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A Pedagogical model of autonomy, competence and relatedness for pre-service teacher educators

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ABSTRACT

The present research demonstrates initial evidence of validity of a model of pedagogical practice for teacher educators, the Pre-Service Teacher Motivation Model, which is conceptually based in self-determination theory. The study deployed a survey comprising items constituting the proposed model's factors, and measures of satisfaction of basic psychological needs and teacher self-efficacy, which were completed by pre-service teachers (N = 402) in two independent cohorts (n = 185; n = 217). The final model comprised three factors, Relational Dynamics, Student-Centered Organization, and Connected Learning. The findings are evidence of the model's potential utility as a tool for informing the design of learning and teaching, and reflective practices in teacher education.

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Relatedness; autonomy; competence; teacher education; self-efficacy; classroom management

Introduction

Educators who promote learning cultures that enable the satisfaction of basic psychological needs will facilitate students feeling self-determined and autonomously motivated (Brophy 2010). In contrast, learning cultures that do not effectively satisfy these needs may lead to students feeling controlled, disaffected, and pressured. Self-determination theory (SDT) asserts that psychological well-being and optimal functioning is based on *autonomy, competence*, and *relatedness* (Deci and Ryan 2002a; Niemiec and Ryan 2009). The present research adds to the current literature about SDT's application to education, broadly (Ryan and Deci 2016), and, specifically, to satisfaction of basic psychological needs in pre-service teachers (e.g., Korthagen and Evelein 2016; Vermeulen et al. 2012). We test an SDT-inspired model of pre-service teachers' perceptions of their learning experiences with respect to satisfaction of their basic psychological needs, namely the Pre-Service Teachers Motivation Model (PSTMM). To begin, we overview the SDT's concepts relevant to the PSTMM.

SDT Psychological Needs

Autonomy is afforded and internalisation promoted via student centred organisation initiatives such as volition, guided inquiry and collaborative decision-making (Deci and

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Ryan 2002b; Reeve, Bolt, and Cai 1999). Autonomy in pre-service teacher education is likely promoted and nurtured through student-centred organisation initiatives. Ideally, choices and opportunities to self-initiate behaviours are presented to pre-service teachers. For example, problem-solving activities and preparing action plans to implement in practicums afford pre-service teachers' opportunities to forge their own learning directions.

Competence is enhanced via a structured and connected learning environment providing authenticity, optimal challenge, mastery and informational performance feedback (Cheon et al. 2018; Deci and Ryan 2002b). For pre-service teachers, competence is likely enhanced by an appropriately structured and connected environment, which provides optimal challenge and performance feedback. Establishing ongoing formative assessment provides timely feedback to pre-service teachers regarding their developing proficiency of knowledge and skills. Enabling pre-service teachers to construct new knowledge, by building upon prior knowledge, fast tracks their mastery.

Relatedness is likely fostered through building interpersonal relationships within a unified culture of care, empathy, and collective values (Deci and Ryan 2002b). In pre-service teacher education, relatedness is developed through instructional features such as group work, providing access to existing professional networks and affording opportunities to collaborate with model professionals are examples of strategies to meet the need of relatedness.

The Proposed Pedagogical Model

The PSTMM is a pedagogical model extended from an earlier framework designed for school settings (McLennan and Peel 2011, 2012). The PSTMM assumes that students require teachers who are critical, credible, and influential role models who: (a) enable supportive learning environments (Brophy 2010); (b) promote internalised motivation (Deci and Ryan 2002b); and (c) afford opportunities for students to satisfy their needs of competence, autonomy and relatedness (Deci and Ryan 2002b; Niemiec and Ryan 2009). Further, these educators assert that learning contexts promoting the balance of autonomy support (Cheon et al. 2018) and structure (e.g., scaffolding) enhance an individual's intrinsic enjoyment and desire for learning. This assumption reflects internalised motivation in the SDT (Ryan and Deci 2000).

The PSTMM expresses the SDT tenets as four pedagogical components: (1) student centred organisation, (2) collective values, (3) connected learning, and (4) interpersonal relationships. *Student centred organisation* provides opportunities for pre-service teachers to exercise the psychological need of autonomy and is best implemented through a guided, investigative and hands-on approach in which participants apply some choice and control over when, how and what they learn. Autonomy supportive teacher educators in partnership with their pre-service teachers establish *collective values* that underpin a community of learning. This focus on common values attends primarily to the psychological need of relatedness, ensuring students' sense of belonging is nurtured, integrated, and internalised. *Connected learning* satisfies the psychological need of competence in a flourishing learning milieu. Pre-service teachers' levels of internalisation likely increase when teacher educators design learning programmes linking curriculum demands with prior learning and relevancy to real world application. A desire for pre-service teachers to

Table 1. Initial PSTMM Factors and Item Descriptors.

