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Extending self-determination theory's dual-process model to a new tripartite model to explain diminished functioning

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Abstract

In a three-study investigation, we pursued three purposes: (1) extend self-determination theory's dual-process model to a new tripartite model—to recognize that environmental conditions sometimes render a psychological need dormant; (2) better explain adolescents' diminished functioning; and (3) develop the Three States Questionnaire (TSQ). In Study 1, 402 high schoolers reported the satisfied, frustrated, and dormant state of their psychological needs (autonomy, competence, and relatedness) during classroom instruction to develop the TSQ. In Study 2, 320 high schoolers reported their satisfied, frustrated, and dormant states as well as 17 indicators of their effective, defiant, and diminished classroom functioning. The TSQ showed excellent psychometric properties, and the predictive power of the tripartite model was superior to that of the dual-process model in the prediction of all five indicators of diminished functioning (e.g., disengagement). In Study 3, 457 high schoolers' perceived teachers' motivating styles (supporting, controlling, and neglecting) predicted their three need states (satisfied, frustrated, and dormant), which predicted the quality of their classroom functioning (effective, defiant, and diminished). Overall, the dormant state was distinct from the other two states, it uniquely explained diminished functioning, and the tripartite model out-predicted the dual-process model.

Keywords Disengagement · Dormant · Frustration · Psychological needs · Self-determination theory

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Introduction

Why do students sometimes lack energy and disengage themselves from the learning activity of the day? Why do they sometimes shut down during the lesson, instead of participating energetically? In the present investigation, we sought to understand this phenomenon and provide a new motivationally-based explanation for it, using self-determination theory (SDT; Ryan & Deci, 2017).

To explain the ups and downs of classroom engagement and disengagement, early SDT researchers proposed the motivation mediation model shown in Fig. 1A (based on Deci et al., 1991). According to this model, exposure to a relatively autonomy-supportive environment promoted high need satisfaction (autonomy, competence, and relatedness), which then energized effective functioning, such as engagement, learning, and well-being. Empirical research found substantial support for the capacity of this early model to explain effective functioning (Deci et al., 2001; Jang et al., 2009, 2012).

Fig. 1 Evolution of the self-determination theory explanation for the quality of students' functioning: basic motivation mediation model (**A**), dual-process model (**B**), and tripartite model (**C**)
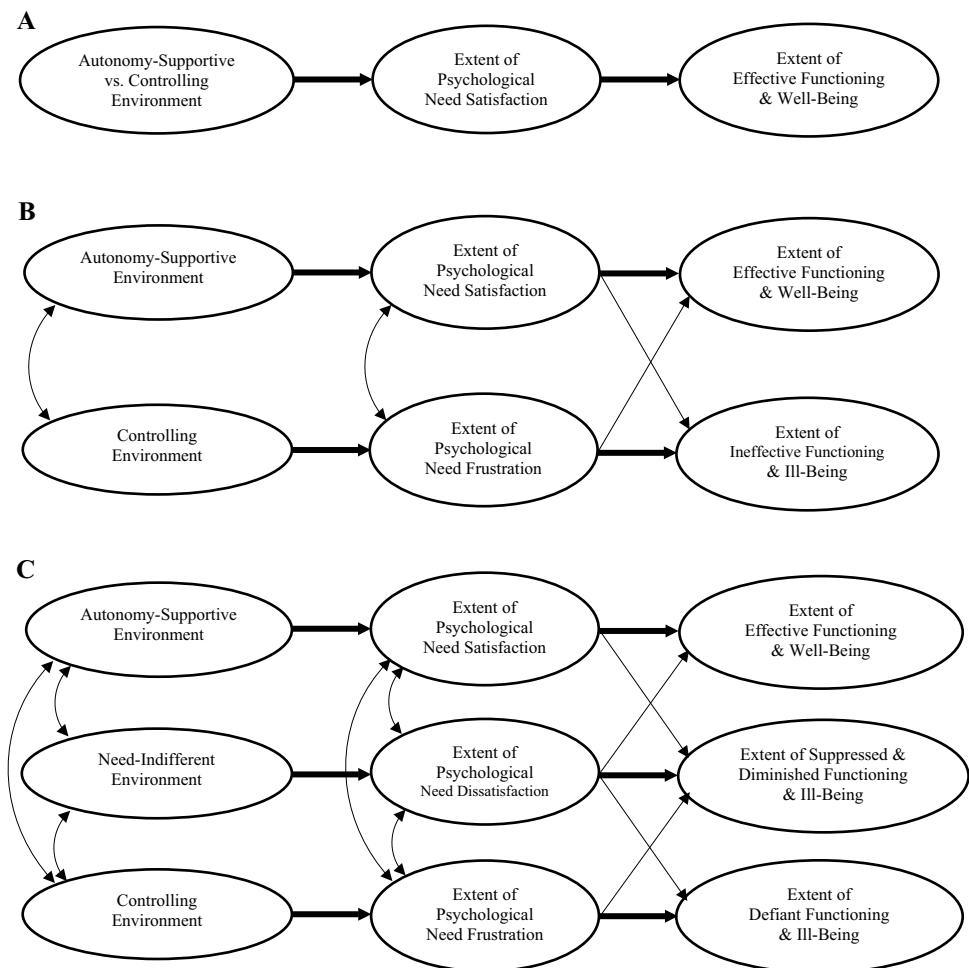
Self-determination theorists then expanded this basic motivation mediation model into the dual-process model shown in Fig. 1B (based on Bartholomew et al., 2011a). They did so because they sought to explain not only students' effective functioning (as per Fig. 1A) but also their ineffective functioning (e.g., disengagement, antisocial behavior, and ill-being). To make this theoretical advance possible, SDT theorists began to recognize (1) the predictive power of not only need satisfaction but also of need frustration and (2) that need satisfaction arose from a supportive environment while need frustration arose from a controlling environment. According to the dual-process model, an autonomy-supportive environment facilitates the "bright side" processes of need satisfaction and effective functioning, while a controlling environment catalyzes the "dark side" processes of need frustration and ineffective functioning (though the model further included the "cross-over" paths in Fig. 1B; Vansteenkiste & Ryan, 2013). Empirical research also found substantial support for the capacity of the dual-process model to explain both effective and ineffective functioning (Amoura et al., 2015; Bartholomew et al.,

2018; Cheon et al., 2016; Haerens et al., 2015; Jang et al., 2016).

As SDT researchers investigated "dark side" outcomes such as classroom violence (Assor et al., 2018), psychopathology (Levine et al., 2022), and amotivation (Cheon & Reeve, 2015), it became apparent that ineffective functioning manifests itself in two ways—maladaptive and diminished. Maladaptive functioning arose out of reactance-based motivations (i.e., the thwarting of one's needs) that energized outcomes such as defiance, antisocial behavior, and problematic relationships, while diminished functioning arose out of apathy-based amotivations (the lack of fulling one's needs) that led to passivity and disengagement (Levine et al., 2022). To better explain such diminished functioning, SDT researchers found it necessary to introduce the new concept of need dissatisfaction (Bhavsar et al., 2020; Cheon et al., 2019; Costa et al., 2015; Sheldon & Hilpert, 2012), as shown in Fig. 1C (based on Costa et al., 2015). This new concept of need dissatisfaction has not yet been universally embraced, and it remains a controversial addition to the SDT explanatory framework. The

purpose of the present paper was to shed new light on this controversy.

Incorporating the dormant state into the SDT explanatory framework

One assumption within SDT is that of "intrinsic activity" (Ryan & Deci, 2017). That is, all people naturally possess a repertoire of engagement-fostering inner motivational resources that are fully capable of energizing and directing their effective functioning—inherent resources such as intrinsic motivation and the psychological needs for autonomy (desire for personal endorsement during behavior), competence (desire for effectance during environmental interactions), and relatedness (desire for acceptance and closeness during relationships). However, a second SDT assumption is that these inner motivational resources require socio-environmental support for their satisfaction. This is the "organismic approach" assumption within SDT, one based on the classic plant metaphor (e.g., to thrive, plants need sunlight, water, and nutritious soil). This second assumption somewhat qualifies the first, at least when SDT is put into practice in applied settings such as the classroom. The teacher can assume students' active engagement—if the classroom environment is autonomy supportive. But, if the classroom environment is controlling or indifferent to students' inner motivational resources, then students' natural motivation may be suppressed or diminished.

To illustrate how the classroom environment can either energize or deflate a student's inherent motivation, Patrick et al. (2000) examined how teacher enthusiasm can "jump start" a student's intrinsic motivation and, alternatively, how teacher monotony might deflate it:

> Given that intrinsic motivation is an internal source of energy that motivates behavior as an end in itself, it may seem somewhat strange and theoretically inconsistent to think of teacher enthusiasm—a contextual stimulus that is clearly external to the student—as a source of intrinsic motivation to learn. However, we resolved that dilemma by conceiving of teacher enthusiasm as an external catalyst for the intrinsic motivational energy that may be lying dormant within the student. That phenomenon of *dormant energy* may be particularly prevalent in college students, many of whom, as veritable veterans of an educational system built around external incentives and rewards, may have forgotten or lost faith in their own intrinsic motivation to learn. Enthusiasm may act somehow as a spark to reignite the flame of curiosity and interest for students, giving their intrinsic motivation a jump start, if you will. (Patrick et al., 2000, p. 219, italics original).

Patrick et al.'s reference to intrinsic motivation applies equally well to our focus on psychological needs because the autonomy, competence, and relatedness needs are the very source of intrinsic motivation (Ryan & Deci, 2017). If a monotonous teacher or an uninteresting activity can render intrinsic motivation dormant, then it makes equal sense that a motivationally-indifferent environment might do the same to the psychological needs.

