Assessing Mathematics Teachers' Dispositions

¹Khadijah Batool, ²Muhammad Anwer, ³Muhammad Shabbir

¹Phd Scholar, University of Education Lahore, Pakistan, Khadijah.syedd@gmail.com

²Assistant Professor University of Education Lahore, Pakistan, dranwer@ue.edu.pk

³Assistant Professor, Govt. College University Faisalabad, Pakistan, mskhalid606@yahoo.com

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ABSTRACT

The study was aimed at comparison mathematics teacher's dispositions at secondary level. The research was conducted to distinguish the difference of disposition among teachers on male and female basis as well as on their academic qualification base. One hundred and twenty teachers who were teaching mathematics at secondary level were selected. Data were gathered through stratified sampling technique by administering the questionnaire. The results indicated a statistical difference exist among mathematics teachers on gender basis and also with respect to their qualifications as well within groups. When comparing the mean scores results of the study depicted a significant effect of gender and qualification on teacher's dispositions towards mathematics. ($p < .05$). The results of this research indicated that bulk of teachers had significant difference of dispositions towards self, students and insignificant difference of disposition towards colleagues. In addition, the in-service teachers' DIPS vary and also significant on the basis of their qualifications. It is recommended that larger sample should be taken from public and private school to check and improve teacher's dispositions. This study should also be carried out on college and university level to assess and enhance teachers' dispositions.

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Corresponding author's email address: Khadijah.syedd@gmail.com

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1. Introduction

Disposition can be defined in terms of trust which motivates someone to act and react (Biber, Tuna, & Incikabi, 2013). Mathematical disposition identifies an individual's psychological capacity. According to (Beyers) 2011 Mathematical disposition is divided into 3 perspectives (1) Cognitive, (2) Affective, and (3) Conative. The National Research Council explains mathematical disposition as the inclinations towards mathematics and consider it both valuable and advantageous, to accept that getting mathematics knowledge is profitable, and to help an individual to consider himself as an oneself to be a powerful student and practitioner of math" (2001, p. 131) dispositions of teachers most probably reveal educators professional skills and techniques. It shows instructors' frames of mind, conduct and set of qualities is

reliant on their expert learning. The National Accreditation Council for Teacher Education (2001) describes "beliefs, potentials, responsibilities, and expert morals that impact practices toward pupils, families, partners, and organizations that influence pupils learning, inspiration, and advancement and also the teacher's very own proficient development". "Qualities of people, such as frames of mind, convictions, interests, appreciative nature, qualities, and abilities to modify according to change"(Taylor and Wasicsko ,2000). Disposition is a framework of conduct which is often shown in the nonattendance of stress that is a conscious and unconscious one. A report from European Commission highlights (Eurydice, 2011) Change activities in mathematics are an immediate reaction to the manners in which subject was being taught (Cobb, Wood, Yackel, 2012). Researchers depicting an old mathematics classroom, in which procedural type issues are both taught and learnt. Cobb (2012) expressed that "mathematics in institutions regularly has the nature of guidelines or principles and rules for some pupils," rather than an attention on understanding mathematics ideas. Additionally, Boaler (2016) who did research on two schools that utilized various instructional practices, in the school that engaged with old practices, critical thinking in classrooms. Researching on non-contextual reading material issues may likewise pupils are occupied with study related material.

It is proposed that these kinds of procedural mathematical exercises center around low level intellectual abilities, for example, reviewing, , or recognizing numerical figures. Such exercises infrequently request that pupils to go beyond the techniques so they might be difficult to understand conceptual things (Bushman and Bushman 2004).

Besides, Boaler's (2016) research featured, pupils in the conventional study hall frequently pay attention to teachers' lectures and afterward rehearsed the issues that were displayed by the instructor. In such sequence such as questions, and assessment, pupils don't generally examine arithmetics thoughts, nor do they build mathematics conceptual understandings, yet are associated with what Richards (2011) called such a number talk which includes the discourse.

Sometimes students may not involve in classroom discussions. In this way they cannot get the advantages that can be achieved by communicating, for example, to get a chance to explain one's mathematical thinking. The responsibility of a teacher in classrooms is to deliver knowledge clarify thoughts, explain processes and give them time to rehearse the methods (Hiebert, 2007).

It is stated that educators in such customary classrooms show strategies or calculations by demonstration methods for pupils (Bushman and Bushman, 2014). In these study halls, pupils frequently have to listen carefully what is said by teacher while the instructor is the practitioner (Lockhead, 2011). This may be called as educators are just delivering knowledge while pupils get it. In Boaler's (2002) study, despite the fact that the instructors in conventional study halls knew the courses, they were committed also. Old mathematical study halls are portrayed by instructor focused action, (for example,) utilizing strategies, rules, or methods to tackle issues.