Item
Student Centred Organisation
(1) *Monitoring Progress*. The provision of regular, timely and informative feedback from the course lecturer.
(2) *Student Control→Student Agency*. The provision of learning opportunities by course lecturer that enable student-voice and choice.
(3) *Competency*. Modelled and scaffolded strategies implemented by the course lecturer to support pre-service teacher learning and build capacity.
(4) *Inquiry Learning*. Provision of opportunities for pre-service teachers to generate and stimulate curiosity relevant to the course content.
Collective Values
(5) *Respect*. Through narrative, course lecturer offers examples insights into self as a practitioner, which enables pre-service teachers to reflect on themselves.
(6) *Common Language*. Course lecturer establishes and implements consistent ways of working that facilitates a community of learning.
(7) *Purposeful Spaces*. Course lecturer utilises the learning spaces available to encourage, enhance, and optimise a community of learning.
(8) *Leadership*. Course lecturer affords opportunities for pre-service teachers to take responsibility for their own and their peers' learning.
(9) *Success*. Course lecturer implements an array of ways to celebrate individual, group and class achievements that contribute to the community of learning.
(10) *Boundaries*. Explicit communication from course lecturer that frames the teaching and learning design of the course.
Connected Learning
(11) *Resource Rich*. Course lecturer creates, selects and applies a range of resources to promote engagement and enhance learning.
(12) *Making Links*. Course lecturer demonstrates clear links between theory, practice and prior knowledge.
(13) *Synthesis of Learning*. Course lecturer demonstrates frameworks and organisers that promote pre-service teacher conceptualisation and reflection.
(14) *Engagement*. Course lecturer projects enthusiasm that motivates pre-service teachers to connect learning.
(15) *Metacognition*. Course lecturer develops pre-service teachers' capacity to analyse critically their own learning processes and preferences to connect learning.
Interpersonal Relationships
(16) *Group Management→Group Dynamics*. Course lecturer organises a range of social structures to allow pre-service teachers to co-operate in a cross-section of roles with their peers.
(17) *Collaboration*. Course lecturer affords opportunities for pre-service teachers to contribute, influence and impact upon the learning community.
(18) *Interacting with Diversity*. Course lecturer establishes a learning community in which everyone's voice is encouraged, valued and heard.
(19) *Significant Others*. Learning with and from significant others in the context of the course.
(20) *Communication*. Course lecturer constructs a safe learning environment in which pre-service teachers feel their contributions to authentic dialogue are valued.

have belonging or relatedness within the class context is a psychological need that can be satisfied through designing opportunities for individuals to interact dynamically with the diversity of their cohort and develop *interpersonal relationships* with peers, teacher educators and significant others. Each factor is constituted by elements or motivational actions of the teacher. Table 1 presents descriptions of the hypothetical elements that constitute the PSTMM's factors.

The Present Research

The present research is an empirical investigation into the validity of the PSTMM with two specific aims. First, we aimed to establish the factor structure of the PSTMM model and relations among its components. Second, having first established

a satisfactory factor structure, we aimed to test the components' relations with an extant measure of the satisfaction of basic psychological needs for pre-service teacher (Vermeulen et al. 2012). Correlations between the PSTMM's and levels of satisfaction of psychology needs would be taken as evidence of validity. Furthermore, we explored whether levels of teacher self-efficacy (Tschannen-Moran and Woolfolk Hoy 2001) were predicted by the PSTMM. Given the crucial role of self-efficacy for teachers (Klassen and Tze 2014; Zee and Koomen 2016), the presence of predictive relations between PSTMM and self-efficacy would be taken as additional evidence of the model's validity.

The research was conducted within the context of pre-service teacher education and, in particular, within a course devoted to classroom management. Effective classroom management in schools is an international issue impacting on students' academic outcomes, schools' performance, student and teacher wellbeing, teacher quality and retention of teachers in schools (OECD 2014; Zee and Koomen 2016). Pre-service and beginning teachers who demonstrate enhanced classroom management self-efficacy are more likely to engender effective instructional and behavioural outcomes, as well as sustain rewarding teaching careers that buffer burnout (Hughes 2012; Klassen and Tze 2014; Tschannen-Moran and Woolfolk Hoy 2001; Zee and Koomen 2016). Thus, the context of the present research adds to its significance as a source of knowledge about pre-service teachers' motivation in a challenging area of practice.