Figure 2 presents our theoretical framework. It explains how the environmental context can leave a psychological need satisfied, frustrated, or dormant. It further shows the effects of each of these three states on the quality of students' (effective, maladaptive, and diminished) functioning. The figure illustrates how each state links to a specific set of outcomes, though it omits the "cross-over paths" introduced by the dual-process model to add that each state can have a supplemental effect on the other two sets of outcomes (Bartholomew et al., 2011a; Vansteenkiste & Ryan, 2013). For instance, to predict female athletes' depressive symptomology, Bartholomew et al. (2011a) tested for need frustration as the primary predictor but also added (low) need satisfaction as a secondary or supplemental predictor.

Notably, we felt it necessary to reconceptualize "need dissatisfaction" (Fig. 1C) into the newly-proposed dormant state. Our concern was that need frustration and need dissatisfaction overlapped too much (e.g., Bhavsar et al., 2020; Cheon et al., 2019; Costa et al., 2015), and that what better explained diminished functioning was a situation in which the psychological need deflated from its full natural state—like air coming out of a balloon, or energy coming out of a psychological need.

Figure 2 explains why a psychological need is satisfied, frustrated, or deflated. Given autonomy support from an activity, relationship, or environment, the student tends to experience a satisfied state that catalyzes effective functioning (e.g., behavioral engagement), as shown on the left side of Fig. 2. Given a controlling activity, relationship, or environment, the student tends to experience a frustrated state that catalyzes maladaptive or defiant functioning (e.g., anti-internalization), as shown on the right side of Fig. 2. Given a motivationally-indifferent or motivationally-neglecting activity, relationship, or environment (i.e., the teacher is unaware of or clueless about students' psychological needs), the student may experience a dormant state that catalyzes diminished functioning (e.g., behavioral disengagement), as shown in the lower part of Fig. 2.

Plan of the investigation

The overall purpose of the present three-study investigation was to test the merits of the theoretical model depicted in Fig. 2, especially the capacity of the dormant state to explain indices of diminished functioning. However, before we could

Fig. 2 Theoretical model of the rise of the three states and their associated indices of functioning
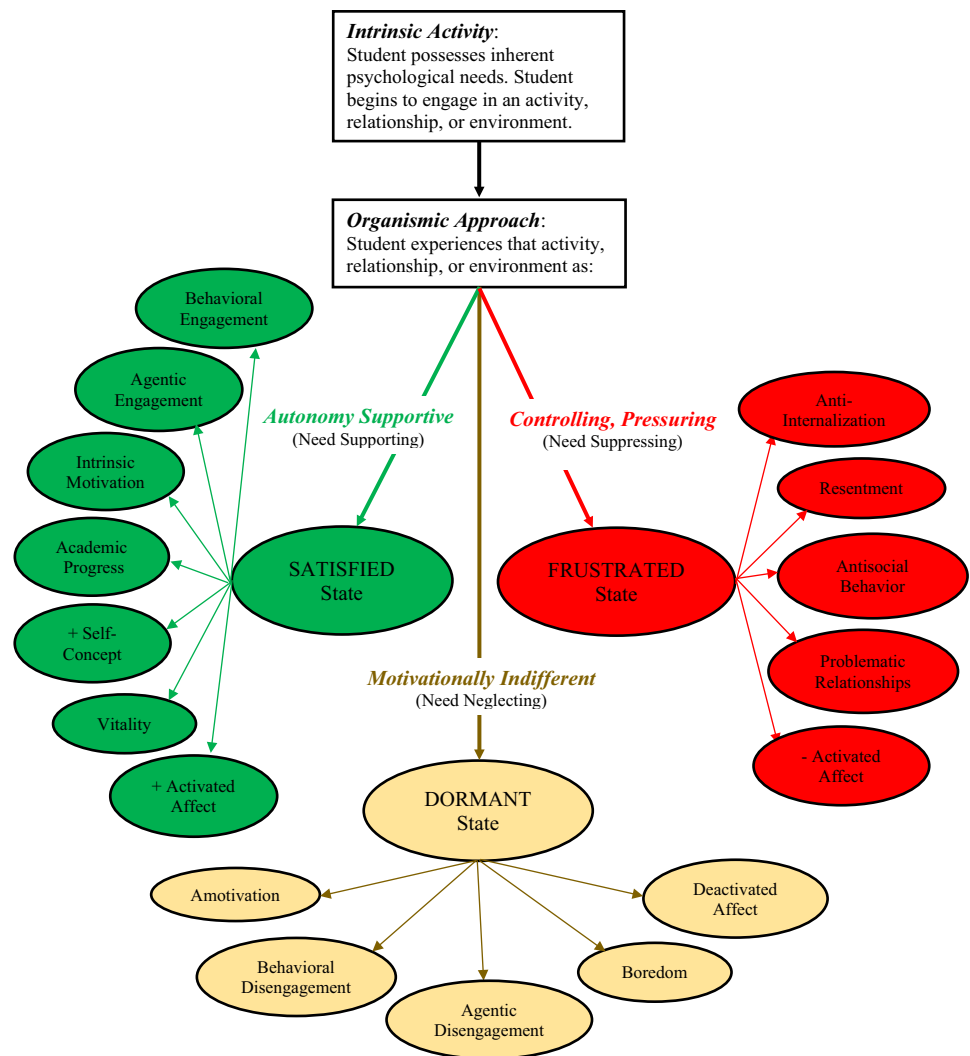
test this model, we first needed to propose, develop, and validate a new measure of the dormant state. In Study 1, we developed this new measure to operationally define the dormant state. In Study 2, we sought to validate the predictive power of this new measure in terms of its capacity to uniquely explain students' diminished functioning (e.g., disengagement), controlling for experiences of both low need satisfaction and high need frustration. In Study 3, we tested the full theoretical model depicted in both Figs. 1C and 2 in which students' perceptions of their supporting, controlling, and neglecting environments predicted their ensuing need state (satisfied, frustrated, and dormant) and corresponding functioning (effective, defiant, and diminished).

Study 1

Study 1 sought to develop a brief, construct-congruent, and psychometrically strong measure of the dormant state. A psychological need is an inherent, universal psychological condition that needs to be satisfied for an individual to thrive and be fully functioning in terms of adjustment, psychological growth, and wellness (i.e., that "condition" is an experience of autonomy, competence, or relatedness; Ryan & Deci, 2017). We suggest that a psychological need can exist in one of three different states, and we propose the following conceptual definitions of these three states:

- The *dormant state* is an energy-deflating experience that occurs when one's current activity *has little or nothing to do with* one's desire to experience (a) personal ownership while acting (autonomy), (b) effectance during an environmental transaction (competence), and (c) acceptance and closeness in a relationship (relatedness). One

example would be desiring relatedness but having no opportunity for a warm social interaction.

- The *satisfied state* is an energy-mobilizing experience that occurs when one's current activity *is congruent with* one's desire to experience (a) personal ownership while acting (autonomy), (b) effectance during an environmental transaction (competence), and (c) acceptance and closeness in a relationship (relatedness). One example would be desiring relatedness and being engaged in a warm social interaction.
- The *frustrated state* is an energy-blocking experience that occurs when one's current activity *contradicts against* one's desire to experience (a) personal ownership while acting (autonomy), (b) effectance during an environmental transaction (competence), and (c) acceptance and closeness in a relationship (relatedness). One example would be desiring relatedness but being forcibly told not to engage in that warm social interaction.

Our conceptual definition of the dormant state is new, while our definitions for the satisfied and frustrated states reflect established conceptualizations in the SDT literature (Mabbe et al., 2018; Ryan & Deci, 2017).

With these conceptual definitions in hand, a four-person panel of SDT experts within the author team conducted a two-stage process to develop the Three States Questionnaire (TSQ). First, the panel identified 60 candidate items to represent the three states—27 for "dormant", 15 for "satisfied", and 18 for "frustrated". Second, through discussion, the panel reached a consensus as to which 20 items best represented the corresponding conceptual definition (9 for dormant, 5 for satisfied, and 6 for frustrated). For instance, the panel selected "switched to off" for further investigation as a candidate item to represent the dormant state because it connotes both deflation and acting without psychological need involvement. The panel included a mix of early-career and senior researchers with established publication records (M h-index = 27.8). In the Study 1 data collection, the two inclusion criteria for the retention of a candidate item on the TSQ were that it must, in a factor analysis, (1) load highly and uniquely on the factor it was designed to measure (i.e., convergent validity) and (2) not load on a factor it was not designed to measure (i.e., low cross-loadings; discriminant validity).

Method

Data availability, preregistration, ethics approval, and sample size rationale

Study 3 was pre-registered (while Studies 1 and 2 were not). Our preregistered hypothesized model, individual

hypothesized paths, and specific measures are available at both AsPredicted #97585: https://aspredicted.org/f3re7.pdf and our Open Science Framework (OSF) project site: https://osf.io/cvb2s/?view_only=d9c5a5f072d5471284e949c6d9857056. The OSF project site also includes the (SPSS) data sets from all three studies (Studies 1, 2, and 3), the Mplus syntax for the Study 3 data analysis, the study questionnaire, and the original list of 60 candidate items.

The first author's University Research Ethics Committee approved the separate research protocols for Studies 1, 2, and 3. Sample sizes were determined by an a priori power analysis for regression-based analyses using the G*Power 3 program (Faul et al., 2007). We aimed for a minimal sample size in each study of at least $N = 146$ to detect a moderate effect size ($f^2 = .15$) using at least six predictors and conventional statistics ($\alpha = .05$, two-tailed, power = .95). Table 1 shows the obtained sample sizes for Studies 1, 2, and 3.

