Simultaneously Students and Teachers: Measuring Achievement Goals in Pre-service teachers

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Abstract

Pre-service teachers can be considered simultaneously students and teachers and therefore likely have both academic and professional goals. However, once in a professional program, predicting professional outcomes becomes somewhat more important than academic ones. This distinction may have implications for the selection of measurement tools used in research on pre-service teachers' motivation. We use a multitrait-multimethod (MTMM) design that included tests of alternative confirmatory factor analyses (CFAs), within and between method correlations, and relations with other variables to compare two measures of achievement goals: Elliot and Murayama's (2008) measure of students' achievement goals and Butler's (2007) measure of teachers' achievement goals. Results of the CFAs suggested that the scales are measuring separate constructs. The MTMM correlations, however, revealed some evidence that certain factors may function similarly nonetheless. This was most evident for the homotrait-heteromethod factors of mastery-approach, which correlated similarly with sense of self-efficacy, emotions, and classroom mastery goal structures.

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1. Problem

Researchers interested in studying motivation in achievement settings frequently base their work in the principles of Achievement Goal Theory. Whether trying to help students excel in school, athletes train for an important race, or employees to be more productive, the tenants of achievement goal theory shed light on individuals' cognitions, emotions, and behaviors within a given achievement setting. While the principles of achievement goal theory have proven robust, part of this success may be attributed to the tendency to examine goals in the context of a single situation, thereby giving rise to a fairly precise focus of competence. Researchers do not know what happens when the individual within the achievement setting has competing indicators of competence. This may be the case for many trainees who during their training programs have to balance academic pursuits with professional ones. As a case in point, although pre-service teachers may have student concerns such as getting good grades and winning scholarships, they are simultaneously striving to develop the skills required by their chosen profession (e.g., Alberta Education, 1997). The same argument could be leveraged for medical residents, law interns, and nursing students – during their training they need to perform well from a student perspective while simultaneously attending to their burgeoning professional aspirations.

The ability to predict professionally related outcomes *even during training* requires a closer examination of our current measurement tools for achievement motivation constructs. Therefore, the purpose of the current study was to investigate evidence of validity for two measures of achievement goals, one designed for use with students and one designed for use with teachers. To do this we measured pre-service teachers' responses to two measures of achievement goals and used a multitrait-multimethod (MTMM) approach to construct validation

(Campbell & Fiske, 1959) that included tests of alternative confirmatory models, within and between method correlations, and relationships with other variables including sense of teaching efficacy, enjoyment and boredom, and intended classroom goal structures.

2. Achievement Goals

2.1. The 2 x 2 Model of Achievement Goals

One hat worn by pre-service teachers is that of a college student and the dominant perspective on college students' achievement goals is the 2 x 2 model forwarded by Elliot and Church (1997). According to this model, achievement goals differ on the basis of the definition of competence and the valence of the achievement striving. First, achievement goals tend to conform to one of two broad definitions of competence representing the underlying reasons for engaging in an activity: (1) mastery/learning to gain or develop competence and (2) performance/ability to demonstrate competence relative to others (Elliot, 1999). Second, achievement goals are recognized as taking on one of two possible valences: (1) approach, to move towards a desirable/positive outcome (i.e. success) and (2) avoidance, to move away from an undesirable/negative outcome (i.e. failure; Elliot, 1999). The valence of achievement goals are underpinned by more general motives such as the need for achievement or fear of failure and by environmental factors such as perceptions of the achievement setting (Elliot, 1999; Elliot & Murayama, 2008). The resultant 2 x 2 matrix produces mastery-approach goals, which are conceptualized as goals to develop competence, mastery-avoidance goals, which are conceptualized as goals to avoid losing competence, performance-approach goals, which are conceptualized as goals to demonstrate competence, and performance-avoidance goals, which are conceptualized as goals to avoid the appearance of incompetence. The Achievement Goal Questionnaire-Revised (AGQ-R) focuses specifically on ratings of important achievement goals

in the typical four domains: mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance by directly asking about one's achievement goals (i.e., my goal is…).

   2.1.1 Research using the 2x2 with pre-service teachers. As the dominant perspective in the achievement goal literature, it may be unsurprising that the 2 x 2 model was the guiding theoretical framework for several studies involving pre-service teachers. For example, mastery-approach goals measured by the AGQ-R have been positively correlated with pre-service teachers' efficacy, commitment, enjoyment, reflective thinking, personal intrinsic motivation, and intention to establish mastery classroom goal structures (Daniels, Frenzel, Stupnisky, Stewart, & Perry, 2013; Daniels, Stupnisky, Perry, Mandzuk, Clifton, 2008; Malmberg, 2008). In addition to advantages for mastery-approach goals, Malmberg (2008) found performance-avoidance goals were associated with more task-irrelevant behavior during teacher education and performance-approach goals were associated with graded performance. Malmberg (2008) concluded that mastery-approach goals were on average high and stable in pre-service teachers in comparison to performance-approach or performance-avoidance goals. In a study that examined the stability of personal goals during the transition from pre-service to new practicing teacher, Daniels (2015) argued that the 2 x 2 Achievement Goal Questionnaire-Revised (AGQ-R; Elliot & Murayama, 2008) was the most appropriate measure because pre-service teachers have not yet fully adopted professional responsibilities.

2.2. Other Configurations of Achievement Goals

   Although the 2 x 2 is the most commonly used operationalization of achievement goals for college students and by extension pre-service teachers, it is by no means the only accepted conceptualization. For example, Elliot and colleagues more recently proposed an expanded 3 x 2 framework which replaced the traditional mastery/performance distinction with task, self, and

other based definitions of competence and crossed that with approach and avoidance tendencies (Elliot, Murayama & Pekrun, 2011). This division is somewhat similar to Grant and Dweck's (2003) Achievement Goal Inventory, which operationalized performance-approach goals as linked to validating ability, normative achievement goals as comparing the self to others, and outcome goals as focused solely on the outcome. They also qualified learning goals as either having or not having an explicit challenge component.

Two other types of goals that have a presence in the literature are social goals and work avoidance goals. First, social goals are defined as "perceived social purposes for academic achievement" (Urdan & Maehr, 1995, p. 213) and evidence is fast accumulating in support of their relevance to achievement. Achievement goal researchers have begun to study young people's social or friendship goals (Elliot, Gable, & Mapes, 2006; Ryan & Shim, 2008) in conjunction with ability and performance goals. There is also evidence of social goals in achievement goal research that examines teachers, where some research has begun to include relational goal items (e.g. maintaining close and caring relationships with students; Butler, 2012).

Second, Nicholls and colleagues originally proposed the notion of work avoidance (Nicholls, 1984; Nicholls, Patashnick & Bobbit Nolen, 1985; Nolen, 1988), which is defined as feeling successful through accomplishing a task with as little effort as possible. Unlike mastery and performance goals, which focus on a particular definition of competence (i.e., learning or demonstrating ability), work avoidance goals are largely separate from any indicators of achievement other than perhaps completion (Kaplan & Flum, 2010; King & McInerney, 2014). Work avoidance has had a limited role in the field of student achievement goals (King & McInerney, 2014; Dowson & McInerney, 2001; Seifert & O'Keefe, 2001) and instead, has received greater traction in the work or teaching practice domain. For pre-service teachers, who

straddle this student-professional divide, work avoidance goals may thus be relevant as they step into their professional identities.

Indeed, work-avoidance is included in the most common measure for practicing teachers' achievement goals, the Goal Orientations for Teaching (GOT; Butler, 2007). The three other goals on the GOT are mastery goals, ability-approach goals, and ability-avoidance goals. The GOT indirectly assesses achievement goals, using the phrasing "I feel like I had a successful day when…" which may capture the achievement-related affect that often accompanies achieving a particular goal but not the goal itself (Hulleman, Schrager, Bodmann, & Harackiewicz, 2010). Butler (2007) suggested that this phrasing allows for the development of believable work-avoidance items because teachers are more likely to mention a successful day as involving little work rather than directly stating work avoidance as a goal itself. Insomuch as the "other hat" worn by pre-service teachers is that of a teacher, the GOT may be a suitable measure of achievement goals in pre-service teachers.

