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How Valid Are Self-Report Survey Data Obtained from School District Personnel?

Cindy M. Walker, PhD

Thomas Schmitt, MS

Tamara B. Miller, MS

University of Wisconsin - Milwaukee

Paper presented at the

MSP Evaluation Summit II, Minneapolis, MN, October 4-5, 2006

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Most quantitative evaluation endeavors undertaken to assess the effectiveness of large scale educational reform efforts must rely on self-report data to some extent. For example, the analytical framework used to assess the impact of the Milwaukee Mathematics Partnership (MMP) on increasing student achievement in mathematics is largely dependent on data obtained from an online survey administered to all Milwaukee Public School District (MPS) employees at the K-8 level who have the potential to positively affect student achievement in mathematics. This survey was designed to measure various aspects of educators' daily responsibilities that would likely be affected by MMP activities and in turn, affect student achievement in mathematics. However, the validity of self-report data is always suspect due to the possibility of response bias, which occurs if participants respond to items in a more socially appealing manner. In the current survey, because respondents are primarily reporting on the quality of their own work and that of their colleagues it is quite possible that the validity of our data is compromised by response bias. Moreover, if this is true then the results of any statistical tests conducted on these data may be biased because these results are wholly dependent on how well the variables have been measured.

Therefore, this year the evaluation team of the MMP made a concerted effort to assess the validity of our self-report data. Two approaches were taken to attain this goal: (1) A global approach that utilized all schools in the district that participated in the quantitative evaluation efforts; and (2) A case-study approach that only made use of schools that participated in the qualitative evaluation efforts. For the global approach, overall indicators of the quality and quantity of a school's participation in MMP related activities obtained from the self-report survey data were compared to ratings obtained from the district level Mathematics Teaching Specialists (MTS) assigned to that school. For the case-study approach, an attempt was made to triangulate the self-report survey data obtained with other external criteria in a subset of schools targeted to participate in more in-depth intensive evaluation efforts. The primary purpose of this paper is to describe the methodology utilized and report the findings for both of these approaches to assess the validity of our data.

Validity Study #1: Global Approach

In the organizational structure of the MMP there are district level personnel, known as Mathematics Teaching Specialists (MTSs) that are assigned a subset of schools to work with throughout the year, on school improvement efforts related to mathematics. With the thought that the MTSs are able to provide unique insight into the work that is being done at each of their assigned schools, a survey was designed to allow each MTS to rate their respective schools. This survey was developed in collaboration with the MTSs and the PI and was created to capture differences in what they believed were the most pertinent MMP related activities. Specifically, each MTS was asked to rate each of their schools on the following criteria:

1. The number of teachers at the school that were working together to improve their mathematics content and pedagogical knowledge;
2. The percentage of teachers using the school's chosen mathematics curriculum;
3. How aligned instruction at the school was to the Comprehensive Mathematics Framework (CMF);
4. The level of leadership provided by the Learning Team (LT) and the Math Teacher Leaders (MTL) at the school, in terms of efforts designed to improve student learning in math;
5. The quality of the working relationship between the MTL and the principal and other LT members; and
6. The level of support requested of the MTS by the school, as well as the level of support provided by the MTS to the school.

Individual ratings for each school on each of the criteria were used, as well as an overall rating that was obtained by summing the individual ratings (α= 0.90) obtained from an MTS, to determine the relationship between a school's self-reported rating and that reported by the MTS. It should be noted that individual responses were averaged within a school to obtain a school's self-reported rating.

Tables 1 and 2 depict the results obtained from the analyses undertaken to assess the validity of the self-report data obtained from the online survey in a more global manner. To facilitate interpretation of the results, the validity coefficients corresponding to variables pertaining to a school's curriculum and instruction are presented in Table 1 while those corresponding to variables pertaining to quality of MMP related leadership at a school are presented in Table 2. In each of the tables convergent validity coefficients are indicated by bold

type in the tables. These correlations should be relatively higher than the discriminant validity coefficients in the table because they reflect the relationship between the same construct or variable as indicated by two different sources (i.e. school level personnel and MTS).