Participants and procedure

Using the online crowdsourcing service Qualtrics, for Study 1 we recruited 402 high school students in the United States of America (USA) to participate in a study on their classroom experience in a particular course, which we predefined as their "Wednesday, 2nd period class". In selecting this specific day and time, we followed the recommended procedures of the American Educational Research Association to determine which particular class to focus on for school-based survey research. The left column in Table 1 shows the Study 1 sample's demographic characteristics, including gender, grade level, age, ethnicity, and course/subject matter. The questionnaire began with a consent form. Students were assured that their responses would be confidential and used only for the purposes of the research study. Students completed the questionnaire online using the Qualtrics commercial survey software program.

Measures

The questionnaire used a 1–7 response scale in which 1 = *strongly disagree*, 7 = *strongly agree*. An opening page asked participants to report their demographic information and to focus their responses specifically on their Wednesday, 2nd period class: "Consider your 2nd period class on Wednesday. What is that class (subject matter)? Please name the course in the blank below: ____").

Three States Questionnaire (TSQ) We formatted the TSQ as a 3-page (3-screen) measure. Page 1 provided the relatedness vignette, followed by the 20 candidate items designed to assess the dormant, satisfied, and frustrated states related to relatedness: "During my Wednesday, 2nd period class,

Table 1 Demographic characteristics of the sample of USA high school students in Studies 1, 2, and 3

Demographic characteristic	Study 1 (N = 402)		Study 2 (N = 320)		Study 3 (N = 457)	
Gender						
Female	302	75.1%	208	65.0%	309	67.6%
Male	86	21.4%	105	32.8%	123	26.9%
Preferred not to say	14	3.5%	7	2.2%	25	5.5%
Grade level						
10th Grade	145	36.1%	147	45.9%	158	34.6%
11th Grade	204	50.7%	137	42.8%	240	52.5%
12th Grade	53	13.2%	36	20.8%	59	12.9%
Average age	16.8 years old		15.7 years old		15.8 years old	
Ethnicity						
Caucasian-White	173	43.0%	157	49.1%	211	46.2%
African-American	99	24.6%	75	23.4%	125	27.4%
Hispanic or Latino	74	18.4%	48	15.0%	65	14.2%
Asian or Asian-American	32	8.0%	21	6.6%	27	5.9%
Native American	5	1.2%	3	1.0%	7	1.5%
Hawaiian	1	0.2%	2	0.6%	4	0.9%
Other (mostly biracial)	19	4.7%	16	5.0%	18	3.9%
Course						
Math	73	18.2%	73	22.8%	101	22.1%
English	66	16.4%	51	15.9%	59	12.9%
History	41	10.2%	33	10.3%	33	7.2%
Chemistry or Biology	35	8.7%	22	6.9%	27	5.3%
Spanish or French	30	7.5%	14	4.4%	13	2.8%
Science	16	2.5%	14	4.4%	31	6.8%
Art	17	4.2%	5	1.6%	18	3.9%
Other	124	30.8%	107	33.4%	206	45.1%

my desire to have a good, close relationship with my teacher and classmates typically feels…" (italics included). Page 2 provided the competence vignette, followed by the same 20 candidate items: "During my Wednesday, 2nd period class, *my desire to feel effective, make progress, and finish with 'a job well done'* typically feels…". Page 3 provided the autonomy vignette, followed by the same 20 candidate items: "During my Wednesday, 2nd period class, *my desire for choice and personal freedom* to do interesting and important activities typically feels…".

Here we explain why we adopted the questionnaire's unique format (i.e., three vignettes followed by the same set of 20 experiential states). Several reliable, valid, and widely-used measures of the psychological needs already exist, such as the Basic Psychological Need Satisfaction and Need Frustration Scale (BPNSFS; Chen et al., 2015), the Balanced Measure of Psychological Needs (BMPN; Sheldon & Hilpert, 2012), and the Psychological Need Thwarting Scale (PNTS; Bartholomew et al., 2011b). These measures feature statements such as, "I feel pressured to do too many things" (for autonomy frustration), "In this class, there are times when I am told things that make me feel incompetent"

(for competence frustration), and "I feel that people who are important to me are cold and distant toward me" (for relatedness frustration). These items, especially those assessing need frustration, unintentionally but consistently confound the motivational experience (i.e., "feel pressured", "feel incompetent", "feel distant") with its situational antecedent (e.g., "too many things to do", "told things that make me feel inadequate", and "people are cold and distant toward me"). We note that only the subjective feeling actually reflects the state of the psychological need. The remaining item content reflects environmental conditions that presumably cause that way of feeling. To avoid confounding the need state with its antecedent conditions, we designed the TSQ to feature only the feeling state (e.g., "satisfied", "unengaged", "thwarted").

Data analyses

Our primary analysis was an exploratory factor analysis (EFA). EFA is used routinely in the early phases of scale construction (van Zyl & ten Klooster, 2022). In our EFA, we expected a 3-factor solution, and we used promax rotation (that allows for intercorrelated factors). Of particular

importance was whether each candidate item loaded high on its respective factor (convergent validity) and low on the other two factors (i.e., little or no cross-loading; divergent validity). Our a priori plan was to identify the 4 best items to represent the dormant state (out of 9 candidate items), the 4 best items to represent the satisfied state (out of 5 candidate items), and the 4 best items to represent the frustrated state (out of 6 candidate items).

Prior to conducting the EFA, we aggregated/averaged participants' autonomy, competence, and relatedness scores across each candidate item (e.g., satisfied) into a single score. For instance, if a participant reported a "5" for "satisfied" on the relatedness vignette, a "4" for "satisfied" on the competence vignette, and a "3" for "satisfied" on the autonomy vignette, we entered a score of "4.0" for that participant's "satisfied" state. We did this because need satisfaction produces its beneficial effects whether it derives from autonomy satisfaction, competence satisfaction, or relatedness satisfaction (Ryan & Deci, 2017). In Study 2, we justify this aggregation strategy with a confirmatory factor analysis (CFA) designed to test the merit of this aggregation strategy. We delayed this CFA until Study 2 so that we could analyze the final items on the questionnaire rather than all the candidate items (several of which we planned to discard after Study 1).

Results

For each of the 20 candidate items, Supplemental Table 1 displays its descriptive statistics and factor loadings from the EFA's 3-factor solution.

Descriptive statistics

As shown on the left side of Supplemental Table 1, each candidate item showed acceptable descriptive statistics in terms of range (i.e., a lack of ceiling or floor effects) and distributional properties, as skewness and kurtosis values were all |0.96| or less. Few items showed any bias associated with gender (t-test), grade level or ethnicity (one-way ANOVAs). The one exception was that the need frustration items tended to show a mild but sometimes significant association with gender (females > males).

Factor loadings

The 3-factor EFA solution revealed three factors with eigenvalues greater than 1.0. Together these three factors accounted for 68.5% of the total variance in the 20-item questionnaire. The right side of Supplemental Table 1 shows the factor scores (parameter estimates) of the 20 candidate items across the three factors. An examination of these parameter estimates revealed fairly well-defined factors with

modest cross-loadings: *Dormant*, λ's ranged from .130 to .747 (M = .541) with cross-loadings from |λ| = .051 to .618 (M = .218); *Satisfied*, λ's ranged from .444 to .873 (M = .681) with cross-loadings from |λ| = .039 to .857 (M = .262); and *Frustrated*, λ's ranged from .411 to .992 (M = .814) with cross-loadings from |λ| = .005 to .326 (M = .110). Based on our convergent and divergent validity criteria, the selected items for the dormant factor were *unengaged*, *inactive*, *irrelevant*, *disconnected from what I was doing*, and *switched to "off"* (but not unexpressed, unused, empty, and dormant). The selected items for the satisfied factor were *satisfied*, *fully realized*, and *fulfilled* (but not abundant and overflowing). The selected items for the frustrated factor were *thwarted*, *destroyed*, *hurt*, and *injured* (but not crushed and frustrated).

Discussion

Study 1 sought to reduce the initial pool of 20 candidate items down to a final 12 or so. Based on the EFA-generated target and cross-loading parameters generated, we identified 5 well-representative items for the dormant scale, 4 for the frustrated scale, and 3 for the satisfied scale. Because the satisfied scale featured only 3 successful items in Study 1, the aforementioned panel met again to nominate a new fourth candidate item to test in Study 2—namely, "deep satisfaction".

Study 2

Study 2 sought to establish the predictive validity of the dormant, satisfied, and frustrated scales. To do so, we asked participants to complete the 13-item TSQ developed in Study 1 as well as a battery of scales to assess all 17 outcomes featured in Fig. 2. To identify these outcomes, we completed a comprehensive review of the outcomes featured in empirical tests of the dual-process theory. Our aim was to be comprehensive in scope in terms of outcomes most relevant to classroom instruction. We predicted that (1) the dormant scale would explain independent variance in all five indices of diminished functioning (e.g., behavioral disengagement), controlling for scores on the satisfied and frustrated scales; (2) the satisfied scale would explain independent variance in all seven indices of effective functioning (e.g., vitality), controlling for scores on the dormant and frustrated scales; and (3) the frustrated scale would explain independent variance in all five indices of defiant functioning (e.g., anti-internalization), controlling for scores on the satisfied and dormant scales.

