

Instruments for Professional Development and Program Evaluation Measuring Teachers'**Motivational and Behavioral Traits****Abstract**

This paper presents two empirically developed and validated instruments that can be used to evaluate and conduct research on the effectiveness of professional development (PD) programs for science and mathematics teachers. The first instrument is a survey composed of Likert-scale items about teaching self-efficacy, teacher-school fit, leadership engagement, and diversity dispositions relating to competence, autonomy, and relatedness domains of the self-determination theory (SDT; Ryan & Deci, 2017). The second instrument includes a set of interview protocols to gather data on motivations behind teacher retention and mobility, leadership engagement, and teachers' social networks. The two instruments provide an efficient, valid, and reliable way for researchers and practitioners to evaluate and study the impact of PD programs for teachers.

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Introduction

Teacher retention and persistence are crucial first steps towards remedying teacher burnout and turnover in educational settings, especially for novice teachers in response to the challenges faced in high-need schools (Ansley et al., 2019). Retention goes beyond just teacher commitment and relates to motivation (intrinsic value and self-efficacy for teaching), leadership skills, diversity disposition, social networks, and school-work environment (e.g., Youngs et al., 2015; Zhou et al., 2023). Assessing these factors often requires the utilization of multiple, long, and involved instruments. Therefore, there is a need for streamlined and efficient instrumentation that targets multiple factors (Takhashi et al., 2020). Such instrumentation must be reliable and validated to ensure that defensible conclusions are drawn regarding teacher dispositions to assist policymakers, district leaders, and school administrators develop retention protocols.

Our goals here were to: (a) produce a single instrument composed of established surveys including different scales that relate to teacher retention, and (b) develop interview protocols to not only complement the shortened surveys but also to provide qualitative insights into teachers' leadership, retention, and social networks. This survey instrument and interview protocols can be used in teacher education and professional development programs such as Noyce and Knowles programs to measure program impact (as a program evaluation tool would be useful as an impact study).

A Brief Literature Review

Self-Efficacy

Teaching self-efficacy (TSE) has been defined as teachers' beliefs about their ability to successfully perform teaching tasks within particular contexts (Tschannen-Moran & Hoy, 2001), or more generally as the "confidence that teachers hold about their individual capability to

influence student learning” (Klassen et al., 2010). TSE is central to the focus within SDT of *flourishing*, that is the enhanced performance that a teacher will show related to their teaching style from confidence in their own capacities and wellness (Ryan et al., 2023).

Teacher-School Fit

From the SDT theoretical perspective, school-work environment and autonomy can foster or inhibit work motivation, job satisfaction, and persistence (Gagné & Deci, 2005). Research indicates that teachers’ person-organization fit (P-O fit) and principal autonomy support predicts teacher mobility (Player et al., 2017). In this study, we use the term “teacher-school fit” (TSF) to refer to teachers’ P-O fit. Previous research indicates moderate to strong associations between TSF and teachers’ commitment to their school and to their teaching (Youngs et al., 2015). This relationship seems to be even stronger for beginning teachers (Miller et al., 2020).

An important component of the support from school leadership relates to teacher autonomy. Autonomy can be described as having the power to choose one’s behavior (Gagné & Deci, 2005). According to SDT, work environments that support autonomy promote one’s intrinsic value for work, job satisfaction, high work performance and persistence (Baard et al., 2004).

Teacher Leadership

Teacher leadership is a phenomenon that has become increasingly popular as an area of inquiry over the past twenty years (Wenner & Campbell, 2017; York-Barr & Duke, 2004). Studies connect positive outcomes to teacher satisfaction across multiple dimensions (autonomy, empowerment, agency) with experiences that support their professional goals and their ability to effect change. Egan (2022), for example, found that classroom autonomy and leadership opportunities are important to those teachers willing to stay in challenging schools. In the current

study, we were interested in validating an instrument that includes measures of teacher leadership so that researchers can use it to understand leadership experiences of teachers and how they are tied to retention decisions.