2.2.1 Research using the GOT with pre-service teachers. Despite its potential, Butler's (2007) GOT has not been used in empirical studies with pre-service teachers. However, similar scales consisting of the same achievement goal categories have been tested. For example, Fasching, Dresel, Dickhäuser, and Nitsche (2010) investigated the same four goal categories and showed that mastery goals were negatively associated with stress and dropout and positively correlated with seeking help in pre-service teachers. In contrast, performance-avoidance and work-avoidance goals were positively associated with stress and negatively correlated with help seeking.

The GOT has a strong research tradition with practicing teachers from which we borrow. With this group, mastery goals continue to be highly adaptive, as evidenced by positive

correlations with teachers' help seeking and organizational support (Butler, 2007), perceived teacher support (by students; Butler & Shibaz, 2008), interest, and mastery classroom goal structures, while also protecting teachers from burnout (Retelsdorf, Butler, Streblow & Schiefele, 2010). In contrast, the endorsement of the ability-avoidance scale resulted in teachers being less likely to seek help and endorsing the work-avoidance scale was associated with a desire to receive expedient help (Butler, 2007). Research by Retelsdorf and colleagues (2010) found that ability-avoidance and work-avoidance goals increased chances of teacher burnout. In addition, work-avoidance was a positive predictor of teachers' performance classroom goals structures, while ability-avoidance was a negative predictor of mastery classroom goal structures. Finally, Butler's (2007) ability-approach goal was unrelated to outcomes in teachers such as help-seeking, mastery instructional practices, interest, and burnout, (Butler, 2007; Nitsche, Dickhauser, Fasching, & Dresel, 2011; Nitsche, Dickhäuser, Fasching, & Dresel, 2013; Retelsdorf et al., 2010).

2.3 External Criteria in Professional Programs

Although researchers have considered a wide range of outcomes of achievement goals, once students are admitted to a professional program, it seems that professional outcomes, such as teaching efficacy, likely become somewhat more relevant than academic ones, such as grades. Although the debate surrounding which cognitions, emotions, and practices are best related to teacher effectiveness is ongoing, teachers' sense of efficacy, emotions, and classroom goal structures are common components and thus logical considerations for collecting evidence of validity in terms of relations with other variables (e.g., Klassen et al., 2017; Kunter, Klieckmann, Klusmann, & Richter, 2013; Pianta & Hamre, 2009).

We chose to measure teaching self-efficacy because of its associated instructional approaches that foster constructivist learning, greater student motivation, and higher academic performance (e.g., Klassen & Tze, 2014). Cho and Shim (2013) found small-to-medium positive correlations between teaching efficacy and mastery-approach (.39) and performance-approach (.17) but not performance-avoidance goals. We included measures of enjoyment and boredom because positive emotions and interest for teaching is associated with persistence in teaching (e.g., Watt & Richardson, 2007). In a meta-analysis of the associations between students' achievement goals and emotions, Huang (2011) reported a medium positive association between mastery-approach goals and enjoyment (.42) and a medium negative relationship between mastery-approach goals and boredom (-.34). With teachers specifically, mastery-approach goals have small positive associations (.11 to .42) and work-avoidance goals demonstrated small negative correlations (-.25) with enjoyment (Wang, Hall, & Rahimi, 2015).

Finally, we examined classroom goal structures because mastery structures have been positively associated with students' achievement, effort, persistence, social satisfaction, and emotional engagement (e.g., Lau & Nie, 2008; Shim, Cho, & Wang, 2013; Wolters, 2004). Based on four studies examining relationships between teachers' personal goals and their self-reported classroom goal structures (Daniels, 2015; Daniels, Frenzel, Stupnisky, Stewart, & Perry, 2013; Shim & Cho, 2013; Wang et al., 2015), it appears that personal mastery-approach goals have small to moderate associations with classroom mastery goal structures (.17 to .65) and are unrelated to classroom performance goal structures. Personal performance-approach goals are more often than not positively associated with classroom performance goal structures (.20 to .37) as are personal performance-avoidance (.09 to .27) and work avoidance goals (.18). Work-

avoidance goals also showed a small negative association with classroom mastery goal structures

(-.12).

2.4. Conceptual Framework and Hypotheses

The theoretical and empirical review above highlights that both the AGQ-R (Elliot &

Murayama, 2008) and GOT (Butler, 2007) emerged from the same historical tradition, share

similar characteristics, and have similar evidence of validity in terms of relations with other

variables. However, teachers and students are different in that they have distinct roles, tasks to

complete, and means by which they are evaluated, suggesting that their frames of reference for

competence may be somewhat different. In fact, practicing teachers have directly stated that their

achievement goals change from when they were a pre-service teacher to when they have their

own classroom (Daniels, 2015). This distinction makes pre-service teachers a unique sample in

that they are simultaneously driven by student demands and emerging professional obligations.

Therefore, the purpose of the current study was to investigate similarities and differences

between the AGQ-R and the GOT in pre-service teachers by examining how responses to items

on each questionnaire relate to one another and other variables, namely sense of teaching

efficacy, emotions, and intended classroom goal structures.

We employed a multitrait- (i.e., multiple types of achievement goals) multimethod (i.e.,

two measurement tools) approach (Campbell & Fiske, 1959) that involved examining three

sources of validity evidence (American Educational Research Association, American

Psychological Association, National Council on Measurement in Education, 2014; Barron,

Brown, Egan, Gesualdi, & Marchuk, 2008; Byrne & Goffin, 1993; Cronbach, 1988; Messick,

1989). First, following a similar procedure as used in Marsh (1994), we applied Confirmatory

Factor Analysis to test alternative measurement models thereby using the internal structure of the

constructs to be one source of validity evidence. If the matching traits (i.e., types of achievement goals) from the two separate questionnaires (i.e., heteromethod) measure the same underlying constructs, then we should be able to collapse across those factors for a parsimonious model providing evidence of convergent validity, defined as the extent to which scores are correlated with similar constructs. Second, we examined correlations within and between the two methods to evaluate convergent and discriminant validity and method effects. Strong correlations between matching traits across methods (homotrait-heteromethod) suggest convergent validity of the constructs; whereas, strong correlations between different traits measured by the different methods (heterotrait-heteromethod) or among different traits from the same method (heterotrait-homomethod) suggest method effects. Third, we expanded the traditional MTMM to include other variables of interest (Marsh & Grayson, 1995). Similar correlations for the homotrait-heteromethod constructs with the other variables provides further evidence of consistency between the methods and convergence of traits.

Because the sets of traits included in each method (i.e., measurement tool) were not exactly identical, we had to draw on the theoretical foundation of the tools to determine which traits should be considered matching. We argue that the two mastery scales, the performance-approach/ability-approach, and the performance-avoidance/ability-avoidance scales match because they were designed to measure the same underlying traits (i.e., homotrait-heteromethod) and therefore will produce the convergent validities. We believe that mastery-avoidance and work-avoidance represent conceptually different achievement strivings and therefore can only be considered in heterotrait-heteromethod comparisons. This investigation will aid in determining the commonalities of the two methods and help researchers in selecting the appropriate measures that are suitable for examining professionally oriented outcomes with pre-service teachers.

3. Method

3.1. Participants

Self-report data was collected from 270 pre-service teachers at a Canadian research-intensive university. Participants were roughly evenly distributed between those training to be elementary school teachers ($n = 132$) and those training to be secondary school teachers ($n = 126$). The majority of the sample was female (74%), which aligns with the provincial statistic that 71% of people working in the educational services industry are women (Government of Alberta, 2015). The average age of respondents was 23.01 ($SD = 5.23$, range 18 – 52). No data were collected on ethnicity or on the amount of teaching experience they had. Data was retained from 246 pre-service teachers after removing participants who stopped the questionnaire early.

