Assessment mathematics teacher's competencies

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Abstract:

This paper aimed to identifying the professional efficiencies for the intermediate schools mathematics teachers and tries to know at what level the math teachers experience those competencies. The researcher used a descriptive research approach, the study data collected from specialist educators and teacher's experts and previous studies to determine the mathematics teaching competencies.

To know how the math teachers apply those competencies the researcher distributed a questionnaire to 45 teachers after testing it validity and computing its reliability through person correlation coefficient which was 88%.the study create a list of necessary competencies for math teachers, and shows the degree experience those competencies by the teachers.

Key words: assessment, competency, mathematics, teachers, education

INTRODUCTION:

Mathematics has a logical structure. Every block in this structure is connected to every other by gap-free reasoning, all resting upon a foundation of a few agreed-upon definitions and fundamental propositions.

For ages, cultures and societies have recognized the importance of mathematics. Mathematics is a language that helps us describe ideas and relationships drawn from our environment. As the science of patterns, mathematics enables us to make the invisible visible and thereby solve problems that would otherwise be impossible.

Mathematics is a tool of science and technology, not only through computational aids, but by enabling scientists to explore concepts with idealized models before trying them in the real world.

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In recent years, curriculum programs that support the visions of the reform for school mathematics have been developed. These programs, commonly referred to as Standards-based curricula, are designed so to foster a conceptual approach to teaching and learning mathematics. A strong component of the new curricula is their emphasis on student centered learning and students' independent investigations of mathematical ideas. Inherent in the design of these programs is the view taken of the teacher as the facilitator of learning within the classroom. As students engage in investigations, the teacher is expected to create an environment in which mathematical discourse takes place.

Teachers are the key to improving mathematics education. What teachers know how to do, and what they choose to do, when delivering instruction in their classrooms determine what content students learn and which students learn that content? The preparation, certification, and ongoing professional development of teachers define what they are able to do with the students.

A good teacher was enthusiastic, helpful, and strict. Students also said that the best teachers knew the subject matter better (e.g., Hart, 1934).

A good mathematics teacher should do well on all of the following 5 strands:

(1) Conceptual Understanding of the core knowledge required in the practice of teaching

(2) Fluency in carrying out basic instructional routines

(3) Strategic competence in planning effective instruction and solving problems that arise during instruction;

(4) Adaptive reasoning in justifying and explaining One's instructional practices and in reflecting on those practices so as to improve them.

(5)Productive disposition toward mathematics, teaching, learning and the improvement of Practice (NRC, 2001, p. 380).

Therefore it is necessary to identify the teaching efficiency which applied by teachers during teaching. Bandura (1977), identifying teacher efficacy as a type of self-efficacy a cognitive process in which people construct beliefs about their capacity to perform at a given level of attainment. Teacher efficiency has been defined as the extent to which the teacher believes he or she has capacity to affect student performance. (Berman ,et al ,1977). Previous research has found relationship between student achievement and three kinds of efficacy it is the self efficacy of student, the sense of efficacy of teachers, and

the collective efficacy of school. (Goddard, Hoy, woolfolk; Hoy, 2000 ; Pajares,1996 ; Ross, 1992,1994,1998 ;Teschannen-Moran, Woolfolk Hoy, 1998). Previous research has found relationship between student achievement and three kinds of efficacy it is the self efficacy of student, the sense of efficacy of teachers, and the collective efficacy of school. (Goddard, Hoy, woolfolk; Hoy, 2000; Pajares,1996; Ross, 1992,1994,1998 ;Teschannen-Moran, Woolfolk Hoy, 1998) . So that these paper try to identify the efficiencies of mathematics teachers in middle schools and try to know teachers point of view on the competencies significance. Because the primary stages are consider as an important stage of public instruction that it endeavor to prepare students for the life.

CONTEXTUAL BACKGROUND:

The competencies methodology has appeared in the field of preparing the teachers and it was named" competency based education teacher".