Diversity Disposition and Community Connection

The teacher workforce in the US consists of mainly white, middle-class, and monolingual females who come from predominantly different socioeconomic and cultural backgrounds compared to their students (e.g., Ingersoll et al., 2021). This disparity may lead to learning environments that lack inclusiveness and impact negatively on minority student learning outcomes creating social/racial injustices (Williams et al., 2016). When teachers acknowledge the diversity of their students and meet their needs, students become more engaged and feel more self-determined. Specifically, and in the context of SDT (Figure 1), meeting students' psychological needs for autonomy, competence, and relatedness leads to their positive achievement (e.g., Ryan & Deci, 2020). Teachers who are connected professionally to other members of their schools and their larger community can grow professionally and feel a sense of belonging. Teachers' social connections can provide a support system that reduces their intentions to leave the profession (Webb, 2018).

Framework

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Self-determination theory (SDT; Ryan & Deci, 2017) provides the theoretical lenses for this study through which important teacher traits (both motivational and behavioral) are considered within the context of professional development of teachers. Teachers' views of their ability (i.e., self-efficacy) to support their students' learning aligns well with the construct of competence in SDT. Teachers' perceptions of how their principals support them to be

autonomous agents (autonomy support) and how they see themselves as an important part of their school environment (person-organization fit) align well with the principles of SDT's autonomy and relatedness domains. Teachers' engagement in leadership activities (decision-making, coaching, mentoring etc.) and leadership experiences also correspond well with autonomy and relatedness. Teachers' perceptions of their interactions with diverse students in the classroom and adults outside the classroom (in the community) fall in with the value of relatedness.

Methods

We administered a comprehensive survey and conducted extended interviews covering several motivational constructs and behavioral traits that correspond to SDT components with science and mathematics teachers from six states.

Participants

The development of our survey instrument involved 167 K-12 science and mathematics teachers. Of these teachers, 85 were Master Teachers (MTs) and 82 were not (non-MTs). Both MTs and non-MTs were from the same locations across the U.S. Demographic backgrounds of teachers are provided in Table 1. We argue that one of the areas of use for the instruments developed in this study relates to teacher retention. Therefore, we recruited teachers representing four different retention categories: stayer—actively teaching in the same school for the last few years; mover—actively teaching but recently changed schools; shifter—shifted from a teaching position to a non-teaching position; and leaver—left K-12 education.

---Table 1 goes here---

Additionally, for interview protocol development, we conducted interviews in two phases. First, eight interviews were conducted with K-12 teachers from the gulf coast of Texas.

Four of these interviews were conducted with MTFs and the other four with non-MTFs from high-need schools from the Gulf Coast of Texas. After revisions of the protocols were completed based on the interview responses from the first phase, we conducted four more interviews with teachers randomly selected from the pool of 167 teachers that were included in the survey development.

Instruments

Survey. Teachers in the current study were administered a survey six main constructs mentioned above. The survey items were adapted from previously developed and validated scales. The name of these scales, their original sources and number of items in each scale are provided in Table 2.

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We conducted factor analysis and verified the number of factors to extract by parallel analysis (Franklin et al., 1995).

Interview Protocol. We drafted the interview protocols by reviewing prior literature on three areas: (a) teacher leadership (e.g., Danielson, 2006; York-Barr & Duke, 2004), (b) social networks including teaching network and teacher leadership network (e.g., Lewis, 2019; Moolenaar, 2012), and (c) teachers' persistence and retention (e.g., Mullen et al., 2021; Rodriguez, 2019). We developed six separate interview protocols based on teachers' retention status (four categories) and MTF-status (two categories). In each of all eight possible combinations (4x2), the total number of interview questions ranged from 41 to 47. We conducted the interviews, which ranged from 40 to 70 minutes, via Zoom. We video-recorded these interviews and made notes during the interviews. Next, two authors watched all the recordings

and the whole research team discussed their experiences conducting the interviews, pointed out the redundancy in the interview questions, and examined whether some questions reflected the primary goals of the research project.

Results

Survey Instrument

Development and validation of the survey instrument started with establishing the face validity with evidence based on the content (American Educational Research Association [AERA] et al., 2014). The other sources of validity (e.g., convergent/divergent, and criterion) did not apply to the context of this study for several reasons. Because of the space limitations we are not able to provide the details here.