Method

Participants and procedure

Using the online crowdsourcing service Qualtrics, we recruited a new sample of 320 high school students in the USA to participate in a study on their classroom experience in a particular course, which we again pre-defined as their "Wednesday, 2nd period class". The center column in Table 1 shows the Study 2 sample's demographic characteristics. The questionnaire began with a consent form. Students were assured that their responses would be confidential and used only for the purposes of the study. Students completed the questionnaire online using the Qualtrics commercial survey software program.

Measures

Each measure used a 1–7 response scale in which 1 = *strongly disagree*, 7 = *strongly agree*. On an opening page, participants reported their demographic information and read the same instructions as used in Study 1.

Three States Questionnaire We used the same 3-page (3-screen) format for the TSQ as used in Study 1, except that each vignette included a set of 13 (rather than 20) experiential states. As in Study 1, we again averaged participants' autonomy, competence, and relatedness scores (during their Wednesday, 2nd period class) across each experiential state to create a 4-item satisfied scale (satisfied, fulfilled, fully realized, deep satisfaction; $\alpha = .87$), a 5-item dormant scale (unengaged, inactive, irrelevant, disconnected from what I was doing, switched to "off"; $\alpha = .90$), and a 4-item frustrated scale (thwarted, destroyed, hurt, injured; $\alpha = .92$).

Outcome measures Participants completed the following previously-validated and widely-used measures to assess five indices of diminished functioning: 4-item Amotivation scale from the Behavioural Regulations Questionnaire to assess amotivation ($\alpha = .90$; Markland & Tobin, 2004); 5-item Behavioral Disaffection scale to assess behavioral disengagement ($\alpha = .78$; Skinner et al., 2009); 5-item Agentic Disengagement scale to assess agentic disengagement ($\alpha = .66$; Reeve et al., 2020); 8-item State Boredom scale to assess boredom ($\alpha = .90$; Hunter et al., 2016); and 4-item Unpleasant-Deactivated Mood Scale from the UWIST Mood Checklist to assess deactivated affect ($\alpha = .84$; Matthews et al., 1990).

Participants completed the following previously-validated and widely-used measures to assess seven indices of effective functioning: 4-item Intrinsic Motivation scale from the Behavioural Regulations in Physical Education Questionnaire to assess intrinsic motivation ($\alpha = .92$; Aelterman

et al., 2016); 5-item Behavioral Engagement scale to assess behavioral engagement ($\alpha = .86$; Skinner et al., 2009); 5-item Agentic Engagement scale to assess agentic engagement ($\alpha = .86$; Reeve, 2013); 3-item Vitality scale from the Vitality Scale to assess vitality ($\alpha = .85$; Ryan & Frederick, 1997); 5-item Skill Development Questionnaire to assess academic progress ($\alpha = .83$; Cheon et al., 2012); the 3-item Academic Self-Concept scale from the School Self-Concept scale within the Self-Description Questionnaire III to assess positive self-concept ($\alpha = .88$; Marsh, 1987); and 4-item Pleasant-Activated Mood scale from the UWIST Mood Checklist to assess positively activated affect ($\alpha = .75$; Matthews et al., 1990).

Participants completed the following previously-validated and widely-used measures to assess five indices of defiant functioning: 8-item Pressured Reasons to Not Comply with the Teacher's Request scale to assess anti-internalization ($\alpha = .85$; Aelterman et al., 2016); 3-item Feelings of Resentment toward the Lesson scale to assess resentment ($\alpha = .78$; Aelterman et al., 2016); 5-item Antisocial Classmates Scale from the Prosocial and Antisocial Behavior Questionnaire to assess antisocial behavior ($\alpha = .86$; Kavussanu & Boardley, 2009); a single item measure to assess problematic relationships (Deci et al., 2006); and 4-item Unpleasant-Activated Mood scale from the UWIST Mood Checklist to assess negatively activated affect ($\alpha = .86$; Matthews et al., 1990).

Data analyses

We performed five analyses—two preliminary and three hypothesis-testing. The first preliminary analysis tested the extent to which the items on the dormant state scale could be distinguished from the items on the questionnaires to assess diminished functioning. Our reasoning was that the dormant state was a motivational antecedent that led to these indicators of diminished functioning, but it was not an indicator of diminished functioning itself. "Appendix 1" displays the factor loadings from this 6-factor, 31-item EFA solution. Target loadings for the dormant scale's five items (factor 2) were universally high $|\lambda| = .793$ to $.900$ ($M = .847$). Most importantly, cross-loadings from the 26 items representing the five indicators of diminished functioning (factors 1, 3–6) were all low: Boredom, $|\lambda| = .008$ to $.119$ ($M = .053$); amotivation, $|\lambda| = .001$ to $.151$ ($M = .075$); deactivated affect, $|\lambda| = .042$ to $.236$ ($M = .120$); behavioral disengagement, $|\lambda| = .093$ to $.218$ ($M = .146$); and agentic disengagement, $|\lambda| = .027$ to $.305$ ($M = .138$). These statistics confirm strong discriminant validity between the dormant scale and the five indices of diminished functioning.

The second preliminary analysis was a 13-factor, 39-item CFA to confirm the roughly equal contribution of the autonomy, competence, and relatedness items to its designated need state (i.e., satisfied autonomy, satisfied

competence, and satisfied relatedness as three indicators of "satisfied"). For this analysis, we used Mplus 8.3 (Muthén & Muthén, 2019) with the maximum likelihood-robust estimator (MLR) with full information maximum likelihood (FIML) estimation procedures to handle missing data ($< 1\%$). The a priori 13-factor solution fit the data well, $X^2(403) = 591.31$, $p < .001$, $RMSEA = .038$, $SRMR = .041$, $CFI = .971$, $TLI = .947$, and each autonomy, competence, and relatedness item loaded significantly ($p < .001$) on its representative factor: unengaged, $\lambda s = .635, .658, .507$; inactive, $\lambda s = .653, .705, .601$; irrelevant, $\lambda s = .651, .687, .701$; disconnected from what I was doing, $\lambda s = .662, .679, .593$; switched to off, $\lambda s = .667, .717, .716$; satisfied, $\lambda s = .663, .695, .655$; fulfilled, $\lambda s = .622, .628, .624$; fully realized, $\lambda s = .667, .705, .580$; deep satisfaction, $\lambda s = .635, .639, .757$; thwarted, $\lambda s = .720, .781, .647$; destroyed, $\lambda s = .655, .740, .647$; hurt, $\lambda s = .726, .747, .656$; and injured, $\lambda s = .730, .753, .574$. This analysis affirms the merit of our strategy to aggregate the three roughly equally-weighted autonomy ($M \lambda = .668$), competence ($M \lambda = .703$), and relatedness ($M \lambda = .635$) TSQ scores into the 13 need states.

Next, we conducted three hypothesis-testing analyses. First, we performed an EFA similar to the one employed in Study 1.

Second, we calculated descriptive statistics, internal consistencies, and intercorrelation statistics for each of the three scales. Third, and most importantly, we performed regression analyses to establish the relation between each TSQ scale and its set of hypothesized outcomes.

Results

Factor loadings

The left side of Table 2 displays the descriptive statistics for all 13 items, while the right side of Table 2 shows the parameter estimates of all 13 items across the three factors. The 3-factor EFA solution revealed three factors with eigenvalues greater than 1.0, and these three factors accounted for 76.2% of the total variance in the 13-item questionnaire. The parameter estimates revealed well-defined factors with minimal cross-loadings for all three scales: *Dormant*, λ's ranged from .692 to .875 ($M = .809$) with cross-loadings from $|\lambda| = .003$ to .182 ($M = .068$); *Satisfied*, λ's ranged from .812 to .899 ($M = .854$) with cross-loadings from $|\lambda| = .002$ to .399 ($M = .134$); and *Frustrated*, λ's ranged from .694 to .967 ($M = .852$) with cross-loadings from $|\lambda| = .005$ to .210 ($M = .074$).

Table 2 Descriptive statistics and standardized parameter estimates for the EFA 3-factor solution for the 13 candidate items for the Three States Questionnaire, Study 2

Item Eigenvalue	Descriptive statistics				Factor scores		
	M	SD	m^3	m^4	Dormant (λ)	Satisfied (λ)	Frustrated (λ)
					5.87	3.00	1.03
Dormant state items							
1 Inactive	2.98	1.47	0.50	−0.29	.875	.063	.020
2 Unengaged	2.98	1.37	0.30	−0.50	.774	−.119	.106
3 Irrelevant	3.04	1.51	0.57	−0.06	.834	.035	−.012
4 Disconnected from…	3.18	1.34	0.30	−0.39	.872	.003	−.056
5 Switched to "Off"	2.97	1.55	0.45	−0.56	.692	−.080	.182
Satisfied state items							
1 Satisfied	4.11	1.63	0.93	−0.79	.152	.812	−.399
2 Fulfilled	3.80	1.53	0.19	−0.55	.002	.899	.081
3 Fully Realized	3.78	1.44	0.31	−0.30	−.044	.836	.150
4 Deep Satisfaction	3.80	1.58	0.23	−0.61	−.111	.869	.137
Frustrated state items							
1 Thwarted	2.58	1.36	0.51	−0.39	.210	.149	.694
2 Destroyed	2.38	1.38	0.85	0.05	.111	.021	.829
3 Hurt	2.32	1.37	0.92	0.19	−.061	−.009	.967
4 Injured	2.38	1.33	0.77	−0.11	−.005	−.024	.918
Interfactor correlations							
Factor 1					–	−.212	.625
Factor 2						–	−.011
Factor 3							–

$N = 320$ USA high-school students. Possible range for each variable, 1–7

M mean, *SD* standard deviation, m^3 skewness, m^4 kurtosis

These statistics are better than those observed in Study 1 because the Study 2 EFA did not include the 7 relatively poor fitting items that were included in the Study 1 EFA.