Method

Participants

Data collection involved two separate cohorts of students ($n = 185$; $n = 217$), separated by one academic year, who were enrolled in a teacher education degree. The first cohort's ages ranged from 18 to 60 years, $M_{age} = 32.16$, $SD = 9.34$; 156 were female (84.3%); 41 spoke a language other than English (22.3%); 95 were enrolled in the Bachelor of Education (51.4%) and 90 were enrolled in the Graduate Diploma in Teaching (48.6%). The second cohort's ages ranged from 18 to 68 years, $M_{age} = 31.45$, $SD = 9.25$; 189 were female (87.1%); 35 spoke another language other than English (16.1%); 87 were enrolled in the Bachelor of Education (40.1%) and 130 were enrolled in the Graduate Diploma in Teaching (59.9%). The gender balance of the two cohorts were consistent with national workforce statistics (Weldon 2015). All students were taught by the same teacher educator, irrespective of cohort and mode of study.

Procedure

Data were collected using an online survey that opened two weeks prior to the end of semester and closed on the final day of semester. Permission to conduct the research and the survey was approved by the university's Human Research Ethics Committee. In compliance with the conditions of ethical approval, participants had the right to withdraw their consent, participation, and data at any time. An invitation to voluntarily complete the online survey was sent to students' university email addresses. To mitigate potential

bias, the invitation to participate was not sent by the researchers; instead, it emanated from the department's centralised communication system.

Measures

Satisfaction of Psychological Needs

The Basic Psychological Needs Satisfaction Scale for Pre-Service Teachers (BPNST) measures satisfaction of needs and serves as the criterion indicator in this study (Vermeulen et al. 2012). The BPNST is based on the original version of the BPNS measure of need-fulfilment in personal relations, work and life in general (Deci and Ryan 2000; Ilardi et al. 1993; La Guardia et al. 2000). The original BPNS scale consists of 21 items, given as three sub scales: Autonomy (seven items), Competence (six items) and Relatedness (eight items). The original instrument was modified by Vermeulen et al. (2012) for the purposes of measuring needs satisfaction in teachers. As the present study concerned pre-service teachers' need-fulfilment within the context of a teacher education course, the items of the BPNS were adapted similarly to that of the Vermeulen et al. (2012) study (e.g. 'In the teacher education course I get along with the people I come into contact with'). In the current research version, minor vocabulary was altered to ensure cultural and contextual fit such as, 'life' was translated into 'teacher education course', and 'people' were made more specific in terms of 'the lecturer', 'the tutor', or 'fellow students'. Examples of items are, 'In the teacher education course I am free to learn things that suit my interests (autonomy), 'When we work together, everyone can be themselves' (relatedness), and 'In the teacher education course I cannot show that I am competent' (competence, reversed). Participants responded to items by indicating their agreement on a 7-point Likert scale ranging from 1 (*not true at all*) to 7 (*definitely true*) the extent to which the psychological needs of autonomy, relatedness, and competence are generally satisfied in their life. In the present sample, the coefficient alpha reliabilities for the total scale score ($\alpha = .93$) and Autonomy ($\alpha = .85$), Competence ($\alpha = .83$), and Relatedness ($\alpha = .88$) subscale scores were acceptable.

Self-Efficacy

In the present study, pre-service teachers' self-efficacy beliefs are additionally measured using the Teacher Sense of Efficacy Scale (TSES; Tschannen-Moran and Woolfolk Hoy 2001) which measures a teacher's ' … judgment of [their] capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated' (Tschannen-Moran and Woolfolk Hoy 2001, 783). This TSES consists of 24 items, assessed along a 9-point continuum with anchors at 1 (*nothing*), 3 (*very little*), 5 (*some influence*), 7 (*quite a bit*), and 9 (*a great deal*). The instructions directed the pre-service teacher to respond to each of the questions by considering the combination of their current ability, resources, and opportunity to do each of the following in their present position. The scale included three 8-item subscales: Efficacy for Instructional Strategies, Efficacy for Classroom Management, and Efficacy for Student Engagement. Sample items representative of each subscale are: for Instructional Strategies, 'How well can you implement alternative teaching strategies in your classroom?'; for Classroom Management, 'How much can you do to control disruptive behaviour in the classroom?'; and, for Student Engagement, 'How much can you do to

motivate students who show low interest in schoolwork?'. In the present sample the coefficient alpha reliabilities for the total scale score (α = .98) and the Instructional Strategies (α = .93), Classroom Management (α = .97), and Student Engagement (α = .96) subscale scores were acceptable. Although these correlation coefficients are high, suggestive of redundancy, we retained the separate factors because they are conceptually distinct and the TSES is established in the research literature.