This trend has come to the light in the economic and social conditions witnessed by the United States of America in the sixties, and this trend seems to be a global initiative, as research investigating, and discussing competency-based education comes from all regions of the world (e.g., Fretwell & Pritz, 1994; Grootings 1994; Hargraves, 1995; Stennet, 1984 Stevenson, 1992). That has reflected on the educational institution and the scholastic environment components where the teacher is considered one of those important components and that has led to the emergence of the competences trend.

That trend defines the programs based on the special knowledge and competencies needed by the teachers in advance, also defines the conditions that such competencies and performance level that should be.(John, Burk,1990)

Competency specifications:

1- Competency is based on an analysis of the professional role and / or a theoretical formulation of professional responsibility.
2- Competency statement describe out come expected from the performance of professionally related functions, or those knowledge's, skills, and attitudes through to be essential to the performance of those functions.
3- Competency statements facilitate criterion referenced assessment.

4- Competency is treated as tentative predictors of professional effectiveness, and subject to continual validation procedures.
5- Competencies are specified and made public prior to instruction.
6- Learners completing the CBE programmed demonstrate a wide rang of competency profiles. (john, Burke, 1990)

The Social Sciences Unit, Curriculum and Instruction Branch, Saskatchewan Learning. (SSUC, 2002) identify the teacher's rolls depending on the light of Competence specifications

- learning about the students and their interests, abilities and learning styles
_ planning classroom environment and routines
_ Organizing classroom facilities and resources
_ planning and organizing for instruction
_ planning and organizing for assessment and evaluation
_ planning for communication with students' families
_ reflecting upon the effectiveness of their
- Planning, instruction and assessment as a means of gathering information about their students' progress and instructional needs, and the success of their practice.

Research on teacher efficacy has been driven by the constructs powerful
Predictive and relational impact on both student and teacher outcomes. As Woolfolk and Hoy (1990) noted, "Researchers have found few consistent relationships between characteristics of teachers and the behavior of learning of students.

Numerous studies have found a positive relationship between teacher efficacy and student achievement (e.g., Armor et al., 1976; Ashton, Webb, & Doda, 1986) and student motivation (e.g., Midgley, Feldlauger, & Eccles, 1989). Moreover, teacher efficacy influences how teachers persist and interact with struggling students (Gibson & Dembo, 1984), how teachers plan and organize their instruction (Allinder, 1995), and how teachers manage their classrooms (Woolfolk, Rosoff, & Hoy, 1990).

Although several researchers have attempted to develop unique teacher efficacy instruments, the majority of teacher efficacy studies have measured the construct quantitatively, primarily using some version of Gibson and Demo's (1984) Teacher Efficacy Scale (TES). Further, when researchers have wanted to consider context-specific

teacher efficacy, they have usually simply adapted the (TES) to the setting. For example, the items of the TES were used as a foundation for the Science Teaching Efficacy Beliefs Instrument, which in turn, was adapted to develop the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI)? However, as these subject specific instruments were developed, pedagogical knowledge and pedagogical content knowledge were addressed, but teachers' beliefs about their content knowledge were not considered.

This is pertinent because Hebert, Lee, and Williamson (1998) found that the number one reason that teachers rated themselves high on teacher efficacy was their confidence in their knowledge.

Tschannen-Moran and hoy (2001) developed their own teacher sense of efficacy scale. Tschanned-Moran et al. (1998) suggested that a valid measure of teacher efficacy must assess both personal competence and an analysis of the task with certain resources and constraints in particular teaching contexts. With this concept in mind, a 24-item Teacher sense of Efficacy scale yielding three variables with eight items in each variable:

1- Efficacy for instructional strategies
2- Efficacy for classroom management
3- Efficacy for student engagement

Previous research has found relationship between teacher efficacy and student achievement.

So that these paper try to identify the competencies of mathematics teachers in medium school and try to know the significance extent of competencies for the mathematics teachers.

-Techannen-moran, m., hoy, a w. & hy, w. k.(1998) teacher efficacy: its meaning and measure, review of educational research, 68(2), 202-248

-Techannen-moran, m., hoy, a. w (2001) teacher efficacy: capturing an elusive construct, teaching and teacher education, 17, 783-805.