3.2. Procedure

We recruited participants through a participant pool associated with their required undergraduate educational psychology course. This course is sequenced to take place prior to any teaching practicum placements. The University Institutional Review Board approved the correlational design. Participants received 5% research credit in exchange for completion of one online survey hosted by Surveymonkey© with data encryption. Students were blind to the content of the survey when they contacted the researcher for the survey link and consent was implied by completion of the survey. The survey required approximately 30 minutes to complete, was done during participants' own time, and was available for the entire semester. In addition to the items presented in this study, the survey also measured pre-service teachers' boredom as students, their perceived causes of boredom, and the ways they cope with boredom. These measures are examined elsewhere.

3.3. Achievement Goal Measures

Participants completed Elliot and Murayama's (2008) revised 12-item Goal Orientation Scale. The instructions were presented as follows to consider a teaching perspective: "When you think about being a teacher, to what extent does each of the following items reflect your goals?" Participants responded to items on a 1 to 5 Likert scale (1 = strongly disagree; 5 = strongly agree), as was the case for all scales unless otherwise stated. Following data collection, the items were sorted into the subscales measuring mastery-approach (e.g., my aim is to completely master teaching), performance-approach (e.g., my goal is to perform better than the other teachers), mastery-avoidance (e.g., I strive to avoid an incomplete understanding of teaching), and performance-avoidance (e.g., my aim is to avoid doing worse than other teachers).

Participants also completed Butler's (2007) Goal Orientations for Teaching scale. Butler's original instructions were used: "Teachers differ in what makes them feel they had a successful day in school. Indicate the extent to which you feel each of the following would be part of a successful day for you." The subscales measured mastery (e.g., the class made me want to learn more), ability-approach (e.g., my classes did better than those of other teachers), ability-avoidance (e.g., the principal did not comment on my low teaching ability), and work avoidance (e.g., some of my classes were cancelled). Descriptive information on all variables can be found in Table 1.

3.4. Other Variables

3.4.1. Teaching efficacy. Tschannen-Moran and Woolfolk Hoy's (2001) 12-item short-form of the Teachers' Sense of Efficacy Scale was used to measured *teaching efficacy*. Participants responded to items such as "How much can you do to motivate students who show low interest in school work?" on a rating scale ranging from 1 (nothing) to 9 (a great deal). We chose to examine a composite efficacy score rather than the subscales (i.e., management,

instruction, and engagement) because the developers of the TSES found that these three factors were not as distinct for pre-service teachers as practicing teachers and they suggest that only a total score be used with pre-service teachers (Tschannen-Moran & Woolfolk Hoy, 2001). The TSES has substantial evidence of reliability and validity including results that suggest reliability (αs range .87 to .93), cultural measurement invariance, and validity across five different cultural contexts including Canada (Klassen, Bong, Usher, Chong, Huan, Wong, & Georgiou, 2009).

3.4.2. Emotions. Pekrun and colleagues' Achievement Emotions Questionnaire (2011) is a commonly used measure of discrete emotions with exemplary evidence of reliability (αs range .78 to .92), internal validity via confirmatory factor analyses, and external validity in Canadian university students. We modified instructions slightly to focus on teaching: "Please rate the extent to which you experience the following emotions about teaching." We chose to measure *enjoyment* and *boredom* because they are oppositely valenced emotions that existing research suggests are important for teaching (e.g., Frenzel, Goetz, Lüdtke, Pekrun, & Sutton, 2009; Murray-Harvey, Slee, Lawson, Silins, Banfield, & Russell, 2000).

3.4.3. Classroom goal structures. We used The Patterns of Adaptive Learning (PALS; Midgley et al., 2000) to assess *mastery* and *performance classroom goal structures*. Again, we adjusted the items and instructions slightly in order to accommodate pre-service teachers: "Rate the extent to which each of the following items reflects something you may do in your classroom." Four items represent the subscale measuring mastery classroom goal structures (e.g., I give a wide range of assignments, matched to students needs and skill levels) and five items represent performance classroom goal structures (e.g., I point out those students who do well as a model for the other students). In research with Canadian teachers, reliability coefficients for the PALS scales range from .64 to .85 and evidence of validity over time and with personal

achievement goals is strong (e.g., Daniels, 2015; Daniels, Frenzel, Stupnisky, Stewart, & Perry, 2013; Wong, Hall, Goetz, & Frenzel, 2017).

3.5. Rationale for Analyses

We conducted our analyses in three steps. First, we examined the descriptive statistics and distributional properties of the AGQ-R and the GOT. Second, we used Confirmatory factor analyses (CFAs) with maximum-likelihood estimation, as was the case in the original validation work on the AGQ-R (Elliot & Murayama, 2008) and GOT (Butler, 2007), to test the default models for the AGQ-R and GOT in AMOS Version 23.0. Default models were compared to three alternative CFA models that tested varying degrees of overlap between the traits of the two methods (Marsh, 1994). Specifically, Model A contained eight factors representing each of the eight separate subscales as separate traits. If this model demonstrated adequate fit this would imply that the factors from the AGQ-R and GOT represent separate traits despite similar names (i.e., heterotrait-heteromethod). Model B contained five factors that combined mastery-approach, performance-approach/ability-approach, performance-approach/ability-avoidance as matching traits, and retained mastery-avoidance and work avoidance as separate traits. If this model demonstrated adequate fit it would imply that the mastery and two performance/ability scales represent the same trait across the two methods (homotrait-heteromethod) but that mastery-avoidance and work avoidance were separate (heterotrait-heteromethod). Model C contained two factors representing approach and avoidance motives and is commonly tested in the development of tools for achievement goals (for a recent example see Strunk, 2014). If this model demonstrated adequate fit it would imply that the valence component of the factors on the AGQ-R and the GOT were the same regardless of the definitions of competence. We assessed quality of fit for all models by examining the traditional chi-square (χ^2) test, the comparative fit

index (CFI; Bentler, 1990), the root-mean-square error of approximation (RMSEA; Browne & Cudeck, 1993), and the Standardized Root Mean Square Residual (SRMR; Hu & Bentler, 1999). Suggested cut-off scores for these values vary: We expected adequately fitting models to be associated with CFI ≥ .95 (Kline, 2016; McDonald & Ho, 2002), RMSEA < 0.05 (McDonald & Ho, 2002), and SRMR < .08 (Schreiber, Nora, Stage, Barlow, & King, 2006). This process contributed to the validity evidence for the constructs by examining the internal structure. Then we examined the latent correlations within (homomethod) and between (heteromethod) the AGQ-R and the GOT for evidence of convergent and discriminant validity.

Third, in order to evaluate relations with other variables as a source of validity information, we correlated the subscales of the AGQ-R and GOT with pre-service teachers' sense of self-efficacy, emotions, and intended classroom goal structures. Drawing on the existing empirical literature (Cho & Shim, 2013; Daniels, 2015; Daniels et al., 2013; Huang, 2011; Shim et al., 2013; Wang et al., 2015), we expect both Elliot and Butler's mastery-approach goals to demonstrate positive correlations of medium size with all external criteria except boredom, for which we expect a negative medium association. We expect performance/ability-approach to have a small positive association with efficacy and a small-to-medium positive effect with classroom performance goal structures. We expect both performance-avoidance goals and work-avoidance goals to have small positive associations with classroom performance goal structures. Furthermore, we expect work-avoidance goals to have a small-to-medium negative association with enjoyment.