Plan for Data Analysis

The packages SPSS v.25 and AMOS were used for data analysis. Data from the first cohort were subject to principal component analysis (PCA) to establish the initial model of motivation. Data from the second cohort were subject to confirmatory factor analysis (CFA) to finalise the factor structure of the model. Using independent datasets is good practice when testing the validity of models. Thus, the progression from an initial model in PCA to a final model in CFA would meet the first aim of the research. For CFA, model evaluation involved a consideration of fit indices (Schreiber, Nora, Stage, Barlow, & King, 2006). The χ^2 can be oversensitive to minor model misspecifications and is a restrictive hypothesis test (i.e., exact fit); therefore, the Comparative Fit Index (CFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA) were used for evaluating fit. CFI and TLI values > .90 and .95 are indicative of acceptable and excellent fit, respectively; and RMSEA values < .05 and .08 are suggestive of close and reasonable fit, respectively (Hu and Bentler 1999; Meyers, Gamst, and Guarine 2013). Correlation analysis and multiple regression analysis were used to meet the second aim of the research, to test the presumed relations between the PSTMM and measures of basic psychological needs and teacher self-efficacy.

Results

Factor Structure

Using the first cohort's data (n = 185), PCA was conducted on the original 20 items and it was expected that four hypothesised components would emerge (i.e., Student Centred Organisation, Collective Values, Connected Learning and Interpersonal Relationships). Oblique rotation using Direct Oblimin was selected as it was expected that these hypothesised components should correlate. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis, KMO = .962. Bartlett's test of sphericity χ^2 (190) = 3784.420, p < .001. Inspection of the anti-image matrix revealed that all coefficients were > .95. Table 2 reveals the inter-item correlations.

The four components explained 79.28% of the variance. Inspection of the scree plot's point of inflection revealed a heavy loading on component one which accounts for 67.92% of variance. However, the pattern matrix in Table 3 reveals the items loading predominantly on three components, with component four indicated by a single item (i.e., PLM-PTE item 8); therefore, item 8 and its component were deleted. Furthermore, items from the subscales Interpersonal Relationships and Collective Values both loaded on component one. We reviewed the items and then combined Interpersonal Relationships and Collective Values into a new subscale: Relational Dynamics. This

Table 2. PSTMM Item Intercorrelations (N = 185).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	-																			
2	.727	-																		
3	.680	.764	-																	
4	.650	.815	.767	-																
5	.525	.642	.627	.598	-															
6	.666	.684	.728	.715	.703	-														
7	.616	.707	.699	.690	.647	.790	-													
8	.552	.604	.511	.554	.489	.598	.659	-												
9	.523	.678	.659	.674	.703	.722	.743	.623	-											
10	.617	.690	.699	.728	.601	.675	.623	.562	.642	-										
11	.521	.657	.621	.658	.613	.595	.605	.516	.659	.736	-									
12	.531	.693	.715	.648	.668	.626	.618	.545	.706	.679	.777	-								
13	.520	.676	.715	.674	.626	.687	.653	.527	.713	.698	.756	.812	-							
14	.515	.694	.707	.700	.692	.725	.685	.496	.723	.705	.706	.711	.735	-						
15	.549	.668	.667	.726	.636	.690	.710	.596	.759	.670	.738	.715	.778	.760	-					
16	.462	.640	.576	.595	.653	.651	.646	.512	.699	.518	.547	.608	.631	.647	.702	-				
17	.539	.715	.639	.620	.629	.683	.715	.562	.747	.594	.602	.627	.633	.673	.710	.732	-			
18	.625	.754	.694	.717	.620	.718	.743	.534	.663	.678	.630	.650	.656	.731	.693	.663	.773	-		
19	.567	.666	.610	.649	.633	.651	.679	.562	.692	.648	.628	.626	.703	.713	.750	.691	.691	.706	-	
20	.646	.719	.747	.720	.650	.722	.677	.573	.663	.721	.623	.671	.697	.758	.678	.640	.641	.779	.752	-

Note. All coefficients are significant $p < .001$

Table 3. PCA Pattern Matrix of the PSTMM Components and Communalities.