STUDY OBJECTIVES:

The study aims identifying the competencies of mathematics teachers in intermediate schools and try to know at what level the teachers experiences the competencies teaching

QUESTIONS OF STUDY:

What the necessary competencies for mathematics teachers in intermediate schools?

What is the significance extent of such competencies for the mathematics teachers in the lat three grades of the basic education?

Methodology:

The study have tow sample:

1-Educational educator and experience teachers sample" to know the important efficiency" which consisted 20 persons from huazhong normal university .

2-Teachers sample "to know practice level for these efficiency" which consisted from 50 persons from different schools in wuhan city.

Table (1) shows the teacher sample

male		female		total	
22	48.9%	23	51.1%	45	100%

CONSTRUCTION QUESTINNAIRE:

To identify the necessary efficiency which must mathematics teacher be available the researcher made the following:

-Informing the researches and studies which relate to efficiency teaching.

-Making interview with experience teachers and education scientists and offer open questionnaire to them to know the important efficiency of teaching mathematics the questionnaire consisted from the following questions:

1- What preparation do you usually do before classes when you are in the process of math teaching?

2- What do you think that the students need math?

3- How many parts can you divide in to the math teaching goals?

4- How do you deal with the relationship between math and the life

5- How do you plan to cultivate the "math thought pattern" of the students?

6- What function does the interaction between teachers and students plays in the math teaching?

7- How do you lead the students to learn actively?

8- How many basic skills do you think that a competent math teacher should have?

-Analysis responds of the opening questionnaire

-construct questionnaire including important mathematics efficiency of teaching

INSTRUMENT VALIDITY:

To know the validity of questionnaire the researcher offer the initial formulation to many of specialists and education experts at the huazhong university which consist from 18 arbitrators and told them to give their opinions about the validity of instrument and suitability of measurement efficiency.

-According to the arbitrators opinions the researcher made appropriate adjustments.

INSTRUMENT RELIABILITY:

To know the reliability of the questionnaire the researcher offer the questionnaire to sample consist from 20 teachers and he offer again to the same teachers after two weeks then computing the consistency coefficient was calculated using pearson correlation coefficient between the first and the second application which was 88%

OUT COMES OF THE STUDY:

After verifying the validity and reliability of the questionnaire and defining the study sample, the researcher carried out applying the questionnaire aiming at collecting the data of the study, questionnaire papers were distributed directly to sample members after explaining the goal of the study and the way to answer the questionnaire items.

The period of questionnaire distributed for the Chinese teachers was in April 2006.

After construction the questionnaire including mathematics teachers competencies that had answered the first study question. The questionnaire is consisted of five axis where competencies were distributed on them.

Table no. (2) Show the method of distributing the questionnaire items according to their axis:

axis	Questionnaire axes	No.of items	percentage
1	Preparation competencies and planning the lesson	7	11.66%
2	Competencies in carrying out the lesson	25	41.67%
3	Assessment competencies	10	16.67%
4	Educational means and equipment	5	8.33%
5	Personal competencies	13	21.67%

And to answer the second question the researcher offer the questionnaire to the mathematics teachers to know teachers point of view on the competencies significance.

The researcher offered a letter with questionnaire to some teachers as samples to explain how to mange the questionnaire and were requested to make mark on front of the phrase to shows the importance level of competency.

After the process of gathering the survey data, the researcher carried out interpreting the significance degree levels into arithmetic degree, where he allotted 5 degree for the principal significance, 4 degree for the great significance, 3degree for medium significance, 2 degree for non-significance, one degree for non-existence of significance.

Also, the following criterion was adopted for interpreting the significance degree according to the assessment of the research samples:

(4.5 -. 5) principal significance

(4 - 4.4) great significance

(3 - 3.9) medium significance

(2 - 2.9) non-significant

RESULT AND DISCUSSION

The study aimed to identify the necessary competences for mathematics teachers in the middle schools, and try to know teachers point of view on the competencies significance. In the following the results of study according to the study questions:

1-What the necessary competences for mathematics teachers in middle schools?