Descriptive statistics and interscale correlations

Table 3 shows the descriptive statistics and intercorrelations among the satisfied, dormant, and frustrated scales. Using a 1–7 response scale, participants reported a moderate level of the satisfied state ($M = 3.87$), a moderately low level of the dormant state ($M = 3.03$), and a low level of the frustrated state ($M = 2.38$). All three scales showed high internal consistency and a normal distribution of scores. The satisfied state correlated significantly and negatively with the dormant state ($r = -.235$, $p < .001$), while it was uncorrelated with the frustrated state ($r = -.008$, $p = .883$). The dormant state correlated significantly and positively—and substantially—with the frustrated state ($r = .668$, $p < .001$).

Relations with outcome measures

Diminished functioning Scores on the dormant scale correlated significantly with all five indicators of diminished functioning: $r(320)$'s ranged from .37 to .55, all p's < .001. In the regression analysis for *amotivation*, the individually significant predictors were the high dormant ($\beta = .44$, $p < 0.001$) and low satisfied ($\beta = -.17$, $p = .001$) states. For *behavioral disengagement*, the sole individually significant predictor was the dormant state ($\beta = .54$, $p < .001$). For *agentic disengagement*, the sole individually significant predictor was the dormant state ($\beta = .42$, $p < .001$). For *boredom*, the individually significant predictors were the high dormant ($\beta = .58$, $p < .001$) and low satisfied ($\beta = -.14$, $p = .025$) states (while low frustrated was significant in the opposite direction, $\beta = -.15$, $p = .002$). For *deactivated affect*, the sole individually significant predictor was the dormant state ($\beta = .62$, $p < .001$) (while low frustrated was again significant in the opposite direction, $\beta = -.23$, $p = .001$).

Effective functioning Scores on the satisfied scale correlated significantly with all seven indicators of effective functioning: $r(320)$'s ranged from .45 to .65, all p's < .001. In the regression analysis for *intrinsic motivation*, the individually significant predictors were the high satisfied ($\beta = .58$, $p < .001$) and low dormant ($\beta = -.31$, $p < .001$) states. For *behavioral engagement*, the individually significant predictors were the high satisfied ($\beta = .52$, $p < .001$) and low dormant ($\beta = -.24$, $p < .001$) states. For *agentic engagement*, the individually significant predictors were the high satisfied ($\beta = .49$, $p < .001$) and low dormant ($\beta = -.21$, $p = .002$) states. For *vitality*, the individually significant predictors were the high satisfied ($\beta = .49$, $p < .001$) and low dormant ($\beta = -.37$, $p < .001$) states. For *academic progress*, the individually significant predictors were the high satisfied ($\beta = .54$, $p < .001$) and low dormant ($\beta = -.16$, $p = .013$) states. For *self-concept*, the individually significant predictors were the high satisfied ($\beta = .40$, $p < .001$) and low dormant ($\beta = -.18$, $p = .011$) states. For *positively activated affect*, the individually significant predictors were the high satisfied ($\beta = .52$, $p < .001$) and low dormant ($\beta = -.19$, $p = .004$) states.

Defiant functioning Scores on the frustrated scale correlated significantly with all five indicators of defiant functioning: $r(320)$'s ranged from .30 to .49, all p's < .001. In the regression analysis for *anti-internalization*, the sole individually significant predictor was the frustrated state ($\beta = .41$, $p < .001$). For *resentment*, the individually significant predictors were the high frustrated ($\beta = .25$, $p < .001$), high dormant ($\beta = .27$, $p < .001$), and low satisfied ($\beta = -.14$, $p = .007$) states. For *antisocial behavior*, the sole individually significant predictor was the frustrated state ($\beta = .36$, $p < .001$). For *problematic relationships*, the individually significant predictors were the high frustrated ($\beta = .33$, $p < .001$) and low satisfied ($\beta = -.15$, $p = .007$) states. For *negatively activated affect*, the sole individually significant predictor was the dormant state ($\beta = .38$, $p < .001$).

Predictive power of the dual-process model vs. the tripartite model

As reported above, the dormant state predicted all five diminished functioning outcomes. To determine its unique capacity to predict these outcomes, we performed an

Table 3 Descriptive statistics and intercorrelations among the three scales on the Three States Questionnaire, Study 2

TSQ Scale	Descriptive statistics					Intercorrelations		
	M	SD	m^3	m^4	α	1	2	3
Satisfied state	3.87	1.32	0.31	−0.26	.87	–	−.235**	−.008
Dormant state	3.03	1.23	0.27	−0.24	.90		–	.668**
Frustrated state	2.38	1.22	0.76	0.09	.92			–

$N = 320$ USA high school students. Possible range of scores, 1–7

M mean, SD standard deviation, m^3 skewness, m^4 kurtosis, α Cronbach alpha coefficient (i.e., internal consistency)

**$p < .001$

Table 4 Variance accounted for (Adj R^2) in six diminished functioning outcomes: comparisons of regressions with vs. without the dormant state, Study 2

Diminished functioning outcome	Regressions *without* the Dormant State					Regressions *with* the Dormant State					
	Satisfied	Frustrated				Satisfied	Frustrated	Dormant			
	β	β	$F(4, 315)$	R^2	Adj R^2	β	β	β	$F(5, 314)$	R^2	Adj R^2
Amotivation	−.268**	.345**	18.50**	.190	.180	−.168**	.048	.445**	25.54**	.289	.278
Behavioral Disengagement	−.186**	.279**	10.12**	.114	.103	−.063	−.085	.544**	22.21**	.261	.250
Agentic Disengagement	−.046	.205*	4.45*	.053	.041	−.050	−.080	.425**	10.53**	.144	.130
Boredom	−.286**	.243**	14.78**	.158	.147	−.156**	−.145*	.579**	30.27**	.325	.315
Deactivated Affect	−.234**	.182**	8.89**	.101	.090	−.095	−.231**	.618**	25.82**	.292	.281

$N = 320$

All 12 regressions (6 without the dormant state, 6 with the dormant state) controlled for gender and grade level

β Standardized beta weight, R^2 proportion of explained variance in the outcome measure, *Adj* Adjusted

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

additional set of regression analyses. In the first set, shown on the left side of Table 4, we regressed each indicator of diminished functioning on the satisfied and frustrated states (i.e., the dual-process model; Fig. 1B). In the second set, shown on the right side of Table 4, we added the dormant state as a third predictor and repeated the same set of analyses (i.e., the tripartite model; Figs. 1C and 2). All regressions also entered gender and grade level as predictors (i.e., statistical controls). Across all five indicators of diminished functioning, the adjusted R^2 value (Adj R^2) for the regression that included the dormant state (i.e., tripartite model) strongly exceeded the adjusted R^2 value for the regression that excluded the dormant state (i.e., dual-process model): Amotivation, Adj R^2's = .278 vs. 180; behavioral disengagement, .250 vs. .103; agentic disengagement, .130 vs. .041; boredom, .315 vs. .147; and deactivated affect, .281 vs. .090.

In all five tripartite model regressions, the dormant state was a significant individual predictor. Somewhat remarkably, while high frustration was an individually significant predictor of all five outcomes in the dual-process model regression analyses, its predictive status evaporated in all tripartite regression analyses, as the frustrated state was unable to explain any additional variance beyond that already explained by the dormant state. The two significant effects for the frustrated state on the right side of Table 4 were actually in the wrong direction and represent mild suppressor effects (because of some multicollinearity with dormancy scores, $r = .668$, $p < .001$; see Table 3). This shows that the dormant state, not the frustrated state, explains students' diminished classroom functioning.

Discussion

The descriptive statistics, scale intercorrelations, and parameter estimates from the EFA (Table 2) suggested that the 13-item TSQ was psychometrically strong (and also that the newly-added "deep satisfaction" item performed very

well). We undertook Study 2 to evaluate the questionnaire's predictive validity. The dormant state was an individually significant predictor of all five indices of diminished functioning, and it was the sole individual predictor of behavioral disengagement and agentic disengagement. The satisfied state was an individually significant predictor across all seven indices of effective functioning. Interestingly, while the satisfied state was the primary predictor (i.e., the largest effect size) in all seven regressions, a low level of the dormant state was a supplemental predictor that explained additional independent variance across all seven outcomes. This means that effective functioning is better explained by considering both high satisfied and low dormancy rather than only high satisfied. The frustrated state was an individually significant predictor in four of the five indices of defiant functioning, and it was the sole individual predictor of anti-internalization and antisocial behavior. Interestingly, the sole independent predictor of negatively activated affect was the dormant, not the frustrated, state.

Study 3

Study 3 tested the full theoretical model of "Environmental Conditions → Need States → Outcomes", as represented by Figs. 1C and 2. To assess environmental conditions, students reported their perceptions of their teachers' motivating style in terms of supporting, neglecting, and controlling. To represent these motivating styles, we used Aelterman et al.'s (2019) circumplex model in which the attuning and guiding dimensions represented the supporting style, the abandoning dimension represented the neglecting style, and the domineering dimension represented the controlling style. To represent the three need states, we used the same 13-item TSQ validated in Study 2. To represent the three outcomes, we used a subset of the outcomes from Study 2 (to avoid over-burdening participants with a too-lengthy

questionnaire). Our effective functioning outcome was classroom engagement, assessed by the same behavioral engagement and agentic engagement scales from Study 2. Our diminished functioning outcome was classroom disengagement, assessed by the same behavioral disengagement and agentic disengagement scales from Study 2. Our defiant functioning outcome was classroom defiance, assessed by the same anti-internalization and resentment scales from Study 2. All of these decisions were pre-registered. Overall, we predicted that participants' scores of (1) perceived teacher support would predict the satisfied state which would uniquely predict classroom engagement; (2) perceived teacher neglect would predict the dormant state which would uniquely predict classroom disengagement; and (3) perceived teacher control would predict the frustrated state which would uniquely predict classroom defiance.