	Component				
Items	1	2	3	4	Communalities
PLMQ16	.920				.800
PLMQ17	.778				.784
PLMQ19	.571				.717
PLMQ5	.563				.660
PLMQ18	.550	.453			.794
PLMQ9	.547				.800
PLMQ7	.500				.790
PLMQ6	.449	.406			.763
PLMQ1		.848			.811
PLMQ3		.618			.800
PLMQ2		.578			.803
PLMQ4		.572			.779
PLMQ20		.495			.775
PLMQ11			−.909		.837
PLMQ12			−.810		.819
PLMQ13			−.764		.827
PLMQ10		.411	−.600		.775
PLMQ15	.401		−.499		.801
PLMQ14	.443		−.464		.799
PLMQ8				.857	.923

Note. Items in bold font were retained after CFA produced the final 13-item model.

combination resulted in a solution of three subscales: Relational Dynamics, Student-Centred Organisation, and Connected Learning. Items 6, 14, 15, 18 cross-loaded in the PCA and were deleted. Item 10 was retained because it loaded strongly on its substantive component and only poorly on the other component. A further reduction by deleting items 2 and 5 was justified by their overlap.

Using data from the second cohort ($n = 217$), the 13 items retained were subject to CFA using Maximum Likelihood (ML) estimator. The fit statistics for this model were χ^2 (62, $N = 217$) = 157.411, $p < .001$, CFI = .963, TLI = .946, RMSEA = .084 (90% CI = .068, .101). No further modifications were required as the fit was deemed acceptable with respect to striking a balance between fit and loss of information by further deletions. Thus, the first aim of the research was met by way of validating the factor structure of the final PSTMM depicted in Figure 1.

Relations with Satisfaction of Psychological Needs and Self-Efficacy

The PSTMM's components were correlated with the criterion measures of satisfaction of psychological needs and self-efficacy. Table 4 reveals the correlations among all subscales of the components, BPNST, and TSES. The significant correlations, ranging from $r = .263$ to $r = .552$. Similarly, the PSTMM's correlations, ranging from $r = .240$ to $r = .344$, with the TSES subscales are also additional evidence of validity. With respect to the second aim of the research, these statistically significant correlations are evidence of the PSTMM's validity with respect to expected relations between the model, satisfaction of needs, and self-efficacy.

Regression analyses revealed the predictive relations between the subscales of the PSTMM and TSES. Table 5 presents the analysis summary for TSES subscales regressed on PSTMM. Relational Dynamics significant predicted Classroom Management [$R = .303$,

