve, and intended more to use structure and involvement to facilitate the process and solve the students' problems. Additionally, the associated goals, beliefs, and motivations with growth mindset, such as learning goal, positive beliefs about process-focused teaching approach, and intrinsic motivation (Dweck & Leggett, 1988; Benita et al., 2014) may also have contributed to participants' lower intentions for control.

To explain the association between mindset and control within the SDT frame, when the social environment is controlling with "pressure from below," a growth mindset might still allow teachers to experience less needs-thwarting, including needs for competence, and possibly needs for autonomy and relatedness. They may also experience less controlled motivation, including external, introjected motivation and amotivation (i.e., motivated by external and internal contingencies, or unmotivated). Thus, they are less likely to resort to control. When facing difficulties and pressure, growth mindseted teachers are likely to maintain their teaching efficacy and self-worth (i.e., needs for competence). Even if their perceived competence to handle the situation is not high, they are not defeated and believe the competence is achievable, hence their needs for competence is less thwarted as fixed mindseted teachers would be. Meanwhile, they tend to embrace the challenges and take control of the situation to achieve desired outcomes by making efforts and using strategies, rather than being controlled by the situation (i.e., needs for autonomy). Such efforts to manage the situation may also include seeking support from others (e.g., colleagues, principals) to reduce the pressure and to solve the problems, as well as not taking students' misbehaviors or bad attitudes personal in an ego-involved way, which helps maintain rapport with the students (i.e., needs for relatedness). SDT places basic psychological needs as essential to motivation, behavior outcomes and psychological wellness. It seems just like autonomous/controlled/impersonal orientations (Koestner & Zuckerman, 1994; Ryan & Deci, 2018), growth/fixed mindsets are associated with basic psychological needs supporting/thwarting and autonomous/controlled motivation, and are in turn associated with autonomy/control behaviors.

Different from the behavior patterns of fixed mindseted individuals in face of setbacks, participants in the fixed-mindset group did not demonstrate intentions to give up on students who

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mess up or do not care, or quickly intervene telling the answers and use internal contingency when they get good answers. However, the fixed-mindset group was more likely than the growth and mixed-mindset groups to perceive Tom/Tina and Bonnie as having low ability or disability with fixed-mindset perspectives, and believe motivating students is difficult, and one participant did mention he might give up to some students when he had tried but could not solve the problem. Besides the possibility that the participants are all very nice teachers who do not want to give up on students, it is natural not to speak about intentions to give up, in the interview, just like they would less likely to talk about low structure and low involvement as reflected in our findings. Rather, they would continue to think what they would do to help as prompted. It also seems difficult to capture quick intervention or internal contingency in the interview. For example, Bonnie's lower ability and high motivation engendered fixed-mindset participants' perceptions that her ability is fixed and there is little teachers can do to help, which could make them give up on her, or give comfort feedback rather than focusing on specific strategies to help (Rattan et al., 2012). However, in interviews it would be difficult to detect these intentions. Additional results may come up if we had explicitly asked if participants would give up on the students.

These findings are meaningful in terms of helping teachers tackle the practical constraints and pressure in daily teaching. SDT literature has suggested that enhancing teachers' autonomy support and reducing control could be achieved by explicitly teaching autonomy support, cultivating autonomous orientation, and promoting positive beliefs about autonomy support (Reeve, 2009; Reeve et al., 2014). Along this line, promoting teachers' autonomous motivation also contributes to autonomy supportive practices (Ryan & Deci, 2018). Some other literature also suggests for example mastery goal structure could buffer against the "pressure from above" and help reduce control (Ciani, Middleton, Summers, & Sheldon, 2010), and schools having a positive culture and support for teachers could have an "umbrella effect" that help reduce the pressure and provide a nurturing environment (Bottiani et al., 2019; Reeve, 2009; Ryan & Deci, 2018). Our finding adds to the literature that from mindset theory's perspective, fixed/growth mindset could be another "factor from within" besides what SDT has proposed. Having a growth mindset and reducing the "pressure from within" could in general help teachers experience less "pressure from below" and refrain from control practices.

Mindset and autonomy, structure, involvement

While the fixed-mindset group was higher in control, the growth-mindset group did not show clear higher intentions for autonomy compared with the mixed- and fixed-mindset groups overall, and particularly in the interview. Meanwhile, the differences for structure and involvement across groups were also not salient. As noted earlier, some possibilities include that participants had not acquired sufficient knowledge and skills for high-quality and autonomy supportive practices, the nature of the interview and our ways of coding. In addition, similar to the findings that fixed mindset was clearly related to student decreased intrinsic motivation while growth mindset was not as clearly related to increased intrinsic motivation (Dweck, 2002), perhaps the association between fixed mindset and control is more salient as opposed to the association between growth mindset and autonomy support (and in a degree structure and involvement). This suggests maybe growth mindset does not always have salient positive effect but the negative effect of fixed mindset can be more detrimental. Perhaps the benefit of growth mindset reveals more in difficult situations like "pressure from below" such that it would reduce the pressure to use control whereas fixed mindset would increase the pressure. Overall, the findings suggest growth mindset may not necessarily promote higher intentions for autonomy, but is still slightly more associated with positive practices like structure and involvement, and growth mindset is still important as fixed mindset is more likely to induce control.

Differences among mindset groups

Overall, the differences were between the fixed-mindset group versus the growth- and mixed-mindset groups; the growth- and mixed-mindset groups were similar although the mixed-mindset nuancedly demonstrated a middle ground between growth- and fixed-mindset groups in terms of control. It makes sense that the mixed-mindset group tended to actually have a growth mindset, while the fixed-mindset group had a fixed to mixed mindset, based on Dweck and colleagues' (1995) cut-off scores. Our finding further suggests that the differences between lower growth mindset (mixed-mindset group) and very strong growth mindset (growth-mindset group) are trivial. Some differences may exist if we had a "true" mixed-mindset group in comparison to "true" fixed- and growth-mindset groups. Theoretically, the intentions of structure, involvement, autonomy of a "true" mixed-mindset group should be lower than a growth-mindset group but

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higher than a "true" fixed-mindset group, and intentions of control would also be in the middle. Although we were only able to partially conclude the middle ground of the mixed-mindset group for control with the current sample, our study was one of the first qualitative studies that included a mixed-mindset group, which provides a relatively fuller view of the problem at hand. Perhaps as long as individuals reach a bar beyond fixed mindset, they would have fewer negative outcomes.

Participants predominantly had more growth mindset than fixed mindset, congruent with literature that the teacher populations may tend to be growth mindseted (Fang, 2017; Gutshall, 2014; Jones et al., 2012). However, it does not mean it is unnecessary to continue to promote teachers' growth mindset. Teachers in certain fields such as mathematics and science may tend to have more fixed mindset that harms their teaching practices and student achievement (Dweck, 2008). Recent mindset literature also suggests that many teachers may report they have a growth mindset, but in fact have developed a "false growth mindset" that their understanding of the core message of growth mindset is incorrect (Dweck, 2015).

Unexpected findings and alternative explanations

Some more nuanced findings were unexpected. First, the interview fixed-mindset group had about equal level of autonomy (narrow conceptualization) as the growth-mindset group overall and when facing "pressure from below"; the field journal fixed-mindset group also tended more to report the belief that autonomy was effective. This finding might be attributable to the fixed-mindset participants' seniority and knowledge of teaching. Five out of six of the interview fixed-mindset group participants were junior, senior, and graduate students, and their average self-reported teaching experience scored 4.33 out of 5. Experienced as opposed to novice teachers are usually more autonomy supportive and focuses more on learning quality (Leroy et al., 2007; Wolff et al., 2015). Regarding the field journal results, writing quality of the field journals and other factors we do not know could have influenced the results. It is possible that the fixed-mindset group happened to write more about positive beliefs about autonomy as they learned in class, while the mixed- and growth-mindset groups did not.