The factor analysis was conducted using principal components analysis with varimax rotation and Kaiser normalization. Parallel analysis suggested a five-factor solution for the initial holistic factor analysis. In the first five-factor solution, several items were loading similarly to multiple factors. After these items were dropped all together because of their cross loadings, the final holistic factor analysis yielded 37 items. Parallel analysis still suggested a five-factor solution with the 37 final items. Kaiser-Meyer-Olkin measure of sampling adequacy was 0.80, above the commonly recommended value of 0.60; therefore, the sample size was appropriate for the final analysis. Bartlett's test of sphericity was significant ($\chi^2(703) = 3651, p < .001$). The five-factor solution explained a total of 55.11% of the variance in the data, which demonstrates a good model-data fit. Factor loadings for the final solution is provided in Table 3.

---Table 3 goes here---

Cronbach's alpha for each scale ranged from .72 to .91, indicating moderate-to-high reliability estimates for the scales used in the study (see Table 4).

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After validation of the instrument was completed, the instrument was used to study how these constructs relate to teacher retention (Authors, *in preparation-A*).

Interview Protocols

For each interview, we chose a protocol based on the interviewees' retention status (i.e., A-stayer, B-mover, C-shifter, and D-leaver) and one protocol based on their MTF-status (i.e., M-MTF and N-non-MTF). The interview questions were grouped into three sections: (1) professional background and get to know (background), (2) teacher leadership (leadership), and (3) teaching and teacher leadership networks (networks).

The main changes based on the eight interviews (the first phase) were (a) reduction in the number of questions by removing the redundant questions and aligning the questions to the overall research project; (b) clarification on ambiguous questions by including examples or follow-up questions; and (c) adjustment in the order of questions for a better flow. As a result, the number of interview questions was reduced from the range of 41 to 47 to the range of 25 to 31. Most of the interview questions were cut down in the third section (see Table 5). For example, in the third section, we removed the question about the structure of teaching and teacher leadership networks because they did not provide further insights into these areas. We marked two questions in the teaching network and two questions in the teacher leadership network sections as optional questions (or if-time-permit questions). Most of the required clarification occurred in the first section of the interview protocol. For instance, we added examples for the question about characteristics of school and school district, which were particularly related to our research project's goals (e.g., working condition). Finally, we changed the order of some of the interview questions to improve the flow of the interviews.

---Table 5 goes here---

After the validation of the interview protocols was completed, the protocols were used in two different studies (Author, *in preparation-A*; Authors, *in preparation-B*).

Discussion

Short and concise survey instruments are highly valued by researchers because they save time and effort while still providing valid and reliable data to understand and describe a phenomenon or a practice using fewer items without losing the extent and depth of information needed. When accompanying the survey data with the interviews, researchers will be able to gain in-depth and additional insights into teachers' professional background, teacher leadership, and teaching and teacher leadership networks. The changes made in the initial interview protocols created a short but critical and informative set of questions. Using the final interview protocols will help to tell a more comprehensive story of reasons behind teacher retention and persistence, which can become a vehicle for reducing the problem of teacher shortage, particularly in high-need schools.