Method

Participants and procedure

Using the online crowdsourcing service Qualtrics, we recruited a new sample of 457 high school students in the USA to participate in a study on their classroom experience in a particular course, which we again pre-defined as their "Wednesday, 2nd period class". The right column in Table 1 shows the Study 3 sample's demographic characteristics. The questionnaire began with a consent form. We assured students that their responses would be confidential and used only for the purposes of the study. Students completed the questionnaire online using the Qualtrics commercial survey software program.

Measures

Perceived motivating styles Participants completed the student version of the Situations in Schools questionnaire to report their perceptions of their teacher's three motivating styles (SIS-S; Aelterman et al., 2019). The SIS-S features 15 common classroom situations followed 4 response options to describe possible teacher responses to that particular teaching situation (autonomy support, control, structure, and chaos). These four general motivating styles are further broken down into eight specific domains, including participative and attuning (for autonomy support), guiding and clarifying (for structure), demanding and domineering (for control), and abandoning and awaiting (for chaos). A SIS-S example is Situation #7: Needing Extra Effort: "Your teacher presents a difficult lesson that requires a lot of effort from you. In doing so, your teacher:" To assess the supporting style, participants completed the 10-item attuning subscale ("Tries to find ways to make the lesson more interesting and enjoyable for you"; $\alpha = .86$) and the 8-item

guiding subscale ("Because the lesson is extra difficult, your teacher provides you with extra help and extra assistance, if needed"; $\alpha = .86$). To assess the neglecting style, participants completed the 10-item abandoning subscale ("Is not too concerned, as you and your classmates need to figure out for yourselves how much effort to put forth"; $\alpha = .87$). To assess the controlling style, participants completed the 7-item domineering subscale ("Insists firmly that 'Now is the time for hard work!'"; $\alpha = .79$). The SIS-S uses a 7-point response scale ranging from 1, *Does not describe my teacher at all*, to 7, *Describes my teacher extremely well*.

Three States Questionnaire We used the same 3-page (3-screen) version of the TSQ used in Study 2 (see "Appendix 2"), and we again asked students to report their experiences in their Wednesday, 2nd period class. Participants reported their classroom experiences of the satisfied state in a reliable way (4-item αs = .80, .78, and .80, respectively, for satisfied autonomy, satisfied competence, and satisfied relatedness), and they did the same for their experiences of the dormant state (5-item αs = .83, .83, and .80, respectively) and of the frustrated state (4-item αs = .79, .81, and .75).

Outcome measures We used six of the same outcome measures from Study 2 to create the three outcomes of classroom engagement, disengagement, and defiance. To assess classroom engagement, participants completed the 5-item behavioral engagement scale ($\alpha = .86$; Skinner et al., 2009) and 5-item agentic engagement scale ($\alpha = .86$; Reeve, 2013). To assess classroom disengagement, participants completed the 5-item behavioral disaffection scale ($\alpha = .84$; Skinner et al., 2009) and 5-item agentic disengagement scale ($\alpha = .72$; Reeve et al., 2020). To assess classroom defiance, participants completed the 8-item anti-internalization scale ($\alpha = .87$; Aelterman et al., 2016) and the 3-item resentment scale ($\alpha = .65$; Aelterman et al., 2016).

Data analyses

We evaluated the hypothesized model with a structural equation model analysis, using Mplus 8.3 with the MLR estimator and FIML to handle missing data (< 1%). The hypothesized model featured three predictive motivating styles (supporting, neglecting, and controlling), three states (satisfied, dormant, and frustrated), three outcomes (engagement, disengagement, and defiance), as well as the two statistical controls of gender (0 = male, 1 = female) and grade level (0 = 10th grade, 1 = 11th grade, 2 = 12th grade). To evaluate model fit, we used the same set of goodness-of-fit statistics as used in Studies 1 and 2: Root-mean-square error of approximation (*RMSEA*), standardized root-mean-square residual (*SRMR*), comparative fit index (*CFI*), and Tucker–Lewis index (*TLI*). For *RMSEA* and *SRMR*, adequate

and excellent fit are reflected by values lower than .08 and .06; for *CFI* and *TLI*, adequate and excellent fit are reflected by values greater than .90 and .95 (Marsh et al., 2005).

Results

Table 5 presents the descriptive statistics and intercorrelations among the nine latent variables and two statistical controls included in the hypothesized model. The hypothesized model fit the data reasonably well, $X^2(144) = 462.97$, $p < .001$, $RMSEA = .070$, $SRMR = .052$, $CFI = .924$, and $TLI = .889$. The standardized beta weights for the structural paths, autoregressive effects, indicators, and supplementary "cross-over" paths appear in Fig. 3.

Predicting the three need states

For the *satisfied state* ($R^2 = .38$), the supporting style was an individually significant predictor ($\beta = .60$, $p < .001$) while the neglecting ($\beta = -.07$, $p = .286$) and controlling ($\beta = .03$, $p = .540$) styles were not. For the *dormant state* ($R^2 = .23$), both the neglecting ($\beta = .30$, $p < .001$) and low supporting ($\beta = -.29$, $p < .001$) styles were individually significant predictors, while the controlling style ($\beta = .05$, $p = .364$) was not. For the *frustrated state* ($R^2 = .20$), the controlling style was an individually significant predictor ($\beta = .19$, $p = .002$), as were the neglecting ($\beta = .23$, $p < .001$) and low supporting ($\beta = -.13$, $p = .019$) styles.

Predicting the three outcomes

For *classroom engagement* ($R^2 = .62$), the high satisfied state was an individually significant predictor ($\beta = .69$, $p < .001$), as was the low dormant state ($\beta = -.26$, $p = .007$) but not the frustrated state, which was significant but in the wrong direction ($\beta = .20$, $p = .022$). For *classroom disengagement* ($R^2 = .47$), the dormant state was an individually significant predictor ($\beta = .70$, $p < .001$), while the satisfied ($\beta = -.04$, $p = .534$) and frustrated ($\beta = -.08$, $p = .371$) states were not. For *classroom defiance* ($R^2 = .66$), both the frustrated ($\beta = .40$, $p < .001$) and dormant ($\beta = .40$, $p < .001$) states were individually significant predictors, while the satisfied state ($\beta = -.07$, $p = .304$) was not.

Discussion

The dormant state was the only individually significant predictor of the disengagement outcome. The dormant state further explained additional variance in both low engagement and high defiance. The most surprising finding was that the low supporting style was just as strong an antecedent to the dormant state as was the neglecting style. We acknowledge that these findings would be more substantial if tested with a longitudinal (rather than a cross-sectional) research design. Nevertheless, these results (like those from Study 2) suggest that the tripartite model (that includes the dormant state) provided a better explanation of students' ineffective functioning (i.e., classroom disengagement) than did the dual-process model (that excludes the dormant state).

Table 5 Descriptive statistics and intercorrelations among the nine latent variables and two statistical controls included in the test of the hypothesized model, Study 3

Latent variables	1	2	3	4	5	6	7	8	9	10	11
1 Supporting Motivating Style	–	−.11	−.11	.60	−.32	−.17	.47	−.24	−.24	.02	−.06
2 Neglecting Motivating Style		–	.66	−.11	.36	.37	−.10	.23	.30	−.05	.00
3 Controlling Motivating Style			–	−.07	.28	.36	−.05	.17	.26	−.06	−.04
4 Satisfied State				–	−.48	−.28	.76	−.36	−.37	.00	.07
5 Dormant State					–	.73	−.45	.67	.74	−.07	.00
6 Frustrated State						–	−.19	.45	.73	−.10	.01
7 Classroom Engagement							–	−.41	−.19	.00	.03
8 Classroom Disengagement								–	.80	−.16	−.08
9 Classroom Defiance									–	−.16	.00
Statistical Controls											
10 Gender										–	.02
11 Grade Level											–
Mean	4.25	3.56	3.27	4.08	2.91	2.29	4.46	3.72	2.96	0.62	1.78
Standard deviation	1.25	1.12	1.30	1.27	1.26	1.11	1.43	1.29	1.24	0.59	0.65