As the tables indicate, the overall MTS ratings were positively correlated with all of the school level variables constructed from the responses to the online survey that were considered in this set of analyses. However the correlations between school ratings obtained from MTS and school personnel tended to be stronger for school level variables related to the quality of MMP leadership than for those related to mathematics curriculum and instruction. Moreover, the patterns expected to emerge among the validity coefficients were not often observed for school level variables related to mathematics curriculum and instruction. For example, the convergent validity coefficients pertaining to the overall quality of the LT and MTL (0.39 and 0.42, respectively) are higher than the corresponding discriminant validity coefficients in the same column. On the other hand the convergent validity coefficient pertaining to the overall alignment of a school's curriculum (0.22) is less than the majority of discriminant validity coefficients in the same column. Although these findings may be indicative of a lack of validity, it is more likely an indication that the Math Teaching Specialists are more aware of what is going on in their assigned schools in terms of school leadership than curriculum and instruction. This makes intuitive sense given that they are primarily responsible for working with those chosen to represent their schools in leadership position (i.e. MTLs and LT members) and may not be totally aware of what is being done in every classroom in each of their assigned schools.

In summary, the results obtained from the analyses undertaken to assess the validity of the self-report data collected from MPS personnel from a more global perspective were generally favorable and reflective of some level of validity. Although the magnitude of some of the validity correlations were not as high as originally expected, especially for some of the variables pertaining to curriculum and instruction, these discrepancies may truly be indicative of a lack of awareness for some of the Math Teaching Specialists. Given the model of professional development utilized by the MMP it is reasonable to assume that the MTS would be more aware of what is being done by those in leadership positions at their assigned schools.

Table 1: Convergent and Discriminant Validity Coefficients for MMP Variables Related to Curriculum and Instruction

	Average Self-Reported Ratings by MPS Personnel within a School									
MTS Ratings	**A**	**B**	Teachers in same grade use same curriculum	Teachers across grades use same curriculum	Overall Consistency	Curriculum aligned to MPS Learning Targets	Curriculum aligned to WI State Standards	Curriculum aligned to Goals of CMF	Overall Alignment	Focus on Increasing Achievement in Math
Teachers are working together to improve math content knowledge **(A)**	**0.46****	0.46**	0.22*	0.26**	0.40**	0.26**	0.26**	0.27**	0.27**	0.45**
Teachers are working together to improve math pedagogical knowledge **(B)**	0.51**	**0.51****	0.21*	0.28**	0.42**	0.28**	0.27**	0.29**	0.29**	0.47**
Percent of teachers using curriculum adopted by school	0.17	0.17	**-0.13**	**0.03**	**0.04**	0.27**	0.24*	0.21*	0.25*	0.16
Alignment of instruction to CMF (Comprehensive Math Framework)	0.39**	0.39**	0.13	0.16	0.23*	**0.20**	**0.19**	**0.27***	**0.21**	0.37**
Overall MTS Rating	0.32**	0.32**	0.16	0.20*	0.20*	0.20*	0.18*	0.15	0.17	0.30**

$^{*}p < 0.05$, $^{**}p < 0.01$

Table 2: Convergent and Discriminant Validity Coefficients for MMP Variables Related to Quality of Leadership at School

	Average Self-Reported Ratings by MPS Personnel within a School								
MTS Ratings	LT helps school focus on increasing math achievement	LT viewed as valuable asset	Overall LT Quality	Overall Self-Reported LT Quality	MTL helps school focus on improving math achievement	MTL viewed as valuable asset	Overall MTL Quality	MTL Reported Frequency of Discussions	MTL Perceived Support
Support/leadership provided by LT for improving student achievement in math	**0.41****	**0.36****	**0.39****	**0.24****	0.42**	0.41**	0.39**	0.12	0.18
Support/leadership provided by MTL for improving student achievement in math	0.29**	0.26**	0.28**	0.25*	**0.44****	**0.39****	**0.42****	**0.09**	0.29**
Good working relationship between MTL and LT	0.31**	0.25*	0.29**	0.14	0.29**	0.29**	0.32**	0.29**	**0.29****
Good working relationship between MTL and principal	0.19	0.18	0.19	0.22*	0.25*	0.24*	0.19*	0.15	**0.33****
Overall MTS Rating	0.25**	0.23*	0.24**	0.37**	0.43**	0.33**	0.36**	0.31**	0.40**

* $p < 0.05$, ** $p < 0.01$

Validity Study #2: Case-study Approach

In the second set of validity studies, an attempt was made to triangulate the self-report survey data obtained with other external criteria in a subset of schools targeted to participate in more in-depth intensive evaluation efforts. Responses to individual survey items were summed to create variables that could differentiate schools in terms of the quality of their participation in, and implementation of, MMP related activities. Descriptions of each of the variables created from responses to survey items are depicted in Table 3, along with the number of items that were utilized to create each variable and the overall reliability for each subscale obtained from each administration of the online survey.