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References

- American Educational Research Association, American Psychological Association, & National Council on Measurement in Education. (2014). *Standards for educational and psychological testing*. American Educational Research Association.
- Ansley, B. M., Houchins, D., & Varjas, K. (2019). Cultivating positive work contexts that promote teacher job satisfaction and retention in high-need schools. *Journal of Special Education Leadership*, 32(1), 3–16.
- Author. (in preparation-A)
- Authors. (in preparation-A)
- Authors. (in preparation-B)
- Baard, P. P., Deci, E. L., & Ryan, R. M. (2004). Intrinsic need satisfaction: A motivational basis of performance and well-being in two work settings. *Journal of Applied Social Psychology*, 34(10), 2045–2068. <https://doi.org/10.1111/j.1559-1816.2004.tb02690.x>
- Danielson, C. (2006). *Teacher leadership that strengthens professional practice*. Association for Supervision and Curriculum Development.
- Egan, C. M. (2022). *Choosing to Stay: The voluntary retention decisions of highly-effective teachers in challenging school contexts* (Order No. 29063081). Available from ProQuest Dissertations & Theses Global. (2659969413). <https://www.proquest.com/dissertations-theses/choosing-stay-voluntary-retention-decisions/docview/2659969413/se-2>
- Franklin, S. B., Gibson, D. J., Robertson, P. A., Pohlmann, J. T. & Fralish, J. S. (1995). Parallel Analysis: A method for determining significant principal components. *Journal of Vegetation Science*, 6, 99–106. <https://doi.org/10.2307/3236261>
- Gagné, M., & Deci, E.L. (2005). Self-determination theory and work motivation. *Journal of Organizational Behavior*, 26, 331–362. <https://doi.org/10.1002/job.322>
- Ingersoll, R., Merrill, E., Stuckey, D., Collins, G. & Harrison, B. (2021). Seven trends: The transformation of the teaching force, updated January 2021. Research Report. Consortium for Policy Research in Education, University of Pennsylvania. https://repository.upenn.edu/cpre_researchreports/
- Klassen, R. M., Bong, M., Usher, E. L., Chong, W. H., Huan, V. S., Wong, I. Y. F., & Georgiou, T. (2009). Exploring the validity of a teachers' self-efficacy scale in five countries. *Contemporary Educational Psychology*, 34(1), 67–76. <https://doi.org/10.1016/j.cedpsych.2008.08.001>
- Klassen, R. M., Tze, V. M., Betts, S. M., & Gordon, K. A. (2010). Teacher efficacy research 1998–2009: Signs of progress or unfulfilled promise? *Educational Psychology Review*, 23(1), 21–43. <https://doi.org/10.1007/s10648-010-9141-8>
- Lewis, M. D. (2019). *A qualitative study exploring if rural school district leaders' professional social network influences the practices that are established for low socioeconomic students* (Order No. 27547835). Available from ProQuest Dissertations & Theses Global.

- (2522410658). <http://ezproxy.rice.edu/login?url=https://www.proquest.com/dissertations-theses/qualitative-study-exploring-if-rural-school/docview/2522410658/se-2>
- Linnenbrink-Garcia, L., Durik, A. M., Conley, A. M., Barron, K. E., Tauer, J. M., Karabenick, S. A., & Harackiewicz, J. M. (2010). Measuring situational interest in academic domains. *Educational and Psychological Measurement*, 70(4), 647–671. <https://doi.org/10.1177/0013164409355699>
- Miller, J. M., Youngs, P., Perrone, F., & Grogan, E. (2020). Using measures of fit to predict beginning teacher retention. *The Elementary School Journal*, 120(3), 399–421. <https://doi.org/10.1086/707094>
- Moolenaar, N. M. (2012). A social network perspective on teacher collaboration in schools: Theory, methodology, and applications. *American Journal of Education*, 119(1), 7–39. <https://doi.org/10.1086/667715>
- Mullen, C. A., Schools, C. C. P., Rustburg, V. A., & Tienken, C. H. (2021). Developing teacher resilience and resilient school cultures. *Editorial Review Board*, 18(1), 8–24.
- Player, D., Youngs, P., Perrone, F., & Grogan, E. (2017). How principal leadership and person-job fit are associated with teacher mobility and attrition. *Teaching and Teacher Education*, 67, 330–339. <https://doi.org/10.1016/j.tate.2017.06.017>
- Pogodzinski, B., Youngs, P., & Frank, K. A. (2013). Collegial climate and novice teachers' intent to remain teaching. *American Journal of Education*, 120(1), 27–54. <https://doi.org/10.1086/673123>
- Rodriguez, A. C. (2019). *Please don't go: An examination of teacher retention in high needs schools* (Order No. 13895521). Available from ProQuest Dissertations & Theses Global; Publicly Available Content Database. (2282533064). <https://www.proquest.com/dissertations-theses/please-don-t-go-examination-teacher-retention/docview/2282533064/se-2>
- Ryan, R. M., Reeve, J., Kaplan, H., Matos, L., & Cheon, S. H. (2023). Education as flourishing: Self-determination theory in schools as they are and as they might be. In R. M. Ryan (Ed.), *The Oxford handbook of self-determination theory*. Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780197600047.013.60>
- Ryan, R.M., & Deci, E.L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. The Guilford Press.
- Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, 61, 101860. <https://doi.org/10.1016/j.cedpsych.2020.101860>
- Schulte, L. E., Edwards, S., & Edick, N. A., (2008). The development and validation of the Diversity Dispositions Index. *AASA Journal of Scholarship and Practice*, 5(3), 11–19. <https://digitalcommons.unomaha.edu/tedfacpub/17>
- Takahashi, S., Norman, J., Jackson, K., Ing, M., & Chinen, S. (2020, April). Measurement for improvement in Education. *Oxford Bibliographies*. <https://doi.org/10.1093/OBO/9780199756810-0247>
- Tschannen-Moran, M., & Hoy, A.W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education*, 17(7), 783–805. [https://doi.org/10.1016/S0742-051X\(01\)00036-1](https://doi.org/10.1016/S0742-051X(01)00036-1)
- 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. <https://doi.org/10.3200/JEXE.75.3.167-202>