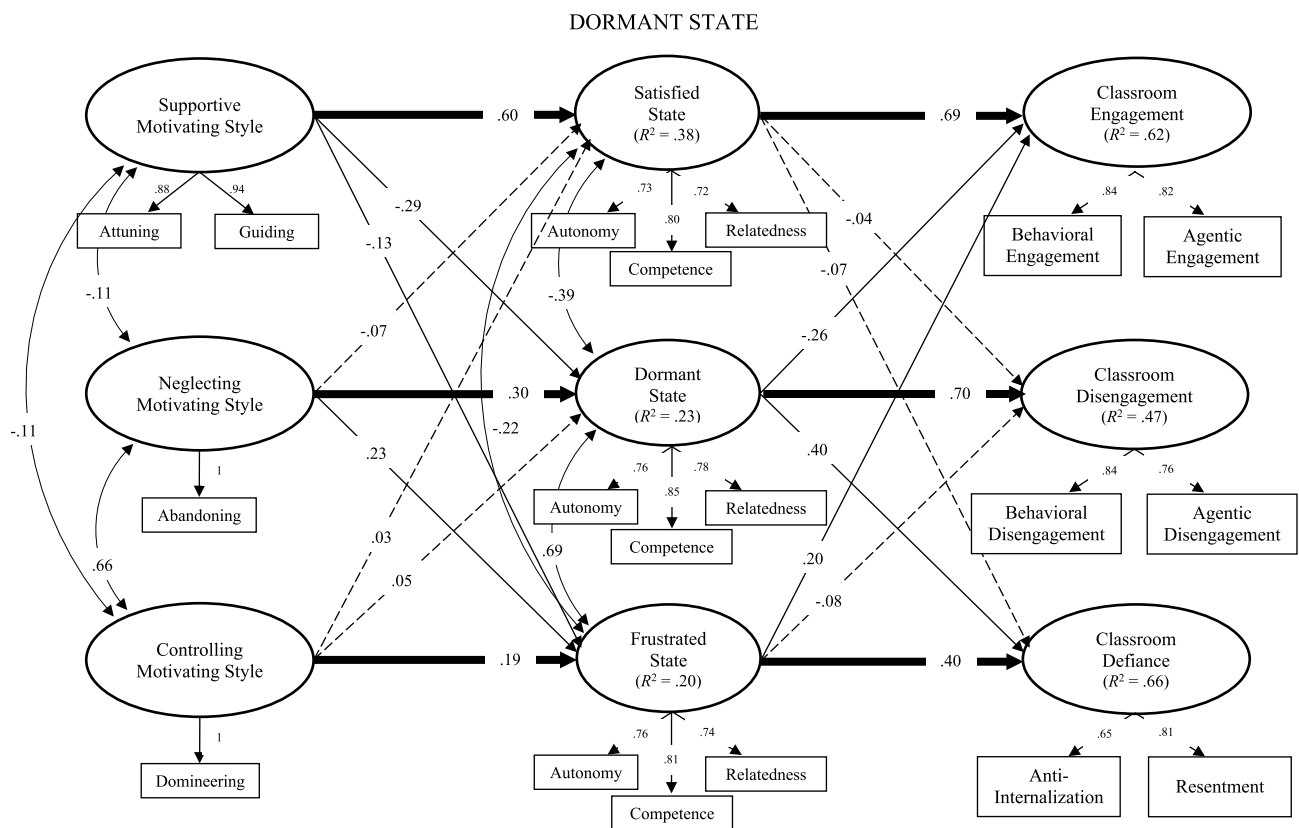Any correlation above r = .16 is p < .01

N = 457

DORMANT STATE

Fig. 3 Test of the three need states model. *Note* boldface horizontal lines represent hypothesized paths, while thin-faced upwardly- and downwardly-sloped lines represent possible "cross-over" effects. Solid lines represent significant paths, p < .05, while dashed lines represent non-significant paths. The numbers overlaying each path are standardized beta weights (*β*). Ovals represent latent variables, while rectangles represent manifest variables

General discussion

In a three-study investigation, we pursued three purposes: (1) extend SDT's dual-process model to a tripartite model; (2) better explain adolescents' diminished classroom functioning; and (3) develop the TSQ to make research on the dormant state possible.

Extend self-determination theory

We suggest that the present paper offers sufficient theoretical reasoning and empirical evidence to warrant expanding SDT to include three, not just two, need states. We outlined such a model in Fig. 2, and here we discuss its two benefits.

First, across all three studies, it was noteworthy that students' scores on the dormant state were measurably higher than were their scores on the frustrated state (e.g., see mean scores reported in Tables 3, 5). It therefore seems reasonable to suggest that the dormant state is a more common experience in the typical USA classroom than is the frustrated state. We do not discount the importance of the frustrated state. Instead, we suggest that SDT has simply overlooked the potential importance of the too-common experience of the dormant state.

We further suggest that the tripartite model has greater explanatory depth and breadth than does the dual-process model. As to depth, the dormant state explained diminished functioning in a meaningfully better way than did the existing SDT explanation that overlooked the dormant state, as we discuss in the next section. As to breadth, the inclusion of the dormant state added considerably new explanatory power to the prediction of effective and defiant functioning (see Table 4; Fig. 3). That is, the findings from Study 2 showed that while the satisfied state was consistently the primary predictor of effective functioning, the dormant state emerged as a significant supplemental explanatory factor across all seven indices of effective functioning (see Table 4). Similarly, the results in Fig. 3 showed that the dormant state added additional (supplemental) explanatory variance to both low classroom engagement (*β* = − .26, *p* = .007) and high classroom defiance (*β* = .40, *p* < .001).

Better explain adolescents' diminished functioning

Existing SDT-based explanations for diminished functioning emphasize the predictive power of high need frustration and, to a lesser extent, low need satisfaction (i.e., the dual-process model; Bartholomew et al., 2011a; Cheon et al., 2016; Jang et al., 2016). However, our analytic strategy in Study 2 to explain indices of diminished classroom functioning was to enter all three need states simultaneously to see which state or states would emerge as (1) individually significant predictors, (2) the primary predictor, (3) a supplemental or secondary predictor, and (4) a redundant or non-significant predictor. The dormant state was the sole individually significant predictor of behavioral disengagement, agentic disengagement, and deactivated affect, and it was the primary predictor of amotivation and boredom. In no outcome was it not the primary predictor. In contrast, the (low) satisfied state was sometimes a supplemental predictor, while the frustrated state made no predictive contribution. Based on these findings, we suggest that diminished functioning emerges not out of a frustrated state but, rather, out of a state in which one's psychological needs feel dormant (i.e., unengaged, inactive, irrelevant, disconnected, and switched to "off").

The most telling findings emerged when we compared the predictive power of the dual-process model (regressions without the dormant state; see left side of Table 4) versus the predictive power of the tripartite model (regressions with the dormant state; see right side of Table 4). While the dual-process model did explain significant and substantial variance in all five diminished functioning outcomes, the tripartite model explained all five outcomes significantly better. This can be seen in the adjusted R^2 values in Table 4 in which the average adjusted R^2 value (across the five dependent measures) for the tripartite model exceeded that of the dual process model (M adjusted $R^2 = .25$ vs. .11). In fact, in the tripartite model, the predictive power of high need frustration dropped to non-significant for all five outcomes (and it was even significant in the wrong direction for boredom and deactivated affect). In contrast, the dormant state was a strong and significant independent predictor for all five outcomes (β's ranged from .425 to .618, p's < .001). What these analyses show is that the tripartite model better explained students' diminished functioning than did the dual-process model.

The Study 3 results replicated these findings. As shown in Fig. 3, the dormant state strongly and uniquely predicted classroom disengagement, while the satisfied and frustrated states failed to contribute additional explanatory power (βs of .70 vs. − .04 and − .08). We conclude that if the goal is to better explain indices of diminished functioning, then it is necessary to adopt the tripartite model.

Develop the Three States Questionnaire (TSQ)

The third goal of the present investigation was to develop a psychometrically strong measure of the newly-proposed dormant state. Based on standard metrics such as internal consistency, normal distribution of scores, convergent validity, divergent validity, and criterion (predictive) validity, we suggest that the present investigation provides sufficient evidence to conclude that the TSQ is a psychometrically strong measure.

In all the major questionnaires to assess self-reported psychological needs (e.g., PTNS, Bartholomew et al., 2011b; BPNSFS; Chen et al., 2015; BMPN, Sheldon & Hilpert, 2012), the need states (satisfied, frustrated) are measured with items that include both the need state and its presumed cause, though this is truer for need frustration than for need satisfaction (e.g., "I feel the relationships I have are superficial"; and "I feel like a failure because of the mistakes I make"). We agree that superficial relationships can lead to relatedness frustration, and that mistakes can lead to competence frustration. But these items focus at least as much on the environmental conditions (e.g., superficial relationships, the mistakes I make) as on the state of the need per se. To understand the motivational nature of need frustration per se, one needs to separate out the socioenvironmental antecedent. To avoid this confound, we assessed only the experiential state itself. By doing so, we suggest that the TSQ more approximates a "pure" (unconfounded) measure of the state of the person's psychological needs, though we recognize that this is a claim best evaluated by future research.

In looking at the data generated to develop the TSQ, we acknowledge that it is possible that we focused so much on developing the new dormant scale that we under-developed the frustrated scale. To generate items to represent the frustrated state, we relied heavily on the conceptual definition presented in the Introduction. Still, in retrospect, the Study 1 decision to exclude "frustrated" from the frustrated state scale seems counter-intuitive and perhaps premature. More positively, "thwarted" tested well, and using "thwart" to represent need frustration is fully consistent with early research on both need frustration and the dual-process model (Bartholomew et al., 2011a). Therefore, there may be merit in continuing the effort to develop the frustrated scale further. For a third item (to accompany frustrated and thwarted), it might be helpful to mimic our strategy to develop the satisfied state to test "deep frustration" as a candidate item (to mimic the success of the "deep satisfaction" item). A fourth candidate item that would be fully consistent with the construct's conceptual definition would be "blocked". However, the panel excluded this item from Study 1 testing because it more represents an environmental event than a motivational state per se. An adaptation of this item, however, could be "feeling blocked from what I wanted" (to mimic

the successful "disconnected from what I was doing" item on the dormant scale). Overall, it seems like there may be more work to do before finalizing the frustrated state scale.

Three critical reflections on the dormant state

One concern is to ask if the dormant state is its own motivational experience or simply another indicator of diminished classroom functioning. We addressed this concern in a Study 2 EFA (see "Appendix 1"). The results from that analysis showed rather clearly that items assessing the dormant state did not cross-load with the items and factors assessing the indicators of diminished functioning. To explain this finding conceptually (rather than only statistically), we refer to cognitive evaluation theory (CET; Ryan & Deci, 2017). In CET, intrinsic motivation rises and falls with changes in psychological need satisfaction. In the same way, we suggest that amotivation (and other indicators of diminished functioning) rise and fall with changes in psychological need dormancy.