Second, the interview mixed-mindset group was slightly lower in autonomy overall, but higher in autonomy under "pressure from below" (mostly moderate level; narrow conceptualization), which was inconsistent. All participants in the mixed-mindset group were

freshmen and sophomores, while the fixed- and growth-mindset groups had higher seniority (fixed-mindset group average self-reported teaching experience was 4.33 out of 5, growth-mindset group was 3.33, mixed group was 3). It is possible that the mixed-mindset group who had least experience dealing with the real-world classroom "pressure from below" may be less troubled by the problems presented in the interview scenarios, and may still incline for autonomy under "pressure from below." The inconsistency might also be the case that the fixed- and growth-mindset groups had relatively higher autonomy overall but would be more controlling comparatively under "pressure from below." The higher seniority of the fixed- and growth-mindset groups may also have contributed to their overall higher intentions to use the effective practices they learned about (Bottiani et al., 2019; Schmidt et al., 2015), such as autonomy.

Third, the interview fixed-mindset group also had high intentions for involvement at an equal level for control under "pressure from below." Again, their higher seniority may make them pay more attention to teacher-student relationships. Furthermore, as noted earlier, involvement might be a way these teachers use to compensate for control (Hornstra et al., 2015). Compared with the mixed- and growth-mindset groups, they tended more to perceive Tom/Tina and Bonnie as having low ability, sometimes they associate the low ability with disability and home issues for at-risk students from their experience, which may also engender empathy and intentions to use involvement practices.

Finally, we must also acknowledge individual differences and other factors that might explain the results, including the unexpected results discussed above. Seniority, teaching experience, knowledge of teaching, personality and dispositions, field of teaching, the norms of practicum schools, and other factors not included in the study could all have a role in participants' intended practices. Some previous findings suggest that senior teachers and teachers with more experience and knowledge (Leroy et al., 2007), individuals with autonomous orientation (Ryan & Deci, 2018), individuals in certain fields such as humanities as opposed to engineering and business majors (Yu, Zhang, Nunes, & Levesque-Bristol, 2018) tended to be more self-determined motivationally and more autonomy supportive. School cultures and norms may also influence teachers' beliefs about and practices of autonomy and control (Reeve et al., 2014).

In our study for example, one fixed mindseted teacher who had diverse and rich teaching experience had highest autonomy among all participants, his autonomy practices featured the

whole range including cognitive autonomy. He was also one of those having lowest control and highest involvement and structure, and really cared for his students and made great effort in teaching, although he expressed more frustrations in difficult situations. Another fixed mindset participant had been doing student teaching extensively in a local school and she frequently drew upon her experience from that school in explaining the practices she endorsed and intended for her future students. This participant was rated highly controlling, and she commented what they had been practicing in this school was very like the controlling teaching scenario presented to her at the end of the interview.

Structure and involvement in focus

The SDT literature has focused most on autonomy and control, while structure and involvement are relatively less discussed. Our study focused on autonomy and control as well, but examined all three dimensions using a preservice teacher sample, and included aspects of structure and involvement practices derived from our data in addition to the key features SDT literature has discussed. For structure, we included instruction. SDT literature on structure discussed some aspects of instruction (e.g., activities appropriate for developmental level from the TASCQ scale; Wellborn et al., 1988), but peripheral to other structure practices, while instruction was a key category for our specific sample and in our specific context. For involvement, we included caring climate. Involvement was least studied in SDT literature, but extensively studied in other frameworks and under other terms (e.g., belongingness; Klassen et al., 2011). For example, the caring climate and student-student relatedness is an aspect included in the TARGET framework of achievement goal theory that describes teacher classroom practices (Ames, 1992). Our study contributes to SDT literature by depicting a relatively comprehensive range of structure and involvement practices, and our codebook provides a guide of classifying teacher practices into the autonomy/control, structure and involvement dimensions.

Regarding structure, our results regarding classroom management and monitoring raised questions regarding the somewhat muddy boundary between structure and control. Monitor/manage behaviors and monitor progress/understanding are salient structure practices in our results, while control can come easily in classroom management that teachers could give demands, directives, surveillance and use controlling language. Our participants' talking about

monitor behavior also bordered on control in some cases. Sometimes they talked about a series of actions of dealing with student behavior problems from giving structure initially to being controlling if the problem continues. In addition, sometimes participants thought control meant structure and hence believed control was necessary. SDT has mostly focused on the positive side of structure and depicted structure as competence-promoting practices distinguished from control (Ryan & Deci, 2018). However, there has always been some conceptual confusion for structure and control. Concepts related to structure and control and their measurements are not well distinguished in literature (Grolnick & Pomerantz, 2009). For example, some literature distinguishes behavior control from external control (e.g., Nie & Lau, 2009) or psychological control (e.g., Barber, Olsen, & Shagle, 1994), while behavior control maps onto structure and external or psychological control maps onto control defined in Ryan and Deci's recent handbook of Self-Determination Theory (2018). Structure can also follow a continuum from autonomy supportive to controlling (Gronick et al., 2014). Although we were able to distinguish participants' structure and control practices within our coding frame, participants themselves may not be able to make a clear distinction, and their structure can easily turn into control. The results suggest teacher education programs should help preservice teachers further distinguish structure from control, and perhaps SDT should provide a clearer guidance for where the boundary is.

Implications

Theoretical implications

Theoretically, our study draws from the mindset theory's perspective in studying autonomy and control, and extends the "factors from within" to include growth/fixed mindset beyond what SDT has explained. Some literature has suggested the relation between mindset and autonomy support (e.g., Kingma, Kamans, Heijne-Penninga, & Wolfensberger, 2016; Leroy et al., 2007), and our results added more evidence regarding the association. SDT places central importance on autonomy while the mindset theory places central importance on competence and adds explanations for understanding autonomy and control from a different angle. The malleable view of competence (e.g., intelligence, ability, talent) and the confidence to control desired outcomes of a growth mindseted teacher may help reduce "pressure from within" that pull out control, while the fixed view of competence increases the internal pressure, especially when encountering

"pressure from below." Additionally, our examination of mindset responds to teacher educators' call that attending to personal beliefs should be a central concern of teacher education (Levin, 2015).

Furthermore, our focus on "pressure from below" is meaningful as it is a pervasive real world situation teachers will face every day. How to help teachers deal with the real world pressure and constraints and rely less on control is a question for the field of teacher education that needs continued discussion. Control practices might be unavoidable, and some aspects such as providing external motivators like rewards are helpful when intrinsic motivation are lacking (Ryan & Deci, 2018). Control might be less harmful as well when it is occasional and teachers use structure, involvement, autonomy more. Nonetheless, our goal as teacher educators should be to promote autonomy, structure, and involvement practices and reduce control even under "pressure from below," and for all students including those who struggle and have not achieved high ability yet. Adding to literature's suggestions such as explicitly teaching autonomy support/control and promoting positive beliefs about autonomy (Reeve, 2009), our study further suggests that reducing fixed mindset and cultivating a growth mindset might be helpful. Growth mindset does not only potentially reduce controlling teaching, but also alleviate teachers' internal pressure and improve their motivation and well-being to confront the daily teaching pressure (Dweck, 2014).

Moreover, our study adds to the SDT research by focusing on structure and involvement besides autonomy. We provided a relatively comprehensive picture in understanding preservice teacher intended practices using the autonomy, structure, involvement dimensions. In addition, the somewhat blurring boundary between structure and control when it came to monitor and manage behaviors and understanding in our findings suggest perhaps SDT should continue to provide a clearer guidance for where the boundary is and to address measurement challenges.