- Webb, A. W. (2018). A case study of relationships, resilience, and retention in secondary mathematics and science teachers. *Journal of Educational Research and Practice*, 8(1), 1–18. <https://doi.org/10.5590/JERAP.2018.08.1.03>
- Wenner, J. A., & Campbell, T. (2017). The theoretical and empirical basis of teacher leadership: A review of the literature. *Review of Educational Research*, 87(1), 134–171. <https://doi.org/10.3102/0034654316653478>
- Williams, D. L., Edwards, B., Kuhel, K. A., & Lim, W. (2016). Culturally responsive dispositions in prospective mathematics teachers. *Discourse and Communication for Sustainable Education*, 7(2), 17–31. <https://doi.org/10.1515/dcse-2016-0013>
- York-Barr, J., & Duke. K. (2004). What do we know about teacher leadership? Findings from two decades of scholarship. *Review of Educational Research*, 74(3), 255–316. <https://doi.org/10.3102/00346543074003255>
- Youngs, P., Pogodzinski, B., Grogan, E., & Perrone, F. (2015). Person-organization fit and research on instruction. *Educational Researcher*, 44(1), 37–45. <https://doi.org/10.3102/0013189X15569531>
- Zhou, X., Padron, Y., Waxman, H., Acosta, S., & Baek, E. (2023). How do school climate and professional development in multicultural education impact job satisfaction and self-efficacy for STEM teachers of English learners? A path-analysis. *International Journal of Science and Mathematics Education*. <https://doi.org/10.1007/s10763-023-10381-y>

Table 1.*Demographic Breakdown of Teachers*

	MTF	Non-MTF
Gender		
Female	73%	73%
Male	27%	27%
Non-binary	0%	0%
Ethnicity		
White	86%	90%
Non-White	14%	9%

Table 2.*Scales Included in the Survey*

Scale	Original Source	Number of items
Teaching Self-Efficacy (TSE)	Klassen et al. (2009)	
TSE-IS		4
TSE-SE		4
TSE-Classroom Management		4
Intrinsic Value for Teaching	Linnenbrink-Garcia et al. (2010)	4
AVID	Watt et al. (2009)	16
Teacher-School Fit (POFIT)	Pogodzinski et al. (2013)	6
Principal Autonomy Support for Teachers (PAUT)	Baard et al. (2004)	6
Diversity Dispositions (DD)	Schulte et al. (2008)	16
Community Connectedness (CC)	Schulte et al. (2008)	9
TOTAL		69