4. Results

4.1. Psychometric Properties and Descriptive Information

Descriptive information (means, standard deviations, minimum and maximum values) and distributional indices (skewness and kurtosis) for all variables are presented in Table 1. For the AGQ-R and the GOT, participants most strongly endorsed mastery-approach goals. Indeed, responses to the mastery items were so strong and positive that the scales demonstrated a high level of negative skewness and positive kurtosis. The distribution of scores in response to these items was appreciably different from responses to the other three goals on each questionnaire. The remaining three goals on the AGQ-R were all similarly endorsed in terms of level. In contrast, the avoidance scales on the GOT were endorsed at levels below the midpoint. In terms of other variables we should note that participants' scores on enjoyment and intended mastery classroom goal structures were nearly double their scores on boredom and intended performance classroom goal structures, respectively. All performance scales from the AGQ-R and GOT, as well as work-avoidance, demonstrated adequate internal consistency as measured by coefficient alphas > .70 (Nunnally & Bernstein, 1994). The three scales related to mastery goals, however, fell slightly short of this commonly accepted threshold but remained above α = .60. This cut off can be considered acceptable for "early stages of research" (Streiner, 2003, p. 103), which arguably the use of these scales with pre-service teachers may be considered.

4.2. Confirmatory Factor Analysis

4.2.1 Default models. As a default model we tested the theorized structure of the AGQ-R, including correlations between all latent variables, and it had an acceptable fit to the data (see Table 2 for all fit indices) with all of the item parameters loading above .40. For the second default model we tested the theorized structure of the GOT, including correlations between all latent variables, and it did not meet the minimum standards of model fit. Upon inspection, two items had particularly poor pattern coefficients (referred to generically as factor loadings; Kline,

2013). Specifically, the work avoidance item: "some of my classes were cancelled" and an ability-avoidance item "no one asked a question I could not answer" did not fit with their theorized latent variable. Conceptually, the work-avoidance item is the only one of the four items that is external to a teacher and beyond his or her control. For ability-avoidance, pre-service teachers often have unrealistic expectations and they may not believe that students will ask questions they are unable to answer. We removed these items and re-ran the CFA including 14 of the original 16 items. Although the model did not demonstrate excellent fit to the data, it was in fact superior to that reported by Butler (2007) in the original factor analyses and indeed improved such that the fit indices meet the minimum criteria to be viewed as acceptable (Hu & Bentler, 1999) with all item parameters loading above .40 on the expected factor. All analyses reported herein are based on the reduced 14-item Butler scales.

4.2.1 Alternative models. Next, we fit a series of alternative models to see if the traits from the two methods could be collapsed according to our pre-specified matches. As described above we tested three alternative models: Model A, eight separate factors (heterotrait-heteromethod); Model B, five factors that combined mastery-approach, performance-approach/ability-approach, performance-approach/ability-avoidance as homotraits, and retained mastery-avoidance and work avoidance as a heterotrait; Model C, two factors representing approach and avoidance motives. Of all the models, only Model A had fit indices (Table 2) that even approached an acceptable standard. The parameter estimates for each item in Model A loaded on the appropriate factor range .46 to .90. No other models were acceptable alternatives. Overall this suggests that the AGQ-R and GOT cannot be combined and therefore largely measure separate constructs.

4.3 Multitrait-Multimethod Correlations

4.3.1 Heterotrait-homomethod discriminant validities. Because no combined models of the AGQ-R and the GOT adequately fit the data, we proceeded with all correlations based on separate scales for each factor. The heterotrait-homomethod correlations within the AGQ-R were positive and moderate to high (Table 3) possibly indicating method effects. Although it is common for the scales of the AGQ-R to be positively correlated (e.g., Elliot & Murayama, 2008), the correlation between mastery-avoidance and performance-avoidance in this sample was atypically strong $r = .91$, $p < .001$ and does not demonstrate discriminant validity within the scale. Evidence of discriminant validity was clearer for the GOT (Butler, 2007): Mastery was not significantly correlated with any of the other traits while the other three traits had moderate positive correlations (Table 3).

4.3.2 Homotrait-heteromethod convergent validities. Correlations between the matched traits of the two methods are also presented in Table 3. Each set of homotrait-heteromethod scales were positively and significantly correlated. The homotrait-heteromethod correlations between the two mastery scales and the performance-approach/ability-approach scales were particularly compelling because the remaining heterotrait-heteromethod correlations were non-significant. This was not the case for performance-avoidance, which was both positively correlated with ability-avoidance as a matching trait and similarly correlated with ability-approach goals as a non-matching trait. Mastery-avoidance and work avoidance, which we previously argued were not matched traits because they target different elements of achievement striving, were not correlated.

4.3.3. Correlations with other variables. In terms of correlations with other variables, our results largely align in both direction and strength with the extant literature (Table 4). For example, both mastery scales revealed significant small to moderate correlations with all other

variables in the expected direction. The one exception was that the GOT's mastery scale was negatively associated with performance classroom goal structures while the relationship for the AGQ-R's mastery-approach was not significant. In other words, the two mastery scales functioned quite similarly in relation to other variables. Interestingly, all the other traits on the AGQ-R and GOT were significantly and positively associated with performance classroom goal structures (rs range .13 to .22). The GOT work-avoidance scale also revealed small but significant negative correlations with sense of teaching efficacy and enjoyment, and a positive correlation with boredom. Boredom was also positively associated with ability-avoidance goals but was unrelated to all AGQ-R scales except mastery-approach with which it had a small negative association. Neither the AGQ-R performance-approach/avoidance scales nor the GOT ability-approach/avoidance scales were significantly correlated with enjoyment or mastery classroom goal structures.

5. Discussion

We sought to examine evidence of validity of two measures of achievement goals in a sample of pre-service teachers - a group who may be focused on both academic and professional indicators of competence at the same time. Overall, our results are mixed in terms of the extent to which the AGQ-R (Elliot & Murayama, 2008) and the GOT (Butler, 2007) represent theoretically or empirically different achievement goals. Based on evidence of internal structure we must conclude that the AGQ-R and GOT measure separate constructs. However, for the matching (i.e., homotrait-heteromethod) mastery and performance/ability-approach goals, evidence in the form of discriminant and convergent validity suggests there are some similarities nonetheless. We discuss how our results gave rise to these conclusions and propose that the

professionally oriented GOT may have slight advantages over the student-focused AGQ-R when conducting research with pre-service teachers and focusing on professional outcomes.

Three results support our assertion that the AGQ-R and GOT measure different constructs, particularly in terms of avoidance scales. First, an eight-factor CFA model provided the best fit to the data suggesting that the factor structure of the four scales of each measure cannot be collapsed while retaining structural integrity. Indeed, the model fit statistics barely support this conclusion and instead from a CFA perspective, the strongest fit to the data came from fitting completely separate models for the AGQ-R and GOT. In either instance, the message is clearly that the internal structure cannot support combining matched traits across the two measurement tools. Second, because the homotrait-heteromethod correlation between performance-avoidance and ability-avoidance was not as strong as the heterotrait-heteromethod correlation between performance-approach and ability-avoidance, the evidence for the similarity of the proposed matching traits is not supported. Finally, the correlations with other variables differed for the scales of performance-avoidance and ability-avoidance goals. One explanation for these differences may be based in the instructions of the two scales. Elliot and Murayama (2008) ask directly about one's "goal". In contrast, Butler (2007) uses instructions that focus the participant on what would make them feel like they had a successful day. While Butler argues that this type of instruction allows for more credible inclusion of avoidance items, it may also trigger affective responses. The AGQ-R intentionally *removed* statements that may have allowed affect to be conflated with goals – something identified as problematic with the original AGQ (Elliot & McGregor, 2001). Similarly, Hulleman and colleagues (2010) coded 26% of performance-approach items and 34% of mastery-approach items as "no goal" because they focused on feelings or success without an explicit goal-directed statement. Overall, these results

suggest the AGQ-R and GOT are measuring different underlying avoidance constructs when it comes to performance/ability. By extension, researchers will need to choose one of the two measurement tools because they are not interchangeable.