Additionally, our study also adds to the mindset research by including a middle mindset group with a qualitative approach. The mindset research has largely depicted mindset as a dichotomy and used a quantitative approach, which limits the details and richness of the findings. Our study may inspire some additional insights by including a middle mindset group and with two sources of qualitative data.

Practical implications

Practically, the findings suggest teacher education programs should promote preservice teachers' growth mindset, which could help to reduce internal pressure and controlling practices. Although our participants are predominantly more growth mindseted, and promoting growth mindset has been popular in k-12 schools and in teacher training in the U.S. (Education Week Research Center, 2016), our findings further support the need to continue this effort in training preservice teachers. This is important especially because changing fixed mindset and cultivating growth mindset may need long-term, sustained intervention (Dweck, 2000) and should start early in preservice teacher education. The idea of growth mindset should not only be taught briefly in one foundational educational psychology class, but also embedded in the teacher education curricular and teacher educators' daily teaching practices.

In addition, participants' relatively lower intentions for autonomy (narrow conceptualization) compared to structure and involvement and some misconceptions about autonomy and control suggest that teacher education programs need to continue to teach autonomy support more in depth and to enhance specific skills to practice autonomy support. Preservice teachers could benefit from learning teacher autonomy support practices in general (Reeve, 2009), and further from teacher practices in innovative learning contexts such as inquiry classrooms that feature high cognitive autonomy and content responsiveness, as opposed to the traditional classrooms (Rogat et al., 2014). Misconceptions such as autonomy is "loose" and control gives structure should also be addressed, which are important for conceptual change (Patrick & Pintrich, 2001) and for preservice teachers to identify with autonomy practices rather than control. It is also important that teacher educators help preservice teachers critically reflect on their practicum experiences, understand the various pressure and practical constraints in real world teaching, and use the opportunity to practice autonomy support and refrain from control.

Limitations and future work

The current study has several limitations. First, our selection of the mixed-mindset group did not match a mixed mindset well, and the fixed-mindset group also slightly diverged from a fixed mindset, according to Dweck's original mindset measure, although we used open ended responses to reduce limitations of aggregated survey scores. Meanwhile, the groups were not equal in terms

of seniority, learning of autonomy support in class, and so on. Future research could include "true" fixed-, mixed-, and growth-mindset groups holding other individual characteristics consistent across groups.

Second, although we intentionally asked participants to draw from their real world teaching experience as much as possible in explaining their intentions, intentions are not equal to actual practices, it is unclear how the intentions of the participants would translate into real practices when they start in-service teaching. This issue is beyond the scope of our current study, but it will be interesting if future studies use a longitudinal method and track the development of preservice teachers to in-service teaching.

In addition, our findings are tied to the specific context of our sample that came from one university, as well as to the nature of our interviews and field journals. Future studies could use a more representative sample, examine different contexts, and combine qualitative and quantitative approaches and methods such as classroom observations that may capture naturally occurring teacher practices more thoroughly.

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<center>**Appendix A. Interview Protocol**</center>

Demographic information

Gender_____ Age_____ Ethnicity_____ Major _____(subject and grade to teach)

Classification_____(Freshman, sophomore, junior, senior, graduate)

Ice-breaker

Tell me a little bit about yourself. What teaching experiences do you have so far?

Section I. Generally prompt strategies participants used and want to continue to use

1. Motivational strategy: Based on your practicum or other teaching experiences, in general, what do you think is motivating to your students? What strategies did you use and want to continue to use?

If no such experience, reflect on strategies you observed your teacher using in your practicum or in other occasions that you thought to yourself, "that's very motivating and effective, I'll definitely do it in my future classrooms.

(1). Are there motivational practices that work better for certain students in your class? Are there students in your class who would benefit from a specific subset of motivational practices?

2. Management strategy: Based on your practicum or other teaching experiences, in general, what do you think are some good strategies to manage your class and your students' behaviors? What strategies did you use and want to continue to use?

Section II. Specifically and implicitly prompt autonomy support or controlling strategies for students with ability/motivation-behavior variations (reflect on scenarios and specific practicum experience)

I have a few scenarios that I want to discuss with you.

Scenario 1. **Tom/Tina**

In your class, you have a student Tom/Tina who often struggles a lot and needs additional help. His/Her performance is at the lower end. He/She often encounters setbacks, experiences feelings of doubt, and expresses frustration or indifference through behaviors. Clearly he/she is behind. He/She is often not very engaged. Sometimes he/she ignores your requirements. He/She does not

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focus on tasks, cross talks over you and makes jokes with other kids. He/She does not finish his assignments or turn them in late from time to time.

1. How do you perceive Tom/Tina? How do you perceive his/her ability and motivation?

(1). If you were Tom's/Tina's teacher, do you think you could do anything to help him/her?

2. Have you ever met a similar student in your practicum or other teaching experiences? Please give a concrete description of your experience.

3. What did you do with this student?

4. Is that what you want to continue to do to deal with or help this kind of students? What do you want to continue to do?

5. Now let's go back to this scenario. I want to know if you were Tom's/Tina's teacher,

what you would do to help him/her. Let's talk about it one piece at a time.

(1). Tom/Tina often has setbacks and difficulties during class activities and expresses negative feelings. So for example, maybe when you're working on a math (replace with interviewee area) problem in class, Tom/Tina cannot figure it out and is very frustrated. When that happens, what would you do?

(2). Tom/Tina is not very engaged. What would you do to motivate/engage Tom/Tina?

Would you offer little incentives, rewards, and privileges? In what ways? Why?

(3). Tom/Tina often has trouble staying on tasks. How would you keep him/her stay on task?

Would you monitor his/her progress closely, make sure he/she follows your directions, focus on what he/she should be doing and not what he/she should not be doing? Why?

(4). Tom/Tina sometimes cross talks over you and makes jokes with other kids in class, and doesn't turn in his/her homework. What would you do when he/she misbehaves or doesn't follow your requirements?

Would you assure your authority and tell Tom/Tina he/she must follow your requirements?

 (5). (Optional) In general, are there any other strategies you would use to motivate Tom/Tina

and help him/her to learn?

Scenario 2. Clyde

In your class, you have a student Clyde who is often not very engaged. Sometimes he ignores your requirements. He does not focus on tasks, cross talks over you and makes jokes with other kids. He does not finish his assignments or turn them in late from time to time. But in general, he does what is necessary to get by. He still shows a good knowledge and understanding of what is covered in class, and his performance is at the higher end.

1. How do you perceive Clyde? How do you perceive her ability and motivation?

(1). If you were Clyde's teacher, do you think you could do anything to help him?

2. Have you ever met a similar student in your practicum or other teaching experiences? Please give a concrete description of your experience.

3. What did you do with this student?

4. Is that what you want to continue to do to deal with or help this kind of students? What do you want to continue to do?

5. Now let's go back to the scenario. If you were Clyde's teacher, what would you do to motivate him and help him to learn?

Scenario 3. Bonnie

In your class, you have a student Bonnie who often struggles a lot and needs additional help. Her performance is at the lower end. She often encounters setbacks, experiences feelings of doubt, and expresses frustration through behaviors. Clearly she is making efforts. She pays attention in class, takes a lot of notes, asks questions, and turns in assignments on time. She has been trying to learn, and she expresses and demonstrates interests in the topics and materials. However, she still struggles with understanding the materials.

1. How do you perceive Bonnie? How do you perceive her ability and motivation?

(1). If you were Bonnie's teacher, do you think you could do anything to help her?