Table 3: School Level Variables and Constructed from Survey Responses

Variable	**Description**	n_i	α
Math Focus	How focused a school is on increasing student achievement in mathematics	1	NA
Teacher Improvement	Extent to which teachers at a school are working together to improve math content and pedagogical knowledge	2	0.94
PD Quantity	Quantity of professional development sessions attended	9	0.95
PD Quality	Perceived quality of professional development sessions to classroom practice for those teaching math	6	0.94
Consistency	How consistent the curriculum, pedagogy and expectations are at a school	5	0.68
Engagement 1	How frequently teachers at a school engage in activities designed to align their curriculum to learning targets	5	0.92
Engagement 2	How frequently teachers at a school engage in activities designed around CABS or student work samples	4	0.81
Engagement 3	How frequently teachers at a school engage in activities designed to gauge progress including using data obtained from the WKCE	5	0.88
Engagement 4	How frequently teachers at a school talk about the teaching and learning of math with other teachers	4	0.80
Overall Engagement	How frequently teachers at a school are engaged in any activity designed to improve mathematics teaching and learning	21	0.94
Alignment	How aligned a school's curriculum is to standards and learning targets	4	0.94

Variable	Description	n_i	α
MTL Quality	How supportive MTL is perceived to be in terms of helping to increase student achievement in math	3	0.83
LT Quality	How supportive LT is perceived to be in terms of helping to increase student achievement in math	2	0.93
MTS Quality	How supportive MTS is perceived to be at a school in terms of helping to increase student achievement in math	4	0.78
LC Quality	How supportive LC is perceived to be in terms of helping to increase student achievement in math	2	0.95
SR - MTL Quality	How often MTL reports discussing math instruction with others	5	0.84
SR – LT Quality	How often LT reports discussing math instruction at LT meetings	10	0.96
SR – LC Quality	How often LC reports discussing working the MTL or other math teachers to improve math instruction	4	0.66
MTL Support	Level of Support perceived by MTL by others in school	5	0.81

As Table 3 indicates, one variable was created based on responses to an individual survey item while the remaining variables were created by averaging an individual's responses to two or more items that were similar in nature. These scores were then averaged across respondents within a school to come up with overall scores for individual schools. These school level variables were then correlated with external criteria obtained from 11 case-study schools that were chosen to participate in more in-depth intensive evaluation efforts school level indicators. The external criteria obtained from the case study schools included:

- Four collaboration metrics based on the analysis of a social network survey that was administered at each of the case-study schools;
- Two Learning Team metrics and two classroom practice metrics based on observational data from the case study schools;
- A measure of the overall mathematical content knowledge needed for teaching (MKT) of teachers at the school.

The four collaboration metrics included two measures of density and two measures of centrality. Density is defined as the total number of relationships divided by the total number of possible relationships and is represented as a percentage. One measure of density, network

density, incorporated all of the individuals named on the survey responses for each school—many of whom were not employees at that school. This score can be interpreted as the extent to which a school collaborates with others in the district to improve mathematics education. The second density measure, school density, was based on limiting the data to only those individuals that were employed by the school. This score can be interpreted as the extent to which those within a school collaborate to improve mathematics teaching and learning at their school. The two measures of centrality, MTL role and MTS role, are indicative of how central each of these individual are to the network. One of the LT metrics, LT functioning, addressed overall team functioning and was based on general accepted indicators of high performing teams (e.g., leadership, participation, action orientation). The second LT metric, LT MMP, addressed the extent to which the team appeared to have embraced MMP principles, such as having a coherent school-wide vision for mathematics and clear mathematics leadership. The classroom practice metrics were based on four classroom observations that were conducted in each of the eleven schools. These observations focused on the clarity of the mathematics lesson, the use of formative assessment during the lesson, and how well the lesson depicted elements of the comprehensive mathematics framework. The first classroom practice metric, classroom observation overall, is the average overall quality rating for the 4 lessons observed, which reflects the observers' general impression of the lesion. The second metric, classroom observation gap, reflects the performance gap between the MTL and the 'other' teacher that was observed. A positive score implies that the performance of the MTL was perceived as superior to the other teacher; while a negative score implies that the other teacher was perceived as better performing than the MTL.