Although the same evidence related to internal structure applies to all discrete factors, the other sources of validity evidence suggest that the matched mastery and performance/ability-approach factors share some similarities. For example, the homotrait-heteromethod correlations between mastery-approach goals and mastery goals or performance-approach and ability-approach were the largest of all possible pairs thereby providing evidence of convergent validity for these hypothesized matching traits. Elliot's mastery-approach and Butler's mastery scales were by far the most similar in terms of relationships with other variables as well: as would be expected by the theories each scale was positively associated with sense of teaching efficacy, enjoyment, and mastery classroom goal structures, and negatively associated with boredom. Although existing empirical evidence has not documented negative associations between personal mastery goals and performance classroom goal structures theory would support the association, which was indeed significant between Butler's mastery scale and performance classroom goal structures, but not mastery-approach on the AGQ-R. Thus, perhaps part of the previous failure to find this relationship was because of the measurement tool selected.

In addition to more points of convergence between the homotrait-heteromethod constructs, we would be remiss if we did not point out the dominance of mastery-approach goals in terms of level of endorsement. Clearly pre-service teachers are mainly driven by mastery goals, as measured by either the AGQ-R or GOT, and in turn mastery goals have the strongest relationships with other variables. This finding reinforces other research documenting positive associations between mastery goals and adaptive outcomes for the individual himself/herself and

for his/her students (e.g., Butler, 2007; Daniels, 2015; Daniels et al., 2013; Ruzek, Domina, Conley, Duncan, & Karabenick, 2014). We would argue that regardless of the scale that researchers chose, measuring mastery-approach goals is of critical importance. No other factor had nearly the same number of significant associations with the other variables.

5.1. Limitations and Directions for Future Research

In addition to common limitations associated with correlational research including data collected at a single time point, reliance on self-report data, and a convenience sample, the research presented herein needs to be considered in light of both conceptual and statistical limitations. Conceptually, the main limitation of this study is that it examined only two measures of achievement goal theory despite continued evolution in the field, particularly in the area of teachers' achievement goals. First, the original structure of Butler's (2007) scale did not produce an adequately fitting default model and thus we had to remove items before proceeding with the remaining analyses. This may suggest that pre-service teachers are unable to relate to or image certain items on the GOT, which brings its authenticity into question. However, because removal of just two items improved the model fit to minimally acceptable, the issue may be restricted to the specific details of the items and not the overarching factors they were designed to measure.

A second conceptual limitation is that there are indeed other scales designed for teachers that may prove superior to Butler's original scale. These newer scales were not available when we collected the data for this project but are important to consider in future research. For example, Butler (2012) revised the GOT, to reflect a 5-factor model that includes relational goals. This model has produced intriguing results in which relational goals appear to be even more beneficial than mastery goals. Likewise, Mascret, Elliot, and Cury (2015) adapted a 3 x 2 achievement goal questionnaire for use with practicing teachers. This new 3 x 2 model for

teachers replaced the mastery/performance distinction with task/self/other foci, which has also been mirrored in recent work with students (Elliot et al., 2011). The new 3 x 2 model still showed a limited set of relationships with other variables including mastery and performance classroom goal structures and intrinsic interest. Now that there are more versions of questionnaires particularly designed for teachers, future research could compare the utility of these scales for pre-service teachers, particularly since our research tentatively suggests the GOT may have some superiority to the AGQ-R for pre-service teachers. Indeed, several scales originally created to measure other constructs in practicing teachers have proven valid for pre-service teachers (e.g., teachers sense of self-efficacy, Tschannen-Moran & Woolfolk Hoy, 2001; teacher engagement, Klassen, Yerdelen, & Durksen, 2013; teacher personal responsibility, Lauermann & Karabenic, 2013). Comparing scales all originally created with the profession in mind would make an important step in understanding if pre-service teachers require a unique questionnaire.

From a statistical perspective, we chose to use maximum-likelihood estimation procedures even though Likert scales are not actually continuous data. Rhemtulla, Brosseau-Liard and Savalei (2012) compared maximum-likelihood with categorical least squares approaches to CFA and concluded that "both methods yield acceptable performance" (p. 371) when the variables have at least five categories – as indeed do both the AGQ-R (Elliot & Muryama, 2008) and GOT (Butler, 2007). In their simulation, even when parameter estimates became biased due to non-normality or sample size, the bias never exceeded 10%. We encourage readers to keep this potential bias in mind as they weigh the results of this study. And, we encourage researchers to be sensitive to the ordinal structure of Likert scales.

Implications. At present, there is no scale designed for use with pre-service teachers, or with any group of learners straddling the student-professional divide. As such, researchers have to choose to adapt either student or professional versions, running the risk that the sample may not relate to either scale completely. One common adaptation in these circumstances involves asking pre-service teachers to "imagine that they are teachers." We asked our participants to undertake this type of imagining and it is possible that it had an impact on how participants responded to questionnaire items that were designed as concrete representations of current goals. However, part of teacher education involves regularly imagining, enacting, and reflecting on components of the profession of teaching (e.g., Pedro, 2005) and thus this set of instructions may not seem out of place to pre-service teachers. One solution to making adjustments is to create a measure of achievement goals specifically for pre-service teachers, or for trainees more broadly. We make this recommendation cautiously, considering that there are already many measurement tools available for achievement goals (Hulleman et al., 2010) and acknowledge that we do not want to add unnecessarily to the mix. If this type of research were undertaken, the measurement tool would need to be built in consultation with pre-service teachers to truly capture their relevant achievement goals.

Until an specific measure of achievement goals for trainees can be justified and appropriately produced, we cautiously recommend that researchers interested in examining pre-service teachers' achievement goals use Butler's (2007) GOT if they are interested in variables related to the profession of teaching. The scales on the GOT had more relationships with other variables and those relationships differed for heterotrait-homomethod constructs more than the same factors on the AGQ-R. It is likely that researchers want to understand how achievement goals are linked to eventual teaching outcomes and the GOT seems to provide a marginally more

complete understanding of this than the AGQ-R. Additionally, the scores on each scale for the GOT had a wider range and were less skewed and kurtotic than the AGQ-R. The GOT mastery scale still suffers from ceiling effects, but the other constructs were approximately normally distributed. Finally, for researchers interested in longitudinal research, we know that (a) the GOT was specifically designed for teachers and (b) when teachers reflect on the AGQ-R, they directly state that some goals no longer fit their professional life (Daniels, 2015). Thus, researchers interested in following pre-service teachers into practice can likely have the best continuity in their measurement by using the GOT.

References

American Educational Research Association, American Psychological Association, & National

Council on Measurement in Education. (2014). *Standards for educational and

psychological testing*. Washington, DC: American Educational Research Association.

Byrne, B. M., & Goffin, R. D. (1993) Modeling MTMM Data from Additive and Multiplicative

Covariance Structures: An Audit of Construct Validity Concordance, Multivariate

Behavioral Research, 28:1, 67-96, DOI: 10.1207/s15327906mbr2801_5

Barron, K. E., Brown, A. R., Egan, T. E., Gesualdi, C. R., & Marchuk, K. A. (2008). Validity. In

S. F. Davis & W. Buskist (Eds.), *21st century psychology: A reference handbook* (pp. 55–

64). Thousand Oaks, CA: Sage

Bentler, P. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, *107*(2),

238-246. doi:10.1037/0033-2909.107.2.238

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In: K. A. Bollen

& J. S. Long (Eds.), *Testing structural equation models* (pp. 136-162). Beverly Hills, CA:

Sage. doi:10.1177/0049124192021002005

Butler, R. (2007). Teachers' achievement goal orientations and associations with teachers' help-

seeking: examination of a novel approach to teacher motivation. *Journal of Educational

Psychology, 99*(2)*, 241–252. doi:10.1037/0022-0663.99.2.241

Butler, R. (2012). Striving to connect: Extending an achievement goal approach to teacher

motivation to include relational goals for teaching. *Journal of Educational Psychology,

104*(3), 726-742. doi:10.1037/a0028613

Butler, R., & Shibaz, L. (2008). Achievement goals for teaching as predictors of students' perceptions of instructional practices and students' help seeking and cheating. *Learning and Instruction*, *18*(5), 453-467. doi:10.1016/j.learninstruc.2008.06.004

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological bulletin*, *56*(2), 81-105. doi: 10.1037/h0046016

Cho, Y., & Shim, S. S. (2013). Predicting teachers' achievement goals for teaching: The role of perceived school goal structure and teachers' sense of efficacy. *Teaching and teacher education*, *32*, 12-21.