2. Have you ever met a similar student in your practicum or other teaching experiences? Please give a concrete description of your experience.

3. What did you do with this student?

4. Is that what you want to continue to do to deal with or help this kind of students? What do you want to continue to do?

5. Now let's go back to this scenario. If you were Bonnie's teacher, what would you do to motivate Bonnie and help her to learn?

Section III. **Explicitly prompt autonomy support and controlling practices, and practice choice for students with ability and motivation-behavior variations**

1. Have you learned about autonomy supportive teaching and controlling teaching in class? Please explain to me briefly what they are, and which teaching approach you identify with more.

If they have not learned the concepts, explain to them:

Autonomy support: support learners' initiatives, take learners' perspectives, and motivate them through interests rather than commands, controls, or pressure.

Control: take charge, command, evaluate, criticize, and motivate through controls and pressure.

Reeve et al.'s (2014) scenarios: These are examples of autonomy supportive and more controlling teaching. Please skim through them quickly to get a better idea.

2. Theoretically, we know autonomy support is preferred, but there might be some practical constraints. Would you engage in autonomy supportive teaching at times and somewhat controlling teaching at other times?

3. In what situations would you be more controlling?

4. Now let's refer back to the scenarios.

(1). Are there differences with how you would motivate the students in these three scenarios? Would you take more controlling approach to students similar to any of them?

(2). Would your strategies or approaches be influenced by their ability and motivation levels?

Appendix B. Sample Codebook

Autonomy

Codes	Definitions	Examples
Organizational/procedural autonomy	Giving students choice over class procedures, organizations, and task requirements, including flexible plans and schedules for the purpose of supporting autonomy.	(Interview 15) "The lesson materials is not engaging, I will change up the lesson plan to see what works best for the class." (Interview 11) "Tuesday would be the quiet working day. Students can do their own things as they like. Reading a book, doing homework from another class if they finish…I would allow music on headphones as long as they are showing me they are still doing the work."
Rationale/relevance	Introduce lesson or task purpose and connect to values, goals, everyday experience; provide explanatory rationale for learning activities and for requested and required behaviors.	(Interview 11) "I like to try to motivate students in seeing how this assignment will be helpful in other areas of life."
Inner motivation	Nurture inner motivational resources including attending to interests and curiosity, and providing optimal challenges.	(Interview 14) "I wouldn't want them to be doing something just for a sticker, or something like that. I would want them to be doing something so that they could challenge themselves and advance in their learning more." (Interview 13) "Trying to talk to her and reason with her about why getting a good grade in the class is necessary, and what the rewards for her personally would be making more in the long run."
Content responsiveness	Take students' perspectives, acknowledge students' experiences and the importance of their agendas.	(Interview 5) "So I think it can be good for a teacher to ask feedback from the students. And if they are understanding it, then find a way to re explain it in a form that makes more sense or spend more."
Cognitive autonomy	Elicit and build on students' ideas, give students time to work out problems in their own ways, display patience and pace instruction to allow self-regulated learning.	(Interview 4) "I think oftentimes students feel paralyzed because they're focused on getting the right answer. And so much of what I do is I don't have a right answer in mind. I care about students engaging critically with whatever they're learning and I don't have one answer." (Interview 1) "So I'd be inclined to let her try it herself. And if she needs help, or if I see she's slipping behind again, then I step in."

Control

Codes	Definitions	Examples
External motivation & contingencies	Rely on extrinsic sources of motivation, such as offer incentives, rewards, use competitions, consequences, punishment/discipline.	(Interview 1) "Have a referral system. Have red, green, yellow lights to represent where they are at during the day."
Internal contingencies	Providing attention, affection, recognition, praise contingent upon if students act as directed or desired, including using peer pressure to get desired behaviors.	(Interview 13) "Put him in the hallway. He will be embarrassed in front of friends and peers, and he won't do it again."
Demands, directives, surveillance	Pressure students to think, feel, or behave in specific ways, close surveillance of student compliance with what to do, command students to follow directions and obey assignments.	(Interview 16) "Right away, you need to be, 'This is my class. I'm in charge of this class,' and no-nonsense for the first couple of weeks."
Controlling language	Rely on pressuring language, like "should", "must", "have to".	(Interview 12) "It would also have to take me to put my foot down about it and be like, Hey, just because you don't want to do this, doesn't mean you shouldn't."
Imposed/strict schedules & plans	Strictly follow established schedules and plans, impose established goals, control pace with little flexibility and emphasis on no time to waste.	(Interview 10) "Sometimes I can get on this controlling mode just because there's so much stuff to do. In a two hour delay snow closings, they set you back and you still have to be on time turn in grades. And so it feels more pressure on you and you are throwing that pressure on them [students]."
Negative feedback	Harsh verbal and non-verbal negative feedback with the intent of being critical, rather than towards learning.	(Interview 1) "If you don't [follow the requirement], you will see a repeat of what's been happening. you'll fail assignments, you'll get zeros."
Blocking negative affect	Block student expressions of negative affect, assert power to overcome students' complaints.	(Interview 11) "if a student is making a mess in the classroom, let's say because they're angry. Well, 'here's the consequences, you have to clean it up.'"
Low rationale/relevance	Neglect explanatory rationales and relevance of lessons and required tasks, comments diminish interest or devalue content.	(Interview 4) "I know it is not something you look forward to, but we have to learn it."

Structure v.s. Chaos

Codes	Definitions	Examples
Instruction	Use different instructional strategies, approaches, methods, adjust teaching strategies to help students achieve competence, including flexible schedules and plans for competence purpose, adjusting task difficulty.	(Interview 15) "I would do is change my schedule to spend more time on it and have more practice in class to help them understand what it is they're doing."
Guidance & scaffold	Guide students through ongoing activities and provide a program of actions throughout (e.g., step by step guidelines), which include scaffolding, demonstrating, modeling when needed.	(Interview 3) "Our first graders got overwhelmed when they had more than one task to do in a certain amount of time, so that extra guidance to help them get stuff done, let them do one thing at a time."
Feedback & recognition	Provide rich informational feedback to build skills, competence; encourage, recognize, and praise efforts and mastery.	(Interview 14) "[I praise my students] by saying, 'I really like the way that you did this. Great work on this. Really, that kept me interested. I'm really excited to see what you do later.' Things like that."
Encouragement of competence	Encourage students who are not confident and have self-doubt to be more confident, encourage and support competence motivation.	(Interview 9) "[To encourage Tom], I would start from where students succeed, not to focus on failure, remind Tom of his growth."
Clear expectations	Give clear, understandable, and consistent directions and expectations so that students know what are expected, what to do, limits, and consequences of behaviors.	(Interview 14) "They would know to be on task. I would set those expectations prior to. Just making sure they know what they're supposed to be doing."
Monitor progress & understanding	Monitor if students are understanding the materials and making progress; check on students to make sure they are on the right track.	(Interview 8) "They all have whiteboards, so I'll write this stuff and then they'll put it up in the air and then we show each other what they did so they can keep little tallies up for themselves."
Monitor/manage behaviors	Monitor if students are doing requested behaviors with a general (somewhat loose) purpose of ensuring learning and competence; ensure effective learning environment for all learners, such as staying on task, not misbehaving, etc.; classroom management that does not meet the bar of control.	(Interview 7) "During those times, like I'm kind of like walking around like seeing what students are up to. And I think that's a good time to kind of like, check in with them and be like, hey, like, what's up?"
Chaos/permissiveness	Low structure, such as absence of clear directions, strong guidance, and constructive feedback and recognition, that students have trouble identifying patterns of anticipated actions and developing competence.	Not applied to data.