2- What is the significance extent of such competences for the mathematics teachers?

After construction the questionnaire including mathematics teachers competences, Which had answered the first study question, and to answer the second question the Researcher offers the questionnaire to the mathematics teachers to know teachers point of view on the competencies significance. .

Table. No (2) shows teachers point of view on the competencies significance descending order and the standard mean and the standard deviation of each competency.

Table no. (3) Shows Chinese male teachers point of view on the competencies significance by the mean, standard deviation and percentage of each competency

Co. no	mean	Std.deviation	%	Co. no	mean	Std.deviation	%
1	4.32	0.839	86.40	51	3.64	1.049	72.80
7	4.32	o.894	86.40	10	3.64	0.902	72.80
5	4.23	0.869	84.60	41	3.64	1.136	72.80
60	4.18	0.664	83.60	18	3.59	1.008	71.80
52	4.14	0.774	82.80	56	3.55	0.858	71.00
57	3.91	1.065	78.20	21	3.55	0.912	71.00
40	3.91	0.811	78.20	4	3.55	1.057	71.00
14	3.86	0.889	77.20	6	3.55	0.912	71.00
8	3.86	1.037	77.20	42	3.50	1.102	70.00
59	3.77	0.813	75.40	49	3.45	1.011	69.00
13	3.68	0.839	73.60	53	3.45	0.858	69.00
36	3.45	1.101	69.00	50	3.27	1.032	65.40
9	3.45	0.963	69.00	47	3.27	0.985	65.40
48	3.41	1.008	68.20	15	3.27	0.703	65.40
54	3.41	1.054	68.20	2	3.27	1.162	65.40
55	3.36	0.727	67.20	45	3.27	0.985	65.40
11	3.36	1.093	67.20	24	3.23	0.752	64.60
3	3.36	0.848	67.20	23	3.23	0.685	64.60
20	3.32	0.995	66.40	39	3.18	1.006	63.60
34	3.77	0.869	75.40	33	3.18	0.958	63.60
19	3.77	0.869	75.40	25	3.14	0.774	62.80
16	3.77	1.020	75.40	44	3.09	0.750	61.80

17	3.73	0.827	74.60	31	3.09	1.109	61.80
12	3.73	0.827	74.6	30	2.95	0.844	59.00
58	3.68	0.839	73.60	26	2.91	0.921	58.20
43	3.68	1.041	73.60	38	2.73	1.077	54.60
37	3.68	0.780	73.60	46	2.64	1.064	1.049
28	3.68	0.894	73.6	26	2.45	1.143	49.0
22	3.68	0.716	73.60	32	2.36	1.002	47.20
35	3.32	0.945	66.40	27	2.36	1.002	47.20

From an overview to the table it is evident that the majority of the competencies have got medium significant assessment, where the highest competency no.57 has scored 3.91degree, percentage of 78.2%, and the least assessment of the competency no. 31 has scored 3.09 degree, percentage 61.8%.

The no. of competencies that have got a non-significance are 7 competencies.

Table no. (4) shows the Chinese female teachers point of view on the competencies significance and the standard mean and the standard deviation and the percentage of each competency.

Co.no	mean	Std.deviation	%	Co. .no	mean	Std.deviation	%
5	4.57	0.728	91.40	40	4.09	0.668	81.80
1	4.35	0.714	87.00	59	4.04	0.825	80.80
52	4.30	0.635	86.00	8	4.04	0.638	80.80
34	4.26	0.541	85.20	41	4.00	0.739	80.00
51	4.17	0.778	83.40	37	3.96	0.928	79.20
7	4.17	0.650	83.40	36	3.96	0.928	79.20
53	3.96	0.878	79.20	58	3.78	0.850	75.60
22	3.96	0.878	79.20	33	3.78	0.850	75.60
60	3.91	0.996	78.20	10	3.78	0.736	75.60
35	3.91	0.996	78.20	45	3.74	1.054	74.80
17	3.91	0.848	78.20	14	3.74	0.915	74.80
28	3.61	1.234	72.20	11	3.70	0.974	74.00
15	3.61	0.988	72.20	42	3.65	1.071	73.00
47	3.57	0.945	71.40	44	3.65	0.935	73.00
57	3.57	1.037	71.40	9	3.65	0.775	73.00
21	3.57	1.037	71.40	4	3.65	0.775	73.00
54	3.52	1.201	70.40	56	3.61	0.839	72.20
18	3.52	0.846	70.40	19	3.39	0.941	67.80
2	3.52	0.846	70.40	55	3.35	1.071	67.00