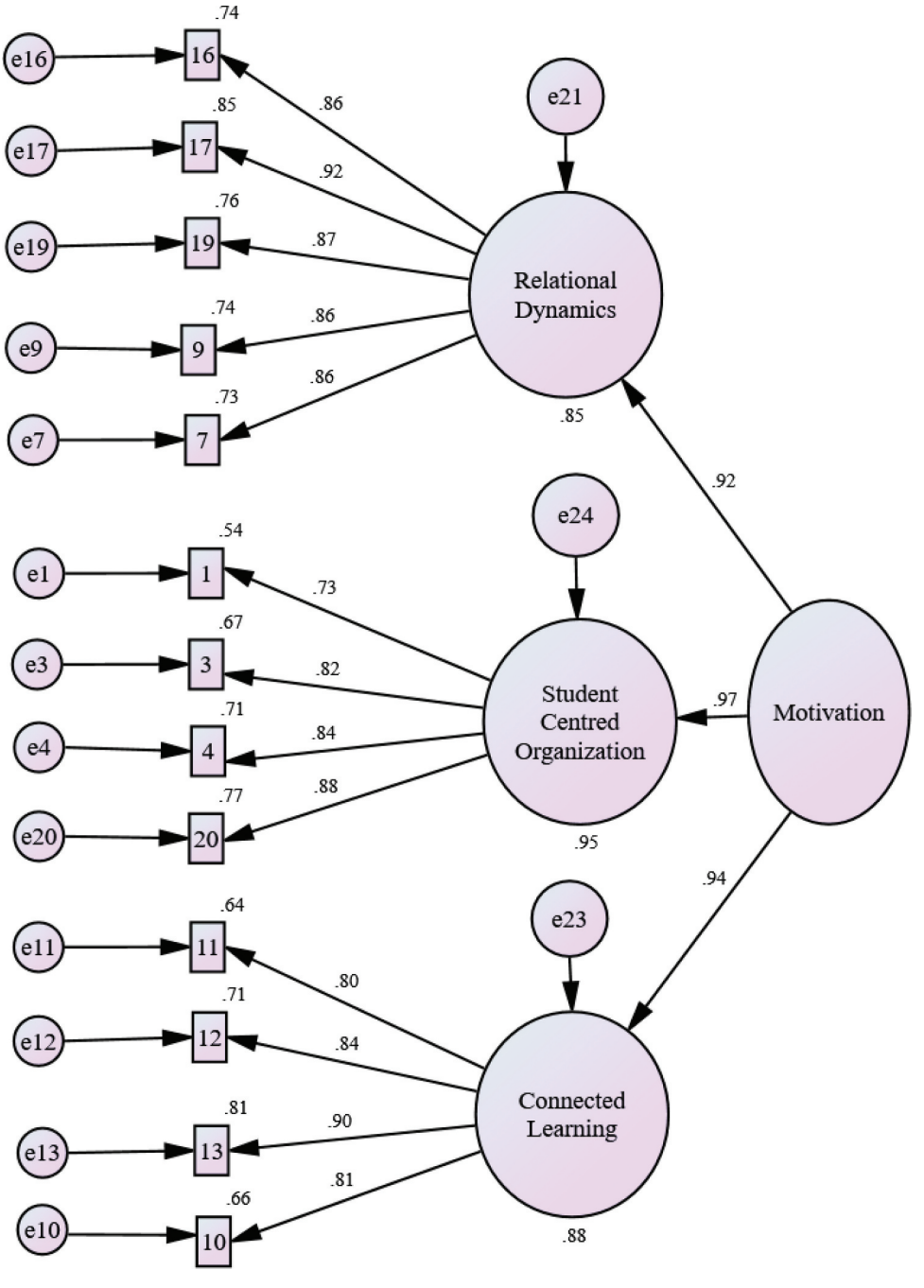

Figure 1. Final Confirmatory Factor Analysis Model.

R^2 = .092, $F(3,366)$ = 12.365, p < .001], Classroom Instruction, [R^2 = .098, $F(3,366)$ = 13.328, p < .001], and Student Engagement [R = .350, R^2 = .123, $F(3,366)$ = 17.084, p < .001]. Student-Centred Organisation and Connected Learning were not statistically significant predictors. With respect to the second aim of the research, these findings clarify which

Table 4. Correlations among PSTMM, BPNST, and TSES Subscales.

	REL	SCO	CL	R	A	C	INST	CM	ENG
REL	-								
SCO	.811	-							
CL	.797	.821	-						
R	.263	.324	.271	-					
A	.522	.549	.552	.457	-				
C	.323	.407	.423	.276	.575	-			
INST	.313	.240	.277	.244	.417	.259	-		
CM	.301	.271	.288	.186	.357	.302	.581	-	
ENG	.344	.320	.289	.185	.364	.234	.580	.756	-

Note. REL = Relational Dynamics; SCO = Student-Centred Organisation; CL = Connected Learning; R = Relatedness; A = Autonomy; C = Competence; INST = SE Instruction; CM = SE Classroom Management; ENG = SE Student Engagement; INST = SE Instruction; CM = SE Classroom Management; ENG = SE Student Engagement. All coefficients significant $p < .01$

Table 5. Analysis Summary for TSES Subscales Regressed on PSTMM.

	B	*SE*	β	*t*	*p*	CI 95% LL	CI 95% UL
SE Classroom Management ($R^2 = .092$)							
SCO	0.040	0.092	0.033	0.433	0.666	−0.141	0.220
CL	0.049	0.105	0.045	0.470	0.639	−0.157	0.255
RD	0.463	0.181	0.240	2.560	0.011	0.107	0.818
SE Classroom Instruction ($R^2 = .098$)							
SCO	−0.034	0.092	−0.028	−0.374	0.709	−0.215	0.146
CL	−0.003	0.105	−0.003	−0.033	0.974	−0.210	0.203
RD	0.649	0.181	0.336	3.590	0.000	0.294	1.005
SE Student Engagement ($R^2 = .123$)							
SCO	0.120	0.090	0.099	1.330	0.184	−0.058	0.298
CL	−0.079	0.103	−0.071	−0.764	0.445	−0.282	0.124
RD	0.642	0.178	0.333	3.606	0.000	0.292	0.992

Note. REL = Relational Dynamics; SCO = Student-Centred Organisation; CL = Connected Learning

factors within the PSTMM has the strongest predictive effect beyond the positive correlations.