Involvement v.s. Low involvement

Codes	Definitions	Examples
Responsiveness, attention, warmth	Positive relationship with students through attention, warmth, concerns, caring, trust, respect, empathy, understanding; responsive to student social emotional affect, acknowledge and accept expressions of negative affect such as frustrations or boredom, have an one-on-one conversation with students understanding their problems and struggles.	(Interview 6) "I will find out and talk with him and to show my concern by him and I think more about I don't know whether I am not professional counselor but as long as you show your love and they can I think they can trust you at some point ."
Dependability	Be available to students when needed, make students understand they can depend on the teacher for problems and concerns.	(Interview 5) "She would know that even if she had setbacks, it's ok, we'd work together, we'd work through it."
Time	Spend significant time, energy, or invest personal time to help students.	(Interview 13) "I'm going to stay an hour after school. And if you need any help, please come. And I'll help you ask any questions you want outside of the normal class."
Resources	Invest resources to help students, provide extra resources.	(Interview 17) "I used up all my resources for the child."
Caring climate	Encourage students to support each other socially through working together, helping each other, connecting with each other.	(Interview 16) "My hope is that Bonnie would motivate the other two to help them want to learn. She seems like she would be a friendly person and share her love for learning with the others."
Low involvement	Low responsiveness, dependability, absence of investing time, resources, and building a caring climate.	(Interview 1) "If he is experiencing something like I talked about before then that's account for the guidance counselor's not me."

Beliefs about autonomy, control, motivation

Codes	Definitions	Examples
Autonomy is effective	Autonomy can boost confidence, good for motivation, promote learning, help build good relationship with students.	(Field journal 102) "This autonomy supportive technique has many benefits to the classroom. The students are highly engaged with the material they are learning because they got to choose how they learn it and they naturally choose ways that excites them. The students work in groups and collaborate with one another, allowing for deeper learning and the spread of ideas."
Autonomy can be ineffective	Autonomy can be loose, doesn't handle misbehaviors well, students may take advantage	(Field journal 61) "The cons [of autonomy] include the possibility of losing some organization and having a few issues with management of the classroom."
Autonomy is difficult	Autonomy can be time confusing, difficult due to practical constraints	(Field journal 48) "I know autonomy can be difficult given how structured the curriculum is."
Control can be effective and necessary	Control builds boundaries, manage behaviors well, gives immediate solutions, external motivators are helpful, teachers need authority and structure, control is necessary due to practical constraints.	(Field journal 109) "I have noticed that she is much more of a controlling teacher. I think this may be due to the fact that she feels pressure to do well. The classroom setting she is teaching in is also very chaotic." (Interview 16) "Interviewer: Would you assure your authority and tell Tom that, 'You must follow my my directions and requirements?' Interviewee: I would say that, I think. I'd have to. You can't lose your authority in the classroom because it's gone for the year."
Control is ineffective	Control makes students hate learning and the teacher, stresses and frustrates students, motivates through fear and hinders intrinsic motivation; engagement is achieved with low quality.	(Interview 14) "I think in order for students to be effectively taught, they have to be in control of their learning. That motivate them. Just by spewing directions at them, they won't want to do the assignments."
Autonomy and control are both needed	Both autonomy and control approaches are needed; no one is better than the other.	(Interview 5) "You need a mixture of both of these [autonomy and control] definitely. Because some students need that extra sternness because they're a little off task. And it's kind of hard to be stern when you're trying to be this one [autonomy supportive]."
Motivating students is difficult	Motivating students is difficult; dealing with students' problems is challenging.	(Interview 2) "I had a couple of their motivations low, as difficult as a teacher, because some, those are the students that will talk and then kind of like what Tina does."

Appendix C. Sample Interview Summary

Interview 10

1. Across interview rating

Autonomy rating: Low

Rationale:

- Autonomy is a peripheral intended practice relative to other practices
- Autonomy is not very frequently coded across interview: organizational procedural autonomy 3 counts, inner motivation 5 counts, rationale 1 count, cognitive autonomy 2 counts, content responsiveness 1 count; organizational autonomy and inner motivation being the primary points, the last two codes were very brief and limited
- Although responses covered the whole range of autonomy codes, the last two codes were only mentioned in section three after reading Reeve et al.'s (2014) autonomy supportive and controlling teaching scenarios, and when I explained that autonomy was the preferred approach
- Quality of autonomy codes were kind of low, elaboration of inner motivation and organizational are aligned with literature definitions but somewhat generic and repeating a single point (e.g., mention "connect with something students enjoy" without concrete examples); understanding of autonomy is misaligned with literature, suggested autonomy is loose and control gives structure.
- Autonomy is mentioned mostly in section three of interview when I explained that autonomy was the preferred approach; also acknowledged in section three that autonomy is preferred but they were very much controlling in the school where she was extensively student teaching, and her responses suggest endorsement of the school's approach

Control rating: High

Rationale:

- Control is the dominant intended practice across interview, and often the primary intended practice in a single move, relative to other intended practices

- High frequency of control codes applied: external contingencies 10 counts, internal contingencies 3 counts, strict/imposed plans & schedules 3 counts, demands 2 counts, controlling language 1 count, negative feedback 1 count, block negative affect 1 count
- The whole range of control codes applied, featuring typical control practices
- The intended control practices were very richly elaborated across interview with concreate examples from her student teaching, and were well aligned with literature's description of featured control practices; dominant use of external motivators, heavy emphasis on student demonstrating good behaviors and various ways to control behaviors
- Control practices were mostly self-initiated and central points in her responses; acknowledged in section three of the interview that the controlling approach scenario was very much like what her student teaching school was every day, and her responses in the first two sections suggest endorsement with the school's approach

Structure rating: high

Rationale:

- Structure was a primary intended practice across interview, and often a primary practice in a single move, relative to other intended practices
- High frequency of structure codes applied: guidance scaffold 7 counts, instruction 5 counts, monitor behavior 3 counts, monitor understanding 5 counts, encourage competence 3 counts, feedback recognition 4 counts, clear expectations 1 count
- Whole range of structure codes applied with most codes applied multiple times
- Quality of codes were good, codes were elaborated covering multiple aspects of each code (e.g., instruction includes multiple modes of teaching, adjusting plans to support competence, collaborative learning, etc.), sometimes with rich concrete examples (e.g., clear expectation example: students are expected to always try at least 10 minutes of their best effort when they struggle with something), although a few times strategies show low cognitive demands in supporting competence (e.g., what she phrased as "promoting higher-order thinking" was more a brief press for understanding); elaboration of structure was in general well aligned with literature descriptions

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- Structure was mostly self-initiated important points across interview rather than repeatedly prompted

Involvement rating: moderate

Rationale:

- Involvement was often a secondary intended practice across interview and in a single move, relative to other intended practices
- Frequency of involvement codes applied was neither high or low: dependability 3 counts, resources and time 6 counts, responsiveness 5 counts, caring climate 2 counts; some codes had relatively high counts but the points made were kind of repeated
- Although the whole range of involvement codes were applied, the codes often did not receive strong emphasis
- Codes were kind of elaborated (sometimes with examples), and kind of superfacial and brief; aligned with literature's definitions of involvement, but the emphasis on tough love and use of public humiliation greatly decreased the effect of involvement
- Involvement were both self-initiated and prompted, and often reflected secondary points or points that were primary but not strongly emphasized as the case with control and structure

2. **"Pressure from below" rating**

Autonomy rating: low

Rationale:

- Autonomy is a peripheral intended practice relative to other practices, although mentioned for all three students Tina Bonnie Clyde
- Autonomy is not very frequently coded for "pressure from below": organizational procedural autonomy 1 count (Bonnie), inner motivation 2 counts (Clyde, marginal brief for Bonnie), rationale 1 count (Tina)