A second concern is the multicollinearity between the dormant and frustrated states ($r = .67$, Table 3; $r = .73$, Table 5). Such multicollinearity makes it difficult for the two states to explain independent variance in the various outcomes investigated in Studies 2 and 3. What was clear, however, was that in the prediction of indices of diminished functioning, the better predictor was always the dormant state. But this high correlation may be more than a measurement phenomenon. It is likely that the two states are reciprocally related. For instance, it is likely that experiencing a dormant state during today's instruction may, over time, generate an accompanying frustrated state. Similarly, experiencing a frustrated state during today's instruction may, over time, generate an accompanying dormant state. This possibility of a reciprocal relationship will require future longitudinal research.

A third concern is how to best conceptualize the nature of the dormant state. Our conceptualization is as follows. Students possess inherent psychological needs, and they bring those inherently activated needs into the classroom setting. If the classroom environment neglects or is indifferent to those psychological needs, then the student may begin to experience the dormant state that then leads to diminished functioning (e.g., behavioral disengagement). In this conceptualization, the psychological need is deflated from its full natural state. But another conceptualization is possible. Instead of being inherently activated, the psychological need may rest in abeyance (a state of dormancy) until situational events support or thwart it. In this conceptualization, psychological needs lay dormant but can be activated by socio-environmental conditions. Though we favor the first conceptualization, we acknowledge that the present findings cannot distinguish between these two conceptualizations.

Limitations

We note three limitations to the present research. First, we did not establish construct validity for the three TSQ scales. That is, we did not show that the scores produced by the TSQ correlate highly with corresponding scales of other validated and widely-used measures of the psychological needs, such as the earlier-mentioned BMPN, BPNSFS, and PTNS. We overlooked this step in the scale development process because there was simply no parallel scale to establish construct validity for our newly-proposed dormant state.

Second, we collected only self-reported data. The inclusion of objective measures (e.g., to assess student outcomes) would strengthen this line of research.

Third, we evaluated the TSQ by aggregating state scores across all three needs, using three indicators (see Fig. 3). An alternative usage of the TSQ would be to focus on a single need (e.g., autonomy) and assess its satisfied, dormant, and frustrated states. Such an investigation would then use a 1-screen (1 vignette) version of the TSQ rather than the full 3-screen (3-vignette) version used here. We encourage and find merit in both uses of the TSQ.

Conclusion

The findings across three studies showed that the TSQ was a psychometrically strong instrument, the dormant state was distinct from the other two states, and the dormant state uniquely and rather substantially explained diminished functioning. At the center of these findings are two conclusions: (1) Environmental conditions sometimes render a psychological need into a dormant state; and (2) the tripartite model explains diminished functioning better than does the dual-process model.

Appendix 1

See Table 6.

Table 6 EFA to evaluate the discriminant validity of the dormant items from the indicators of diminished functioning, Study 2

Factor	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Eigenvalue	11.8	2.2	2.0	1.7	1.3	1.2
Boredom Items						
In this class, I am easily distracted	.933	−.063	−.034	−.050	−.139	.012
In this class, my mind is wandering	.913	.008	−.093	.034	−.061	−.067
I want something to happen, but I'm not sure what	.680	−.112	.060	.031	−.078	.142
I seem to be forced to do things that have no value to me	.668	−.072	.163	−.048	−.169	.171
I feel like I'm sitting around waiting for something to happen	.653	.019	.078	.025	−.023	.102
In this class, I feel bored	.533	−.030	.147	.146	−.078	.206
Time is passing by slower than usual	.478	.004	.043	.177	−.132	.228
I am wasting time that would be better spent on something else	.428	−.119	.456	.067	−.065	.126
Dormant State Items						
Unengaged	.024	.900	−.036	−.032	−.132	.102
Inactive	.040	.888	−.059	−.025	−.073	.043
Disconnected from what I was doing	−.104	.852	−.106	.087	.020	.099
Switched to Off	−.094	.801	.067	.102	−.099	.073
Irrelevant	−.021	.793	.080	.037	.000	−.098
Amotivation Items						
I don't see the point in this class	−.035	.001	.882	.008	.051	.004
I can't see why I should bother coming to this class	.032	.010	.846	.024	.093	−.049
I don't see why I should have to be in this class	.004	−.139	.842	.078	.067	−.018
I think that being in this class is a waste of time	−.028	.151	.790	.063	−.032	−.064
Deactivated Affect Items						
Tired	.051	−.066	.044	.864	.080	−.081
Sleepy	.140	−.042	.006	.774	.060	−.056
Sluggish	−.049	.135	.133	.765	.012	−.102
Dull	−.042	.236	−.020	.664	.021	.090
Behavioral Disengagement Items						
In this class, I do just enough to get by	−.212	−.123	.258	.056	.783	.076
When I'm in this class, I just act like I'm working	−.008	.218	.213	−.066	.566	.046
I don't try very hard in this class	.179	.202	.343	−.193	.379	−.048
When I'm in this class, I think about other things	.743	.094	−.127	−.052	.334	−.214
When I'm in this class, my mind wanders	.789	.093	−.124	.044	.245	−.247
Agentic Disengagement Items						
Most of the time in this class, I am silent and unresponsive	−.036	.037	−.059	−.021	.100	.817
During, I hide from the teacher what I am thinking about	.145	.126	−.056	−.091	.181	.675
In this class, I avoid asking any questions	.117	.197	.055	−.120	.196	.575
In this class, I do only what I'm told—nothing more	−.143	−.305	−.194	.127	.677	.348
Most of the time in this class, I am passive	.154	.027	−.404	.193	.331	.102
Factor Intercorrelations	1	2	3	4	5	6
1 Boredom	1					
2 Dormant State	.542	1				
3 Amotivation	.531	.528	1			
4 Deactivated Affect	.560	.413	.433	1		
5 Behavioral Disengagement	.391	.359	.200	.121	1	
6 Agentic Disengagement	.448	.319	.350	.394	.178	1

Appendix 2

The TSQ

Instructions

Page 1. Here is one classroom experience that students commonly feel. For each descriptive word, click a number near 7 if you strongly agree that you typically feel that way during your Wednesday 2nd period class, but click a number near 1 if you strongly disagree that you typically feel that way.

During my Wednesday, 2nd period class, ***my desire to have a good, close relationship*** with my teacher and classmates typically feels…

	Strongly Disagree						Strongly Agree
1 Satisfied	1	2	3	4	5	6	7
2 Unengaged	1	2	3	4	5	6	7
3 Hurt	1	2	3	4	5	6	7
4 Thwarted	1	2	3	4	5	6	7
5 Inactive	1	2	3	4	5	6	7
6 Fully Realized	1	2	3	4	5	6	7
7 Destroyed	1	2	3	4	5	6	7
8 Switched to "Off"	1	2	3	4	5	6	7
9 Fulfilled	1	2	3	4	5	6	7
10 Deep Satisfaction	1	2	3	4	5	6	7
11 Irrelevant	1	2	3	4	5	6	7
12 Injured	1	2	3	4	5	6	7
13 Disconnected from what I was doing	1	2	3	4	5	6	7

Page 2. Here is a second classroom experience that students commonly feel. For each descriptive word, click a number near 7 if you strongly agree that you typically feel that way during your Wednesday 2nd period class, but click a number near 1 if you strongly disagree that you typically feel that way.

During my Wednesday, 2nd period class, ***my desire to feel effective, make progress, and finish with "a job well done"*** typically feels…

	Strongly Disagree						Strongly Agree
1 Satisfied	1	2	3	4	5	6	7
2 Unengaged	1	2	3	4	5	6	7
3 Hurt	1	2	3	4	5	6	7
4 Thwarted	1	2	3	4	5	6	7
5 Inactive	1	2	3	4	5	6	7
6 Fully Realized	1	2	3	4	5	6	7

	Strongly Disagree						Strongly Agree
7 Destroyed	1	2	3	4	5	6	7
8 Switched to "Off"	1	2	3	4	5	6	7
9 Fulfilled	1	2	3	4	5	6	7
10 Deep Satisfaction	1	2	3	4	5	6	7
11 Irrelevant	1	2	3	4	5	6	7
12 Injured	1	2	3	4	5	6	7
13 Disconnected from what I was doing	1	2	3	4	5	6	7

Page 3. Here is a third and final classroom experience that students commonly feel. For each descriptive word, click a number near 7 if you strongly agree that you typically feel that way during your Wednesday 2nd period class, but click a number near 1 if you strongly disagree that you typically feel that way.

During my Wednesday, 2nd period class, ***my desire for choice and personal freedom*** to do interesting and important activities typically feels…

	Strongly Disagree						Strongly Agree
1 Satisfied	1	2	3	4	5	6	7
2 Unengaged	1	2	3	4	5	6	7
3 Hurt	1	2	3	4	5	6	7
4 Thwarted		1	2	3	4	5	6
5 Inactive	1	2	3	4	5	6	7
6 Fully Realized	1	2	3	4	5	6	7
7 Destroyed	1	2	3	4	5	6	7
8 Switched to "Off"	1	2	3	4	5	6	7
9 Fulfilled	1	2	3	4	5	6	7
10 Deep Satisfaction	1	2	3	4	5	6	7
11 Irrelevant	1	2	3	4	5	6	7
12 Injured	1	2	3	4	5	6	7
13 Disconnected from what I was doing	1	2	3	4	5	6	7

Declarations

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