Table 3.*Factor Loadings for the Final Rotated Five-Factor Solution*

Items (<i>original designation</i>)	Factor				
	1 TSF	2 CC	3 TSE	4 LEAD	5 DD
My principal encourages me to ask questions (<i>paut</i>)	0.881				
I feel understood by my principal (<i>paut</i>)	0.878				
My principal tries to understand how I see things before suggesting a new way to do things (<i>paut</i>)	0.860				
My principal conveys confidence in my ability to do well at my job (<i>paut</i>)	0.845				
I feel that my principal provides me choices and options (<i>paut</i>)	0.839				
I matter to other teachers throughout my school (<i>pofit</i>)	0.626				
My professional goals are the same as those of other teachers throughout my school (<i>pofit</i>)	0.591				
I identify with other teachers throughout my school (<i>pofit</i>)	0.552				
I encourage my students to give back to their community (<i>cc</i>)		0.763			
I work to establish positive school-community relationships (<i>cc</i>)		0.730			
I am involved in the community where I teach (<i>cc</i>)		0.722			
I help my students make connections in their community (<i>cc</i>)		0.721			
It is important that I attend activities in my students' neighborhoods (<i>cc</i>)		0.717			
I see myself as a part of the community in my role as a teacher (<i>cc</i>)		0.625			
I welcome community members into my classes to share their skills (<i>cc</i>)		0.590			
I collaborate on providing community service opportunities for my students (<i>cc</i>)		0.569			
I can motivate students who show low interest in school work (<i>tse-se</i>)			0.754		
I can help students value learning (<i>tse-se</i>)			0.750		
I can get students to believe they can do well in school work (<i>tse-se</i>)			0.725		
I can provide an alternate explanation when students are confused (<i>tse-is</i>)			0.720		

Items (<i>original designation</i>)	Factor				
	1 TSF	2 CC	3 TSE	4 LEAD	5 DD
I can implement alternative strategies in my classroom (<i>tse-is</i>)			0.655		0.435
I can craft good questions for students (<i>tse-is</i>)			0.646		
I can assist families in helping their children do well in school (<i>tse-se</i>)			0.594		
I can implement a variety of assessment strategies (<i>tse-is</i>)			0.526		
I help design school policy (<i>avid</i>)				0.848	
I am involved in selecting types of professional development (<i>avid</i>)				0.718	
I help plan school improvement (<i>avid</i>)				0.717	
I help make personnel decisions (<i>avid</i>)				0.712	
I am involved in campus level decision-making (<i>avid</i>)				0.710	
I influence school budgeting (<i>avid</i>)				0.661	
I am passionate about my own learning (<i>dd</i>)					0.663
I am responsible for creating an atmosphere where all students feel free to openly exchange ideas, thoughts, and opinions (<i>dd</i>)					0.617
I believe that diversity enhances student knowledge (<i>dd</i>)					0.579
I continually search for new knowledge within my content area (<i>dd</i>)					0.573
I look for new ways to teach difficult material (<i>dd</i>)					0.547
I am reflective about how my actions affect student achievement (<i>dd</i>)					0.441
I believe in setting high standards for all students (<i>dd</i>)					0.415

Factors: 1-Teacher-School Fit (TSF); 2-Community Connections (CC); 3-Teaching Self-Efficacy (TSE); 4-Leadership Engagement (LEAD); 5-Diversity Dispositions (DD)

Table 4.*Reliability Estimates for the Five Factors*

Scale	Number of items	Reliability (Cronbach's alpha)
Teacher-School Fit (TSF)	8	.910
Community Connectedness (CC)	8	.865
Teaching Self-Efficacy (TSE)	8	.863
Leadership Engagement (LEAD)	6	.862
Diversity Dispositions (DD)	7	.722
Total	37	

Table 5.*Changes in Number of Questions in Each Interview Protocol*

Interview protocols	Number of questions in the original version				Number of questions in the final version			
	Back-ground	Leadership	Network	Total	Back-ground	Leadership	Network	Total
A-stayer	10	3	24	37	9	3	14	26
B-mover	10	3	26	39	10	3	16	29
C-shifter	10	3	26	39	10	3	16	29
D-leaver	9	3	26	38	9	3	16	28
M-MTF	4	2	2	8	2	2	2	6
N-non-MTF	1	1	2	4	0	1	2	3

Figure 1.

Conceptual Framework Linking Teachers' Psychological and Behavioral Traits to Self-Determination Theory