- Relatively narrow range of codes applied
- Quality of autonomy codes were kind of low, elaborations are aligned with literature definitions but somewhat generic and brief
- In section three of interview talked about choosing autonomy supportive teaching approach for Tina and Bonnie ("less harsh ways"), controlling approach for Clyde, after reading Reeve et al.'s scenarios, but her approach with Tina reflected in section two was actually more controlling

Control rating: high

Rationale:

- Control is a primary intended practice for Tina, Clyde, and similar students she met (note Clyde and Bonnie scenarios were given relatively short time to reflect upon)
- Relatively high frequency of control codes applied: external contingencies 4 counts (primary for Tina; Clyde), demands directives 2 counts (Tina), controlling language 1 count (Tina), internal contingencies 1 count (Tina), negative feedback 1 count (Clyde), block negative affect 1 count (Clyde)
- Wide range of control codes applied, featuring typical control practices
- The intended control practices were richly elaborated with concrete examples from her student teaching (e.g., for a student like Clyde, she used to publicly humiliate by saying "you think you're too cool for school, well you're not…", the intent was to make him feeling bad); were well aligned with literature's description of featured control practices
- Control practices were mostly self-initiated and central points in her responses to help Tina and Clyde and similar students; in section three of the interview chose the controlling teaching approach for Clyde after reading Reeve et al.'s scenarios, while her approach reflected in section two with Tina was also controlling

Structure rating: high

Rationale:

- Structure is a primary intended practice for Tina, Bonnie, and similar students she met (note Clyde and Bonnie scenarios were given relatively short time to reflect upon)
- High frequency of structure codes applied relative to other practices: encouragement of competence 3 counts (main code for Tina), monitor understanding 3 counts (Tina, Bonnie), guidance 2 counts (Tina, Bonnie), feedback recognition 2 counts (Tina), instruction 4 counts (Tina, Bonnie)
- Wide range of structure codes applied
- The intended structure practices were elaborated covering multiple aspects of different codes, sometimes with concrete examples from her student teaching; codes were generally well aligned with literature's description, although having one exception (e.g., one instance of feedback & recognition—praising students "you're smart", doing it for all high or low ability students—had the effect of encouraging competence but promoting fixed mindset)
- Structure practices were mostly self-initiated and central points in her responses to help Tina and Bonnie and similar students

Involvement rating: high

Rationale:

- Involvement is a relatively primary intended practice for Tina, Bonnie, and similar students she met (note Clyde and Bonnie scenarios were given relatively short time to reflect upon)
- Relatively high frequency of involvement codes applied: time 4 counts (Tina, Bonnie), dependability 2 counts (Tina, Bonnie), responsiveness 1 count (Tina, exemplar line 314), caring climate 2 counts (Tina)
- Wide range of involvement codes applied

- The intended involvement practices were elaborated sometimes with rich descriptions (e.g., for responsiveness and time); codes were well aligned with literature's description
- Involvement practices were mostly self-initiated and central points in her responses to help Tina and Bonnie and similar students who she commented needed "less harsh ways" and the more autonomy supportive approach in section three

3. Consistency across interview:

Responses and intended practices were generally consistent across interview, especially first two sections; seemed a bit more inclined towards autonomy than control in section three of the interview when she realized controlling approach was not recommended

Appendix D. Complementary Table for Interview Results

Table D.1. Frequency and ratings for the whole sample across interview and under "pressure from below"

Category	Codes	Frequency		Ratings	
		Frequency of codes	Number/percentage of participants	Ratings	Number/percentage of participants
Autonomy	Organizational/procedural autonomy	44 (18)	16, 94.12% (14, 82.35%)	High	2, 11.76% (3, 17.65%)
	Rationale/relevance	39 (22)	16, 94.12% (13, 76.47%)	Moderate	8, 47.06% (8, 47.06%)
	Inner motivation	62 (32)	13, 76.47% (12, 70.59%)	Low	7, 41.18% (6, 35.29%)
	Content responsiveness	12 (2)	7, 41.18% (2, 11.76%)		
	Cognitive autonomy	9 (1)	6, 35.29% (1, 5.88%)		
	Total	**174 (81)**	17 (17)		
Control	External motivation/contingencies	74 (38)	17, 100% (17, 100%)	High	5, 29.41% (9, 52.94%)
	Demands/directives/surveillance	34 (22)	13, 76.47% (12, 70.59%)	Moderate	4, 23.53% (1, 5.88%)
	Controlling language	13 (6)	8, 47.06% (5, 29.41%)	Low	8, 47.06% (7, 41.18%)
	Internal contingencies	11 (5)	8, 47.06% (4, 23.53%)		
	Negative feedback	4 (3)	4, 23.53% (3, 17.65%)		
	Strict schedules/imposed goals	10 (1)	4, 23.53% (1, 5.88%)		
	Block negative affect	2 (1)	2, 11.76% (1, 5.88%)		
	Low rationale/relevance	2 (0)	2, 11.76% (0, 0%)		
	Total	**158 (84)**	17 (17)		
Structure	Instruction	74 (46)	17, 100% (16, 94.12%)	High	14, 82.35% (13, 76.47%)
	Guidance	67 (47)	17, 100% (15, 88.24%)	Moderate	2, 11.76% (3, 17.65%)
	Monitor/manage behaviors	54 (29)	16, 94.12% (13, 76.47%)	Low	1, 5.88% (1, 5.88%)
	Feedback/recognition	21 (12)	13, 76.47% (8, 47.06%)		
	Encouragement of competence	24 (22)	11, 64.71% (11, 64.71%)		
	Monitor understanding	24 (19)	10, 58.82% (9, 52.94%)		
	Clear expectations	21 (6)	9, 52.94% (5, 29.41%)		
	Total	**287 (183)**	17 (17)		
Involvement	Social emotional responsiveness	126 (84)	17, 100% (17, 100%)	High	12, 70.59% (14, 82.35%)
	Time	25 (22)	12, 70.59% (11, 64.71%)	Moderate	5, 29.41% (3, 17.65%)
	Dependability	21 (15)	10, 58.82% (8, 47.06%)	Low	0, 0% (0, 0%)
	Resource	8 (6)	7, 41.18% (5, 29.41%)		
	Caring climate	5 (5)	4, 23.53% (4, 23.53%)		
	Low involvement	*3 (2)*	*3, 17.65% (2, 11.76%)*		
	Total	**186**/*189* (**133**/*135*)	17 (17)		

Note. Numbers and percentages in parentheses represent frequency and ratings for "pressure from below" situations (i.e., coding for Tom/Tina, Bonnie, and Clyde). A few segments were coded generically as autonomy, control, structure, involvement as they cannot be classified into a specific code, the frequency of the generic coding was not included in the table. For involvement, the total counts of 186 and 133 represent counts excluding low involvement, the counts of 189 and 135 represent the total counts for the involvement category as a whole including low involvement

DISCUSSION & CONCLUSION

The mindset theory and SDT are two major motivation theories in education widely applied to enhancing student motivation and achievement as well as informing teacher training. SDT provides a systematic and comprehensive framework of effective teaching practices from a motivational developmental perspective. Drawing upon the mindset theory besides SDT provides additional insights into understanding preservice teachers' intentions to enact autonomy, structure, and involvement, and facilitates the preparation of future teachers who actively engage in autonomy, structure and involvement practices.