Relational Dynamics was the strongest predictor of self-efficacy, therefore we considered it in relation to the theoretical sources of self-efficacy: mastery, vicarious learning, persuasion, and emotional arousal (Bandura 1997; Pfitzner-Eden 2016). Vicarious learning and persuasion are inherently interpersonal; accordingly, we tested whether there would be differences between a face-to-face on campus mode of instruction and an online only mode of instruction for the students who participated in the research. Accordingly, we tested *post hoc* a potential interaction effect of mode of instruction and Relational Dynamics on self-efficacy. Hayes PROCESS Macro 3.3 was used to test for Study Mode of instruction (i.e., on campus versus online) as a moderator of the effect between Relational Dynamics and the three TSES subscales. Levels of Relational Dynamics were set at −1*SD*, *M*, and +1*SD*. Table 6 presents the analysis summary for the statistically significant interaction effects for Relational Dynamics x Study Mode for Classroom Management [$R = .33$, $R^2 = .11$, $\Delta R^2 = .02$, $F(3,366) = 15.26$, $p < .001$] and Classroom Instruction [$R = .35$, $R^2 = .12$, $\Delta R^2 = .02$, $F(3,366) = 16.96$, $p < .001$]. Although Relational Dynamics predicted Student Engagement, Study Mode did not, and consequently there was no interaction effect for Student Engagement [$R = .35$, $R^2 = .12$, $F(3,366) = 17.39$, $p < .001$]. Figures 2 and

Table 6. Analysis Summary for Interaction Effect Relational Dynamics x Study Model on TSES Subscales.

	B	*SE*	*t*	*p*	CI 95% LL	CI 95% UL
SE Classroom Management (R^2 = .11)						
REL	1.86	.45	4.13	.00	.97	2.74
Study Mode	4.21	1.47	2.88	.00	1.33	7.10
REL x Mode	−.72	.25	−2.92	.00	−1.21	−.23
SE Classroom Instruction (R^2 = .12)						
REL	1.99	.45	4.43	.00	1.11	2.87
Study Mode	4.63	1.46	3.16	.00	1.75	7.51
REL x Mode	−.77	.25	−3.11	.00	−1.25	−.28
SE Student Engagement (R^2 = .12)						
REL	1.34	.45	2.99	.00	.46	2.22
Study Mode	2.16	1.46	1.48	.14	−.71	5.03
REL x Mode	−.39	.25	−1.59	.11	−.88	.09

Note. REL = Relational Dynamics; SCO = Student-Centred Organisation; CL = Connected Learning

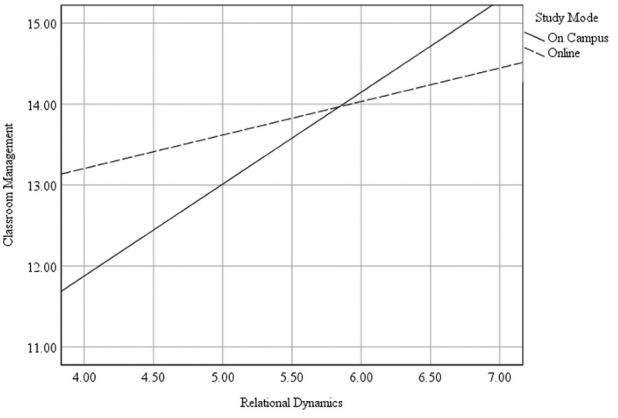

Figure 2. Interaction effect of relational dynamics and mode of study on classroom management.

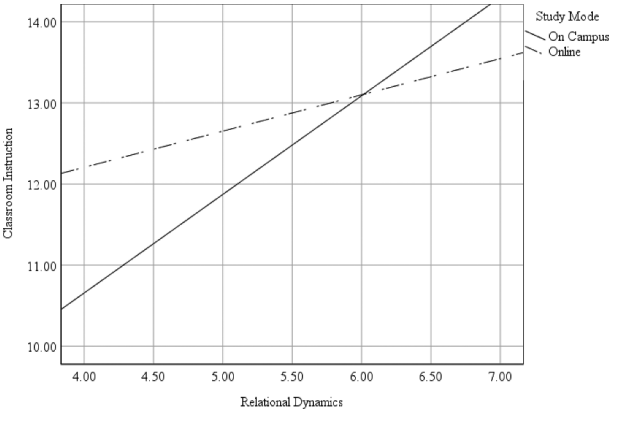

Figure 3. Interaction effect of relational dynamics and mode of study on classroom instruction.

Figures 3 depict the interaction effects with on-campus mode evincing greater gains in the criterion variables.