Cronbach, L. J. (1988). Five perspectives on validation argument. In H. Wainer & H. Braun (Eds.), *Test validity* (pp. 3–17). Hillsdale: Lawrence Erlbaum Associates.

Daniels, L. M., (2015). From pre-service to practicing teacher: Considering the stability of personal and classroom mastery and performance goals. *Educational Psychology, 35*(8), 984-1005. doi:10.1080/01443410.2013.870329

Daniels, L. M., Frenzel, A. C., Stupnisky, R. H., Stewart, T. L., & Perry, R. P. (2013). Personal goals as predictors of intended classroom goals: Comparing elementary and secondary school pre-service teachers. *British Journal of Educational Psychology, 83*(3)*, 396-413.* doi:10.1111/j.2044-8279.2012.02069.x

Daniels, L. M., Stupnisky, R. H., Perry, R. P., Mandzuk, D., & Clifton, R. (2008, March). *Student teachers' mastery and performance goals: Influence on classroom goal structures and professional outcomes.* Poster presented at the Annual Meeting of the American Educational Research Association, New York, NY

Dowson, M., & McInerney, D. M. (2001). Psychological parameters of students' social and work

    avoidance goals: A qualitative investigation. *Journal of Educational Psychology*, *93*(1),

    35-42. doi:10.1037/0022-0663.93.1.35

Elliot, A. (1999). Approach and avoidance motivation and achievement goals. *Educational*

    Psychologist, 34(3), 169-189. doi:10.1207/s15326985ep3403_3

Elliot, A. J., & Church, M. A. (1997). A hierarchical model of approach and avoidance

    achievement motivation. *Journal of Personality and Social Psychology, 72*(1), 218-232.

    doi:10.1037/0022-3514.72.1.218

Elliot, A. J., Gable, S. L., & Mapes, R. R. (2006). Approach and avoidance motivation in the

    social domain. *Personality and Social Psychology Bulletin*, *32*(3), 378-391.

    doi:10.1177/0146167205282153

Elliot, A. J., & Murayama, K. (2008). On the measurement of achievement goals: Critique,

    illustration, and application. *Journal of Educational Psychology, 100*(3)*,* 613-628.

    doi:10.1037/0022-0663.100.3.613

Elliot, A. J., Murayama, K., & Pekrun, R. (2011). A 3 x 2 achievement goal model. *Journal of*

    *Educational Psychology, 10*3(3), 632-648. doi:10.1037/a0023952

Fasching, M. S., Dresel, M., Dickhäuser, O., & Nitsche, S. (2010). Goal orientations of teacher

    trainees: Longitudinal analysis of magnitude, change and relevance. *Journal for*

    Educational Research Online, 2(2), 9-33.

Frenzel, A. C., Goetz, T., Lüdtke, O., Pekrun, R., & Sutton, R. E. (2009). Emotional transmission

    in the classroom: Exploring the relationship between teacher and student enjoyment.

    Journal of Educational Psychology, 101, 705-716. doi:10.1037/a0014695

Government of Alberta. (2015). *Industry profiles 2016: Educational services industry.* Retrieved

from: https://work.alberta.ca/documents/industry-profile-educational-services.pdf

Grant, H., & Dweck, C. S. (2003). Clarifying achievement goals and their impact. *Journal of*

Personality and Social Psychology, 85(3), 541-553. doi:10.1037/0022-3514.85.3.541

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis:

Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55.

doi:10.1080/10705519909540118

Huang, C. (2011). Achievement goals and achievement emotions: A meta-analysis. *Educational*

Psychology Review, *23*(3), 359-388. doi:10.1007/s10648-011-9155-x

Hulleman, C. S., Schrager, S. M., Bodmann, S. M., & Harackiewicz, J. M. (2010). A meta-

analytic review of achievement goal measures: different labels for the same constructs or

different constructs with similar labels? *Psychological Bulletin, 136*(3), 422–449.

doi:10.1037/a0018947

Kaplan, A., & Flum, H. (2010). Achievement goal orientations and identity formation styles.

Education Research Review, 5(1)*,* 50-67. doi:10.1016/j.edurev.2009.06.004

King, R. B., & McInerney, D. M. (2014). The work avoidance goal construct: Examining its

structure, antecedents, and consequences. *Contemporary Educational Psychology*, *39*(1),

42-58. doi:10.1016/j.cedpsych.2013.12.002

Klassen, R. M., Bong, M., Usher, E. L., Chong, W. H., Huan, V. S., Wong, I. Y., & Georgiou, T.

(2009). Exploring the validity of a teachers' self-efficacy scale in five

countries. *Contemporary Educational Psychology*, *34*(1), 67-76.

Klassen, R., Durksen, T., Kim, L. E., Patterson, F., Rowett, E., Warwick, J., ... & Wolpert, M. A.

(2017). Developing a Proof-of-Concept Selection Test for Entry into Primary Teacher

Education Programs. *International Journal of Assessment Tools in Education (IJATE)*, *4*(2).

Klassen, R. M., & Tze, V. M. (2014). Teachers' self-efficacy, personality, and teaching effectiveness: A meta-analysis. *Educational Research Review*, *12*, 59-76.

Klassen, R. M., Yerdelen, S., & Durksen, T. L. (2013). Measuring teacher engagement: development of the engaged teachers scale (ETS). *Frontline Learning Research*, *1*(2), 33-52. doi:10.14786/flr.v1i2.44

Kline, R. (2013). Exploratory and Confirmatory Factor Analysis. In *Applied quantitative analysis in education and the social sciences* (pp. 183-217). Routledge.

Kline, R. B. (2016). *Principles and Practice of Structural Equation Modeling: Fourth Edition*. New York: The Guilford Press.

Lauermann, F. & Karabenick, S. A. (2013). The meaning and measure of teachers' sense of responsibility for educational outcomes. *Teaching and Teacher Education, 30,* 13-26. doi:10.1016/j.tate.2012.10.001

Malmberg, L. (2008). Student teachers' achievement goal orientations during teacher studies: Antecedents, correlates and outcomes. *Learning and Instruction, 18*(5)*,* 438-452. doi:10.1016/j.learninstruc.2008.06.003

Marsh, H. W. (1994). Sport motivation orientations: Beware of jingle-jangle fallacies. *Journal Of Sport & Exercise Psychology*, *16*(4), 365-380. doi:10.1123/jsep.16.4.365

Marsh, H.W., & Grayson, D. (1995). Latent-variable models of multitrait-multimethod data. In R. H. Hoyle (Ed.), *Structural equation modeling: Issues and applications* (pp. 177-198). Thousand Oaks, CA: Sage

Mascret, N., Elliot, A. J., & Cury, F. (2015). The 3× 2 achievement goal questionnaire for

    teachers. *Educational Psychology*, 1-16. doi:10.1080/01443410.2015.1096324

McDonald, R. P., & Ho, M. H. R. (2002). Principles and practice in reporting structural equation

    analyses. *Psychological methods*, *7*(1), 64-82 doi: 10.1037//1082-989X.7.1.64

Messick, S. (1989). Validity. In R. L. Linn (Ed.), Educational measurement (3rd ed., pp. 13–

    103). New York: American Council on Education/Macmillan

Midgley, C., Maehr, M., Hruda, L., Anderman, E., Amerman, L., Freema, K., et al. (2000).

    Manual for the Patterns of Adaptive Learning Scales. Ann Arbor: University of

    Michigan. Retrieved from http://www.umich.edu/~pals/PALS%202000_V13Word97.pdf

Murray-Harvey, R., Slee, P. T., Lawson, M. J., Silins, H., Banfield, G., & Russell, A. (2000).