Table 4 depicts the results obtained from the analyses undertaken to assess the validity of the self-report data obtained from the online survey using data obtained from the eleven case study schools chosen to participate in more in-depth qualitative evaluation efforts. As the table indicates, this attempt to evaluate the validity of our self-report survey data was not as successful as the overall global approach taken, which can most likely be partially explained by a lack of power. Although expected relationships were found in some cases, in others the exact opposite of what would be expected was obtained. For example, fairly strong positive relationships were found between LT Quality, the density measures, and the LT metrics, as expected. On the other hand, MTL support was negatively related to all of the metrics obtained from the subset of

schools targeted to participate in more intensive evaluation efforts. This implies that MTLs that perceived a higher level of support from their colleagues tended to receive lower scores on all of the metrics obtained from the eleven case study schools. Even more surprising is the magnitude of the correlations obtained between MTL support and the LT metrics, which imply that higher performing Learning Teams tended to have MTLs that perceived less support.

Table 4: Validity Coefficients from 11 Case Study Schools

	Network Density	School Density	MTL Role	MTS Role	LT Functioning	LT MMP	Classroom Observations Overall	Classroom Observation Gap	MKT Overall Score
Math Focus	0.37	0.40	-0.17	0.32	0.83	0.80	0.26	0.40	0.25
Teacher Improvement	0.50	0.46	-0.13	0.37	0.45	0.54	-0.13	0.35	-0.06
PD Quantity	0.36	0.47	0.53	0.66*	0.69*	0.64	0.31	0.70*	0.32
PD Quality	0.38	0.51	0.34	0.62*	0.88**	0.85**	0.29	0.75**	0.40
Consistency	0.22	0.61*	-0.05	0.10	0.71*	0.71*	0.40	0.45	0.13
Engagement 1	0.21	0.20	0.23	0.47	0.69*	0.61*	0.28	0.51	0.27
Engagement 2	0.36	0.46	0.26	0.59	0.80**	0.66*	0.37	0.54	0.45
Engagement 3	0.36	0.44	0.50	0.52	0.47	0.40	0.50	0.24	-0.02
Engagement 4	-0.13	-0.14	0.18	0.43	0.56	0.45	-0.21	0.65*	0.57
Engagement Overall	0.24	0.27	0.29	0.57	0.76**	0.65*	0.25	0.60	0.39
Alignment	-0.09	0.08	-0.25	-0.09	0.27	0.33	-0.27	0.40	0.37
MTL Quality	0.27	0.62*	0.24	0.29	0.63*	0.62*	0.33	0.44	0.32
LT Quality	0.71*	0.68*	0.09	0.52	0.50	0.67*	-0.12	0.29	0.41
MTS Quality	0.56	0.50	0.10	0.44	0.30	0.32	0.08	0.01	0.12
LC Quality	-0.03	-0.12	-0.21	-0.10	0.16	0.21	-0.02	-0.33	0.14
SR MTL Quality	0.21	-0.03	0.25	0.09	-0.66*	-0.53	-0.30	-0.52	-0.42
SR LT Quality	0.61*	0.21	0.01	0.53	0.04	0.22	-0.61*	-0.10	0.21
SR LC Quality	0.34	0.16	0.19	0.17	-0.32	-0.15	-0.30	-0.18	0.17
MTL Support	-0.11	-0.30	-0.29	-0.34	-0.76**	-0.64*	-0.60	-0.60	-0.16

Conclusions

In general, the results of the validity studies undertaken were positive. When the Math Teaching Specialists reported that their school was working together positively, embracing the principles of the MMP, and working together to improve mathematics teaching and learning MPS personnel also reported similar constructive practices. However, the results obtained from the validity study that utilized a more global approach seemed to make more sense from a theoretical perspective whereas some unexpected and unexplainable relationships were obtained when using the case study approach. Though it is unclear what may have caused the illogical

case study results, sample bias is one explanation, it is somewhat concerning that they were obtained given that this approach is a common and accepted practice. Thus, the unexpected results necessitate further investigation, which will be a future endeavor, but are unfortunately beyond the scope of the current study. While trying to assess the validity of self-report data can be difficult, it is an important element of many research endeavors. These findings further emphasize the importance of validating results from different analytic perspectives.