Discussion

This research had aimed to assess the validity of an SDT-inspired model of pre-service teachers' motivation, the PSTMM. First, we sought to test the model's factor structure and rendered the proposed model down to three factors: Relational Dynamics, Student-Centred Organisation, and Connected Learning. Having established the model's structure, we then demonstrated its factors' statistically significant correlations with measures of satisfaction of psychology needs, apropos its foundation in SDT (Deci and Ryan 2002a, 2002b), and self-efficacy, which is germane to teaching practice and professional engagement (Hughes 2012; Klassen and Tze 2014; Tschannen-Moran and Woolfolk Hoy 2001; Zee and Koomen 2016). Finally, we discerned Relational Dynamics as the most potent predictor of self-efficacy. Thus, we met the two aims of the research to demonstrate the PSTMM's validity. Furthermore, we also found that the mode of delivery of pre-service teachers' degree qualifications influenced the effect of Relational Dynamics on self-efficacy for classroom management and instruction.

Theoretical Implications

From a theoretical perspective, the present findings contribute to both the conceptualisation of teaching and learning experiences apropos self-determination theory and to the measurement of experiences related to the satisfaction of basic psychological needs. Indeed, the limited range of measures of basic psychological needs relevant to occupational contexts is noted in the literature (Van den Broeck et al. 2010). The present findings extend the work of Vermeulen et al. (2012) and Korthagen and Evelein (2016) who measured basic psychological needs in pre-service teachers. Rather than only measure satisfaction of needs, the PSTMM is bespoke to pre-service teachers' experiences of their learning; thus, it provides an indirect indicator of their needs being met via their appraisals of their educational experiences in a course. Furthermore, finding that Relational Dynamics enhances efficacy suggests that the interpersonal dimensions of pedagogy should be emphasised.

Practical Implications

The PSTMM has utility for teacher educators who ascribe to the motivational principles of SDT. This model is an informative tool for learning and teaching design, and as a reflective-practice tool for teacher educators who wish to determine the motivational impact of their teaching on their pre-service teachers in terms of SDT. By using PSTMM, educators may discern where there are motivational strengths within their teaching and where adjustments to teaching actions may be required. For example, the factor Connected Learning and its element Making Links, may be observed behaviourally as the educator relating learning to contemporary practice to promote pre-service teacher internalisation. For example, teacher educators can convey narratives of personal recollections of the their first few weeks of professional practice. For the factor Relational Dynamics, its element Common Language may involve the teacher educator modelling consistency of language usage and encouraging pre-service teachers do the same (e.g., during robust discussions, ensure course vocabulary is at the core of all contributions so

as to immerse all participants in the metalanguage). For the factor Student Centred Organisation, and its element Monitor Progress, teacher educators' actions may be demonstrating explicitly to the pre-service teachers various ways of self-monitoring their own progress (e.g., demonstrate various checklists and criteria useful in evaluating competence).

We speculate whether the PSTMM approach within pre-service teacher degree coursework reflect transfers to graduates' practices in the workplace. To what extent does the PSTMM influence graduate teachers' approach to their own teaching philosophies and motivational practices with future students in their own classrooms? Future research would do well to test whether the model's effects transfer into the workplace and thereby further examine the model's validity and practical utility.

Limitations

This research involved Australian pre-service teachers, across two cohorts, in one university. Although the sample sizes are statistically robust, other samples should be deployed to test the replicability of the findings. We found significant relations between pre-service teachers' self-efficacy and the PSTMM. Self-efficacy is an important indicator of teacher proficiency (Klassen and Tze 2014; Zee and Koomen 2016); however, there is a need to test the model's relations with other important indicators (e.g., course satisfaction, career optimism). The items that constitute the PSTMM are not necessarily limited to teacher education – there may be other applications. Inspection of the items reveals their wording is ostensibly applicable to the appraisal of teaching and learning experiences in other disciplinary fields.

Whilst we did not hypothesise an effect of mode of study (i.e., of degree delivery by on campus or online study) on the participants' self-efficacy, we found an interaction effect between mode and Relational Dynamics, specifically on self-efficacy for Classroom Management and Instructional Strategies. This finding warrants further investigation into mode of delivery of pre-service teacher education, particularly given that it is an inherently interpersonal profession. Such research would add to current literature about the mode of delivery and sastifaction of psychological needs (Wang et al. 2019).

Conclusion

SDT informs sound teaching practices and, concomitantly, affects students' learning experiences. The PSTMM presented here is a novel perspective and pedagogical tool for focusing on pre-service teachers and their basic psychological needs and self-efficacy. Given the complexities of contemporary teaching and teacher education, the PSTMM may be a useful tool for educators interested in a SDT motivational approach to pre-service teacher education.

Disclosure statement

No potential conflict of interest was reported by the authors.

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