    Under stress: the concerns and coping strategies of teacher education students. *European

    Journal of Teacher Education, 23*(1), 19–35. doi:10.1080/713667267

Nicholls, J. (1984). Achievement motivation: Conceptions of ability, subjective experience, task

    choice, and performance. *Psychological Review, 91*(3), 328–346.

    doi:10.1037/0033295x.91.3.328

Nicholls, J. G., Patashnick, M., & Bobbit Nolen, S. (1985). Adolescents' theories of education.

    Journal of Educational Psychology, 77(6), 683-692. doi:10.1037/0022-0663.77.6.683

Nitsche, S., Dickhauser, O., Fasching, M. S., & Dresel, M. (2011). Rethinking teachers' goal

    orientations: Conceptual and methodological enhancements. *Learning and Instruction,

    21*(4), 574-586. doi:10.1016/j.learninstruc.2010.12.001

Nitsche, S., Dickhauser, O., Fasching, M., & Dresel, M. (2013). Teachers' professional goal

    orientations: Importance for further training and sick leave. *Learning And Individual

    Differences*, *23,* 272-278. doi:10.1016/j.lindif.2012.07.017

Nolen, S. B. (1988). Reasons for studying: Motivational orientations and study strategies. *Cognition and Instruction*, *5*(4), 269-287. doi:10.1207/s1532690xci0504_2

Nunnally, J. C., & Bernstein, I. H. (1994). Psychometric theory (3rd ed.). New York: McGraw-Hill.

Pedro, J. Y. (2005). Reflection in teacher education: exploring pre- service teachers' meanings of reflective practice. *Reflective Practice*, *6*(1), 49-66.

Pekrun, R., Goetz, T., Frenzel, A. C., Barchfeld, P., & Perry, R. P. (2011). Measuring emotions in students' learning and performance: The Achievement Emotions Questionnaire (AEQ) (English). *Contemporary Educational Psychology*, *36*(1), 36-48. doi:10.1016/j.cedpsych.2010.10.002

Retelsdorf, J., Butler, R., Streblow, L., & Schiefele, U. (2010). Teachers' goal orientations for teaching: Associations with instructional practices, interest in teaching, and burnout. *Learning and Instruction*, *20*(1)*,* 30-46. doi:10.1016/j.learninstruc.2009.01.001

Rhemtulla, M., Brosseau-Liard, P. É., & Savalei, V. (2012). When can categorical variables be treated as continuous? A comparison of robust continuous and categorical SEM estimation methods under suboptimal conditions. *Psychological Methods*, *17*(3), 354-373. doi:10.1037/a0029315

Ruzek, E. A., Domina, T., Conley, A. M., Duncan, G. J., & Karabenick, S. A. (2014). Using value-added models to measure teacher effects on students' motivation and achievement. *The Journal of Early Adolescence, 35*(5-6), 852-882. doi:10.1177/027431614525260

Ryan, A. M., & Shim, S. S. (2008). An exploration of young adolescents' social achievement goals and social adjustment in middle school. *Journal of Educational Psychology*, *100*(3), 672-687. doi:10.1037/0022-0663.100.3.672

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural

equation modeling and confirmatory factor analysis results: A review. *The Journal of*

educational research, *99*(6), 323-338. doi:10.3200/joer.99.6.323-338

Seifert, T. L., & O'Keefe, B. A. (2001). The relationship of work avoidance and learning goals to

perceived competence, externality and meaning. *British Journal of Educational*

Psychology, *71*(1), 81-92. doi:10.1348/000709901158406

Shim, S.S., Cho, Y.J., & Cassady, J. (2013). Goal structure: The role of teachers' achievement

goals and theories of intelligence. *The Journal of Experimental Education, 81,* 84-104.

doi:10.1080/00220973.2011.635168

Shim, S. S., Cho, Y., & Wang, C. (2013). Classroom goal structures, social achievement goals,

and adjustment in middle school. *Learning and Instruction*, *23*, 69-77.

Strunk, K. K. (2014). A Factor Analytic Examination of the Achievement Goal Questionnaire–

Revised Supports a Three-Factor Model. *Psychological reports*, *115*(2), 400-414.

https://doi.org/10.2466/14.03.PR0.115c24z0

Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: Capturing an elusive

construct. *Teaching and Teacher Education, 17*(7)*,* 783-805.

doi:10.1016/S0742051X(01)00036-1

Urdan, T., & Maehr, M. L. (1995). Beyond a two-goal theory of motivation and achievement: A

case for social goals. *Review of Educational Research, 65*(3), 213- 243.

doi:10.3102/00346543065003213

Wang, H., Hall, N. C., Goetz, T., & Frenzel, A. C. (2017). Teachers' goal orientations: Effects on

classroom goal structures and emotions. *British Journal of Educational*

Psychology, *87*(1), 90-107.

Wang, H., Hall, N. C., & Rahimi, S. (2015). Self-efficacy and causal attributions in teachers: Effects on burnout, job satisfaction, illness, and quitting intentions. *Teaching and Teacher Education*, *47*, 120-130.

Watt, H. M., & Richardson, P. W. (2007). Motivational factors influencing teaching as a career choice: Development and validation of the FIT-Choice Scale. *The Journal of experimental education*, *75*(3), 167-202.

Wolters, C. A. (2004). Advancing Achievement Goal Theory: Using Goal Structures and Goal Orientations to Predict Students' Motivation, Cognition, and Achievement. *Journal of educational psychology*, *96*(2), 236-250.

Table 1

Descriptive Statistics for Variables in the Study

	N items	Mean	*SD*	Range	α	Skewness	Kurtosis
Achievement Goals Questionnaire-Revised							
1. Mastery approach	3	4.46	0.56	1-5	.68	-2.27	9.59
2. Performance approach	3	3.80	0.87	1-5	.82	-.72	.31
3. Mastery avoidance	3	3.70	0.97	1-5	.67	-.59	-.15
4. Performance avoidance	3	3.58	1.06	1-5	.90	-.43	-.64
Goals Orientations for Teaching							
5. Mastery	4	4.51	0.47	1.75-5	.69	-1.63	5.44
6. Ability approach	4	3.79	0.80	1-5	.81	-.58	.09
7. Ability avoidance	3[a]	2.76	0.87	1-5	.75	-.08	-.41
8. Work avoidance	3[a]	2.61	0.76	1-5	.74	.21	-.07
External Criteria							
9. Teaching efficacy	12	7.27	0.79	4-9	.89	-.21	.49
10. Enjoyment	4	4.27	0.49	3-5	.60	-.36	-.32
11. Boredom	4	1.87	0.73	1-4.5	.84	.79	.14
12. Mastery classroom goal structures	4	4.22	0.56	2.25-5	.72	-.58	.30
13. Performance classroom goal structures	5	2.37	0.75	1-5	.80	.67	.85

Notes. 1=male; 2=female 1=elementary; 2=secondary [a] The descriptive statistics for these scales represent reduced items based on the CFA analyses.

Table 2

Goodness of Fit for Default and Alternative Confirmatory Factor Analysis Models

Model	Description	χ^2	df	CFI	RMSEA [lower 90% CI, upper 90% CI]
Default	Elliot & Murayama (12 items)	123.95	48	.94	.08 [.06, .10]
Default	Butler, 2007 (16 items)	252.60	98	.87	.08 [.07, .09]
Revised	Butler, 2007 (14 items)	155.91	71	.92	.07 [.06, .09]
A	8 factors	503.52	271	.91	.06 [.05, .07]
B	5 factors	1029.49	289	.72	.10 [.01, .11]
C	2 factors (Approach, Avoidance)	1451.33	298	.57	.13 [.12, .13]

Notes. Model A eight factors representing the eight separate subscales across the two questionnaires (heterotrait-heteromethod); Model B five factors that combined mastery-approach, performance-approach/ability-approach, performance-avoidance/ability-avoidance (homotrait), and retained mastery-avoidance and work avoidance and separate factors (heterotrait); Model C two factors representing approach and avoidance motives.