Autonomy support is the focus of SDT, and Study 1 of the dissertation focused on intentions to enact autonomy support. This study used a survey method ($N = 237$) to investigate the interrelationships among growth mindset, autonomous orientation, intrinsic motivation for teaching, beliefs about autonomy support, and intentions to enact autonomy. One set of original structural equation models and one set of alternative models were tested, with "pure" and "net" beliefs about and intentions to enact autonomy support respectively (i.e., with and without beliefs about and intentions to enact control taken into account). Study 1 answers research questions 1 and 2 of the dissertation: Are preservice teachers' mindset and autonomous orientation closely positively associated? Do preservice teachers' mindset and autonomous orientation (IVs) predict intentions to enact autonomy support (DV) directly and indirectly through intrinsic motivation for teaching and beliefs about autonomy support (mediators)?

Study 2 extended the investigation to intentions to enact autonomy support as well as the highly related intentions to enact structure and involvement, and to growth mindset as well as fixed and mixed mindset. This study used semi-structured interviews and field journals to investigate the patterns of intentions to enact autonomy, structure and involvement in preservice teachers with different mindsets. The study placed participants into a growth-, a mixed-, and a fixed-mindset groups on a growth-fixed mindset continuum, and focused on "pressure from below" situations that teachers face in daily teaching. Seventeen selected participants were interviewed, and 103 field journals from preservice teachers taking a foundational educational psychology class were collected. Interviews highlighted three scenarios of students with motivation, behavior, ability problems and participants' intended practices to help those students. Field journals addressed an

observed instance of autonomy supportive or controlling teaching from preservice teachers' practicum, and if they would do the same practices and any modifications. Study 2 answers research question 3 of the dissertation: How do preservice teachers with different mindsets intend to enact autonomy support, structure, and involvement, especially when they face "pressure from below"?

Summary of major findings

The major finding of Study 1 is that in general, growth mindset and autonomous orientation predicted intentions to enact autonomy support through similar paths for the current sample. Specific to research questions 1 and 2, first, the correlation between growth mindset and autonomous orientation was significant in the original SEM models and marginally significant in the alternative SEM models. Second, growth mindset did not directly predict intentions to enact autonomy support, and autonomous orientation did not directly predict intentions to enact autonomy support in the alternative models. However, both growth mindset and autonomous orientation indirectly predicted intentions to enact autonomy support through beliefs about autonomy support, although not through intrinsic motivation for teaching. While intrinsic motivation for teaching did not significantly predict intentions to enact autonomy support, both growth mindset and autonomous orientation significantly predicted intrinsic motivation for teaching which in turn significantly predicted beliefs about autonomy support, putting aside the modified alternative model which has a few abnormalities. In general, Study 1 supported the unique contribution of growth mindset in understanding preservice teachers' intentions to enact autonomy support, despite that some findings slightly deviated from hypotheses.

The major findings of Study 2 are that first, interview participants in general had high intentions to enact structure and involvement and moderate to low intentions to enact autonomy and control, and they tended to have higher intentions to enact control under "pressure from below". The growth- and mixed-mindset groups had higher intentions to enact structure and involvement, lower intentions to enact control in general, and the fixed-mindset group was highest in intentions to enact control when facing "pressure from below." Second, largest percentage of field journal participants intended to use structure and autonomy and smallest percentage of participants intended to use control. The growth-mindset group had highest percentage of participants intended

to use autonomy and not use control compared with the mixed- and fixed-mindset groups. In addition, both interview and field journal participants did not prefer control believing it was ineffective but necessary. Specific to research question 3, the interview growth- and mixed-mindset groups had higher intentions to enact structure and involvement and lower intentions to enact control overall and under "pressure from below" than the fixed-mindset group; the three groups were similar in intentions to enact autonomy. The field journal growth-mindset group had highest percentage of participants intended to use autonomy and not use control. The three groups were similar in control, larger percentage of participants from the mixed-mindset group intended to use structure, and larger percentage of participants from the fixed-mindset group intended to use involvement. In general, all groups had relatively high intentions for structure and relatively low intentions for control, the interview groups had high intentions for involvement and field journal groups had relatively high intentions for autonomy as well. However, when facing "pressure from below," all interview groups tended to be more controlling, and the fixed-mindset group was highest in control. Although it is not clear that high growth mindset is associated with stronger intentions for autonomy, Study 2 in general supported that fixed mindset could be another "pressure from within" source for control, and having a growth mindset could potentially help reduce the overall pressure and reliance on control when teachers face "pressure from below."

In summary, Study 1 partially supported that growth mindset and autonomous orientations share functional similarities, and growth mindset had additional roles in explaining intentions to enact autonomy support beyond the individual level predictors of autonomy support that SDT has specified. Study 2 supported that first, fixed mindset could be another source of "pressure from within" besides the sources SDT specified that pull out intentions to use control when preservice teachers face "pressure from below." Second, a growth mindset could potentially reduce "pressure from within," which alleviates "pressure from below" to an extent, and help preservice teachers to use more structure and involvement strategies than relying on control practices to solve the problems.

Synthesis of results

Through three different data sources and a combination of quantitative and qualitative methods, the two studies complemented and triangulated for each other. Findings of Study 1 and Study 2 are convergent in general, and are consistent with the mindset theory and SDT literature.

The two studies support that drawing growth mindset theory to understand preservice teachers' intentions to enact autonomy, control, structure, and involvement provides additional insights. In the context of the current study, growth mindset partially functioned similarly with autonomous orientation and significantly indirectly predicted intentions to enact autonomy support beyond the predictors SDT has specified. Mindset also was an additional "factor from within" besides the SDT specified sources, and increasing growth mindset and decreasing fixed mindset could potentially help preservice teachers reduce intentions to enact control, especially under the prevalent "pressure from below" situations they would face in daily teaching. Study 2 also adds evidence that growth mindset is associated with higher intentions to enact structure and involvement practices.

Moreover, the two studies suggest the effect of mindset on autonomy and control is likely indirect. In Study 1, growth mindset was not directly significantly correlated with intentions to enact autonomy. In Study 2, patterns of autonomy and control in different mindset groups were not vastly different; all interview mindset groups had relatively moderate to low intentions for autonomy and control while the growth- and mixed-mindset groups were lower in control comparative to the fixed-mindset group. Although the pattern from field journal results was different, such that the growth- and mixed-mindset groups had higher intentions for autonomy while three groups were similar in control, this difference could be attributable to the nature of the two data sources (e.g., interview focus on "pressure from below" that engender control, field journal focus on autonomy), and individual characteristics such as if participants were/had taken classes addressing autonomy support, their seniority and teaching experience, etc. Mindset is at the core and deep level of one's belief systems (Dweck, 2000), hence its effect on intended autonomy and control practices might be indirect compared with other relatively more domain/context specific beliefs and motivations and immediate predictors of autonomy and control, such as beliefs about autonomy support (Reeve et al., 2014).

In addition, beliefs about autonomy support was the most important predictor of intentions to enact autonomy support in Study 1. Although Study 2 did not explicitly prompt beliefs about autonomy support and control, participants often talked about those beliefs when reflecting the practices they would adopt. Overall, both studies suggest beliefs about autonomy support and control are closely related to intentions to enact autonomy support and control.