20	3.52	0.947	70.40	24	3.26	1.096	65.20
39	3.48	1.039	69.60	30	3.26	1.251	65.20
23	3.48	0.994	69.60	25	3.26	0.810	65.20
3	3.43	1.037	68.60	46	3.22	1.126	64.4
49	3.39	0.988	68.60	50	3.13	1.100	62.60
13	3.91	0.793	78.20	31	3.13	1.290	62.60
6	3.87	0.626	77.40	38	3.09	1.240	61.80
48	3.83	0.937	76.60	26	2.70	0.974	54.00
43	3.83	0.984	76.60	27	2.65	1.229	53.00
12	3.83	0.717	76.60	32	2.48	1.123	49.60
16	3.78	0.850	75.60	29	2.09	0.996	41.80

The table shows the female Chinese teachers point of view on the competencies significance.

From overview to the table it is evident that one competency which have got a principal significance, has scored 4.57 degree, and the competencies which have got great significance are 9 competencies.

The competencies which have got medium significance are 46 competencies.

While 4 competencies have got low significance from the point of view of the sample members.

Figure (1) shows the significance percentage at the study sample (male- female)

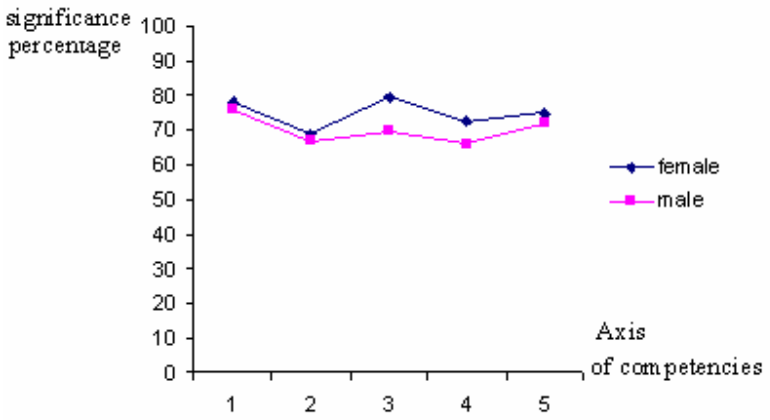

Table. No. (5) Shows the difference in the axis competencies significance among Chinese teachers according to the sex variable (male- female).

The sample is consisted of 22 males and 23 females.

Axis com	t-test for equality of means					
	t	df	Sig.(2-tailed)	Mean difference	mean	sex
Preparation competencies and planning the lesson	-0.979	43	0.333	-0.974	26.59 27.57	M F
Competencies in carrying out the lesson	-0.610	43	0.545	-2.144	83.68 85.83	M F
Educational means and tools	-2.609	43	0.012	-2.460	17.41 19.87	M F
Assessment competencies	-1.736	43	0.90	-3.395	32.91 36.30	M F
Personal competencies	-0.597	43	0.554	-1.338	47.23 48.57	M F

M: male F: female

The table show that non-existence of statistic indicator on the 0.05 level in the degree of the competencies significance in all axis competencies, except for the competencies of Educational means and tools, and the difference is showed that it is in favor of females which reflects the belief of female teachers of this competencies significance.

The non-difference shows the coincidences of opinion among the sample members on the competencies significance in others axis competencies.

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