Table 3

Multitrait-Multimethod Latent Correlation Matrix of Factors from the Separate AGQ-R and

GOT Scales

	1	2	3	4	5	6	7
1. Mastery-approach	--						
2. Mastery-avoidance	.35*	--					
3. Performance-approach	.43*	.55*	--				
4. Performance-avoidance	.15	.91*	.69*	--			
5. Mastery	.57*	.21	.08	.05	--		
6. Work avoidance	-.16	.12	.16	.17	.16	--	
7. Ability approach	.24	.34*	.66*	.42*	.12	.52*	--
8. Ability avoidance	-.10	.33*	.25	.40*	.01	.55*	.51*

Note. Scales 1-4 are from the Achievement Goals Questionnaire-Revised; Scales 5-8 are from

the Goal Orientations for Teaching Questionnaire; Dark grey = heterotrait-homomethod; Light

grey = homotrait-heteromethod

* *p* < .01

Table 4

*Pearson Zero-Order Correlations with Other Variables*

	Elliot Mastery-approach[a]	Butler Mastery[a]	Elliot Performance-approach[b]	Butler Ability approach[b]	Elliot Performance-avoidance[c]	Butler Ability avoidance[c]
Sense of teaching efficacy	.30*	.33*	.18*	.04	.10	-.11
Enjoyment	.21*	.40*	.07	.10	-.02	.04
Boredom	-.18*	-.30*	.06	.08	.07	.20*
Mastery classroom goal structures	.34*	.45*	.08	.06	.06	-.04
Performance classroom goal structures	.09	-.14*	.21*	.22*	.21*	.13*

Note. [abc]Scales with shared superscripts are considered homotrait; all Butler scales are

homomethod and all Elliot scales are homomethod

* $p < .05$

Figure 1: Models combining the items from the two questionnaires.
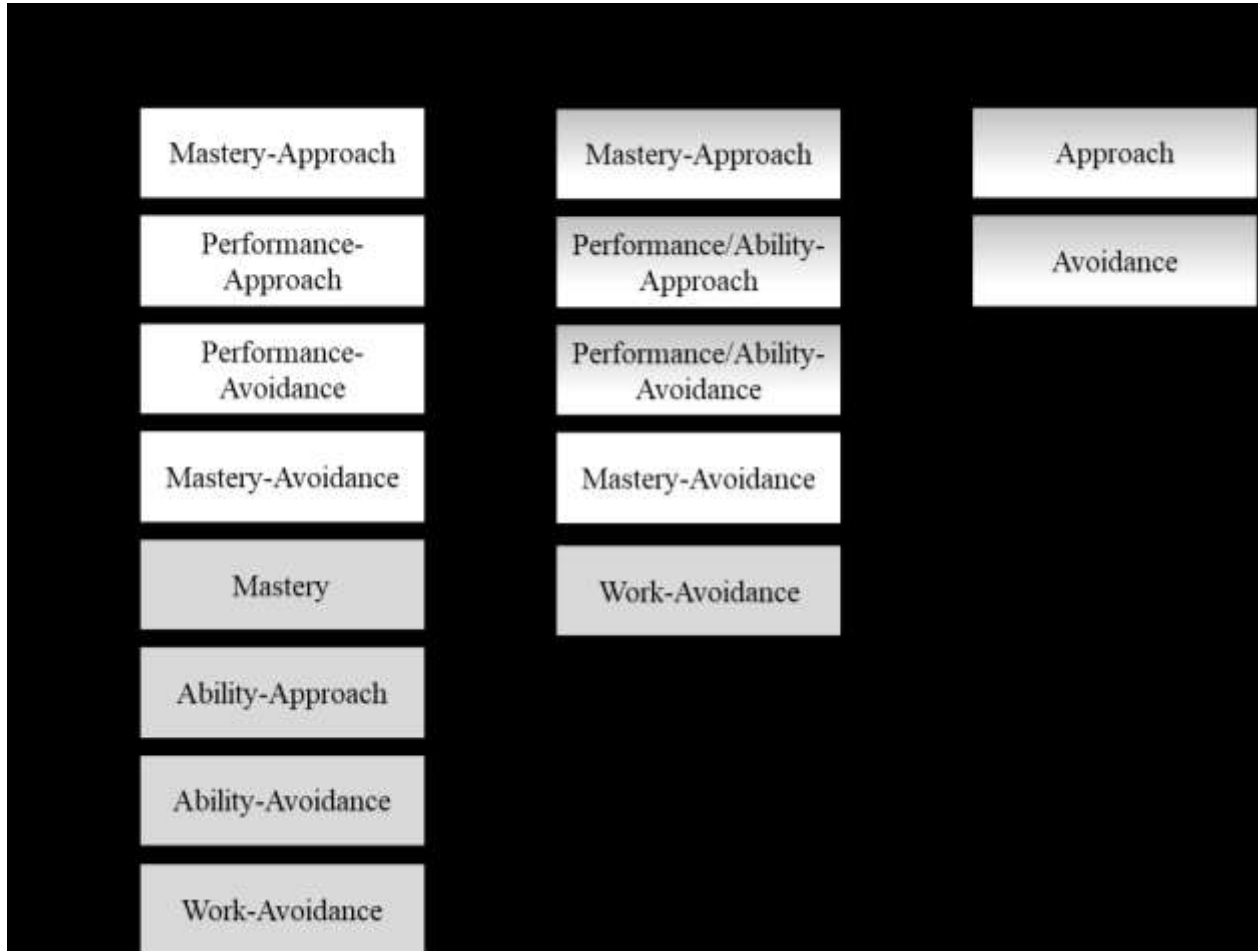
Note: White boxes represent scales from Elliot & Murayama (AGQ-R; 2008). Grey boxes represent scales from Butler (GOT; 2007). Boxes with grey-white gradient represent scales combined from the two.

Appendix A

Item #	Wording Elliot & Murayama (2008)	Latent factor	Pattern Coefficient
1	My aim is to completely master teaching	Mastery-approach	.65
3	My goal is to teach as much as possible.	Mastery-approach	.65
7	I strive to understand teaching as thoroughly as possible.	Mastery-approach	.77
5	My aim is to avoid teaching worse than I possibly could.	Mastery-avoidance	.65
9	My goal is to avoid learning less about teaching than is possible.	Mastery-avoidance	.55
11	I am striving to avoid an incomplete understanding teaching.	Mastery-avoidance	.68
2	I am striving to do well compared to other teachers	Performance-approach	.85
4	My aim is to perform well relative to other teachers.	Performance-approach	.77
8	My goal is to perform better than the other teachers.	Performance-approach	.74
6	My goal is to avoid performing poorly compared to others teachers.	Performance-avoidance	.80

Item #	Wording	Latent Factor	Pattern Coefficient
10	I am striving to avoid performing worse than others teachers.	Performance-avoidance	.89
12	My aim is to avoid doing worse than other teachers.	Performance-avoidance	.90

Item #	Wording Butler (2007) I had a successful day when…	Latent Factor	Pattern Coefficient
6	the principal commended me for having higher teaching ability than my colleagues.	Ability-approach	.82
7	my lesson plans were the best.	Ability-approach	.65
13	I was praised for high ability.	Ability-approach	.67
16	my classes did better than those of other teachers.	Ability-approach	.75
2	the principal did not comment on my low teaching ability.	Ability-avoidance	.46
10	my class did not do worse than those of other teachers.	Ability-avoidance	.93
11	my class was not the furthest behind.	Ability-avoidance	.80
1	some of my classes were cancelled.	Mastery	.55
8	I learned something new about teaching or about myself as a teacher.	Mastery	.64
12	I saw that I was developing professionally and teaching more effectively than in the past.	Mastery	.65

15	my pupil's questions made me think.	Mastery	.52
5	I didn't have to do any marking after class.	Work avoidance	.60
9	I didn't have to work very hard in class.	Work avoidance	.74
14	the material was easy to teach and took less work.	Work avoidance	.76