The two studies also reveal some divergent findings. First, Study 1 suggests a positive association between growth mindset and intentions to enact autonomy, but Study 2 did not suggest a clear association. Although the field journal data as the secondary data source in Study 2 showed that the growth-mindset group was also higher in autonomy, interview data as the primary data source showed that all mindset groups were similar in autonomy although different in control. In theory, growth mindset should be associated with stronger intentions to enact autonomy, the unclear associations in Study 2 might be due to the relatively richer teaching experiences and higher seniority of the low mindset group, as well as other factors such as participants' autonomous orientation and fields of study. It could also be related to our way of coding autonomy, structure and involvement. Some aspects of intended practices we coded as structure and involvement were coded as autonomy in other studies (e.g., Jang et al., 2010), and the growth- and mixed-mindset groups were higher in structure and involvement. We also coded autonomy and control separately, as a teacher low in autonomy is not necessarily high in control and vice versa. However, autonomy and control are often placed on a continuum in SDT studies, if we put autonomy and control on a continuum, Study 2 would still suggest that the growth- and mixed-mindset groups would reside more on the autonomy side and the fixed-mindset group more on the control side. Alternatively, the findings may also suggest that growth mindset is relatively weakly associated with intentions to enact autonomy support, but the effect of fixed mindset would be more detrimental such that it is associated with intentions to enact control, especially when facing difficulties and pressure. Therefore, changing a fixed mindset and cultivating a growth mindset is important.

Furthermore, Study 1 suggests that growth mindset significantly predicts positive beliefs about autonomy, however, Study 2 suggests that preservice teachers with different mindsets may not be different in their beliefs about autonomy and control. Nonetheless, without fixed mindset and relatively mixed mindset as well as beliefs about control examined in Study 1's model, it was difficult to detect if the results on beliefs about autonomy and control were truly divergent. Study

1 did not exclude the possibility that fixed mindseted participants would also believe autonomy was effective as growth mindseted participants. Study 2 beliefs were also more about control, such that participants in all mindset groups believed control was ineffective but needed, which was not examined in Study 1.

Implications

Theoretical implications

With a combined perspective of the mindset theory and SDT, the studies provide additional insights into understanding autonomy support beyond what SDT has explained. Recently, educational psychology researchers have called for an integration of multiple theories and multifaceted models of motivation to explain a studied phenomenon, which allow a fuller understanding (Linnenbrink-Garcia & Patall, 2016). For instance, applying SDT's concepts of autonomous and controlled motivations to achievement goal theory has allowed a fuller understanding of how achievement goal outcomes yield their effects (Ryan & Deci, 2018). Our studies provide some evidence regarding the associations among key constructs in the mindset theory and SDT, and suggests mindset is an underlying mechanism that may function over the SDT identified predictors of autonomy support in predicting intentions to enact autonomy support. The studies demonstrate that mindset could be another "factor from within" that hinder/support autonomy structure involvement practices, and suggest promoting growth mindset may help meeting the challenge of not resorting to control practices under "pressure from below".

In addition, Study 1 provides some empirical evidence partially supporting Koestner and Zuckerman's (1994) proposition that mindset and autonomous orientation function in a similar way in predicting beliefs (beliefs about autonomy support), motivations (intrinsic motivation for teaching), and intended practices (autonomy support). It fills the gap in literature that mindset and autonomous orientation has been scantly studied together albeit their functional similarities. Furthermore, Study 2 provides a relatively comprehensive way to depict autonomy, structure and involvement practices. Researchers and practitioners may use our codebook to conceptualize effective teaching practices. Study 2 also provides some additional insights into mindset research by including a mixed or lower growth mindseted group while past research typically followed a growth-fixed mindset dichotomy.

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Practical implications

First, Study 1 suggests that mindset, autonomous orientations, positive beliefs about autonomy support and intrinsic motivations for teaching contribute to intentions to enact autonomy support practices, Study 2 further suggests the necessity of helping teachers cultivate a growth mindset. Hence, teacher education programs should continue to promote these positive beliefs and motivations in order to help preservice teachers grow as autonomy supportive and by extension competence and relatedness supportive teachers.

Second, it seems the teacher education program did have some positive effect in promoting autonomy support. Some of the participants in both studies have learned about autonomy support in class and reflected upon the concepts and principles in their practicum. The field journal data for example reflected positive beliefs about autonomy support and intentions to enact autonomy support. Participants overall indicated preference for autonomy albeit moderate intentions to enact autonomy. The learning and practices of autonomy support might have raised participants' mindfulness according to SDT (Ryan & Deci, 2018). Mindfulness allows individuals to take interest in what they are doing and experiencing, become more growth-oriented, cultivate positive beliefs and motivations towards autonomy, and choose autonomy practices more than control (Reeve, 2009). Therefore, teacher educators should continue to address the concept of autonomy support in class, and deepen preservice teachers' understanding of how to enact a whole range and high quality of autonomy practices. In addition, linking to practicum experiences, having preserivce teachers reflect on how their beliefs and motivations act out in practices can raise awareness and mindfulness, which could facilitate the cultivation of more adaptive beliefs and motivations (Reeve, 2009). Meanwhile, helping preservice teachers enact autonomy supportive teaching through practicum is important, as practicing the skills and achieved competence to enact these skills could help them better internalize what they learned about autonomy support (Ryan & Deci, 2018).

Additionally, Study 2 revealed that participants were frequently troubled by practical constraints, such as the various levels and sources of pressure they would experience in daily teaching. Teacher educators need to help preservice teachers understand how potential practical constraints such as "pressure from below" may hinder effective practices and pull out control practices, and how to cope with the constraints and pressure. Study 2 suggests cultivating a growth

mindset or changing fixed mindset is helpful. The interventions to promote a growth mindset should start early in teacher education programs, since it needs long-term and sustained interventions to change fixed mindset (Dweck, 2000).

Limitations

The dissertation mainly has two areas of limitations. First, it is less feasible to study participants' actual classroom autonomy support or controlling practices because most of them still have limited experiences. Hence this dissertation focused on intentions to enact these practices. However, it may limit the findings in terms of how participants' beliefs and motivations can actually predict their real-life practices. Preservice teachers are different from in-service teachers but share similarities. Whether preservice teachers translate the adaptive beliefs and motivations they continue to develop in teacher education programs into their teaching practices is controversial (Buehl & Beck, 2015), but it is another issue beyond the scope of the dissertation. At least developing these adaptive intentions, beliefs and motivations in teacher education programs is a good start and a reasonable realistic expectation of preservice teacher education (Loughran & Hamilton, 2016). Interventions at the inservice teachers level should continue to help teachers develop such positive beliefs, motivations and intentions.

The research setting and sample may also pose some threat to the ecological and population validity of the study. Participants are mostly from one university with a strong teacher education program that emphasizes preservice teachers' understanding of content knowledge as well as practicum experiences. The major participating university maintained its top 25 ranking among the nation's public universities and is 65th among all universities, according to U.S. News & World Report. Therefore, the results have limited generalizability to a different context/setting. In addition, the sample mostly fall on the growth mindset side on the mindset continuum, hence the mixed and fixed mindset cases in Study 2 is not most representative. Although research has shown that preservice teachers have a more growth mindset compared to the general population (Fang, 2017), the generalizability of the results across the different kinds of preservice teachers in the larger population is limited.

Future work

Future steps are multiple. Different, more representative samples need to be studied to test the generalizability of the results. Besides including samples more representative of fixed and mixed mindset and samples from different contexts, sub-samples such as elementary and secondary preservice teachers or teachers in different fields may be studied separately to see potential group differences. These teachers may receive different training and experience different classroom dynamics in teaching, which could potentially influence their intentions to enact autonomy structure and involvement.

Also, to provide further implications for teacher education curriculum, future study could use an experimental approach, including an intervention class with targeted designs and another class as the control group to compare the effect of addressing mindset and SDT concepts on preservice teachers' intentions to enact autonomy. Evidence based research is needed in order to enhance the effect of teaching autonomy.

Moreover, the research questions regarding the interrelationships among the study constructs also apply to a larger population of teachers. Studying inservice teachers might offer additional insights to the studied phenomenon as they are already practicing. Additionally, more longitudinal, observational, mixed methods studies with more data sources could facilitate our understanding of how the study constructs interplay.

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