1.1 A Critique of Traditional School Mathematics

Teachers of arithmetic criticized the old method of teachings mathematics (Boaler, Wiliam, & Brown 2007). They have utilized such terminology as process related comprehension and theoretical understanding to allude to the information probably created in conventional and change conditions. This part intends to clarify what analysts think by theoretical and practical agreement and it was necessary to comprehension and applied comprehension for thinking chances.

Developing teachers' teaching techniques in analytical thinking, to improve students' dispositions towards arithmetic reasoning.

1.2 Switching Process Comprehension to Conceptual Understanding

It is recognized the "cycle of comprehension" as connecting mental portrayals through thinking

(Sierpinska, 2014). Skemp (2006) contended for two sorts of comprehension in arithmetic, "social comprehension" (reasonable) and "instrumental comprehension" (procedural). It would be "depicted as 'rules short of reasons', short of understanding for some pupils, educators consider such regulations, and capacity to utilize it, was what they implied by 'understanding'. Skemp (2006) explained about learning social science, expressing it "comprises of working up an applied structure (diagram) from which its holder can (on a fundamental level) produce a boundless number of plans for getting from beginning stage inside his pattern to any completing point"

2. Theoretical Models and Definitions

The inclusion of disposition evaluation in the NCATE standards created a rush to assess a quality not yet fully operationalized. While this rush may have clouded efforts to establish a coherent understanding of the concept, it also initiated a discussion in which all schools of education have a vested interest (Borko, 2007). Grounding this discussion is a body of literature establishing various theoretical approaches recommended for teacher education institutions to consider in developing definitions, educational experiences, and assessments of dispositions.

2.1 Theoretical Models

Some arguments about the nature of dispositions vary along a spectrum between dispositions characterized as innate and immutable traits, and dispositions characterized as subject to growth and development. The existence of an identifiable set of traits and that all students, who represent the entire spectrum of personality traits, will benefit academically from a homogeneous set of teachers possessing that one limited set of traits (Burant et al., 2007). At the other end of the spectrum, the adoption of disposition assessment assumes that teacher education practices influence teaching dispositions (Koeppen & Davison-Jenkins, 2006).

Another conceptual struggle is between characterizing dispositions as a distinct construct, versus seeing them as interwoven with knowledge and skills. Knowledge and skills are believed to influence dispositions because individuals avoid activities and environments, they believe exceed their capabilities, while they readily undertake positively challenging activities and select environments, they judge themselves capable of managing (Bandura, 1997; Hasslen & Bacharach, 2007). While expanding the knowledge and skills in teacher candidates can influence their dispositions, pre-existing dispositions may be what motivates them to seek professional knowledge and skills (Diez, 2007).

2.2 Defining Dispositions

While opponents to the inclusion of disposition assessment in teacher preparation claim there is no agreed upon definition of dispositions, and that existing definitions developed for NCATE requirements are vulnerable to each academy's biases (Borko et al., 2007), there are several definitions in use which do not vary greatly. Dispositions are qualities which are rooted in 13 qualities such as behaviors, attitudes, standards, and dogmas thought to be taken as practices we select (Eberly et al., 2007). Similarly, dispositions tend to be defined at the teacher education level as characteristics associated with desirable attitudes and beliefs, especially those associated with the desire to teach diverse learners equitably and effectively. As mentioned in an earlier discussion of the limitations of previous studies, definitions of dispositions vary in their balance between actions or observed behaviors, and the beliefs and attitudes presumed to be the motives behind those behaviors (Covaleskie, 2007).

Definitions of dispositions are linked to definitions of effective teaching, such as caring, fairness, respect, enthusiasm, and reflective practice (Edwards & Edick, 2006). In any case, dispositions involve awareness, inclination, and reflection on thinking and behavior, not just thinking, or just behavior (Schussler, 2006). An early definition of disposition considered it a summary of observed behavior and the likelihood of its continued occurrence (Katz & Raths, 1985). This definition did not characterize dispositions as a root cause of behaviors, but as a description of behaviors and their relative incidence in certain situations. These behaviors included dispositions to suspend judgment, seek help when needed,

and accept professional advice, and were recommended as goals for teacher education programs. Katz and Rath called them habits of mind, meaning these behaviors were so well practiced that responses were automatic, no longer requiring 14 concentrated thought. Such dispositional goals should be focused exclusively on behaviors related to effective teaching in the classroom (1985). Aligned with the moral perspective is the definition of ethical teaching as the demonstration of specialized attitudes and values which certify equality and impartiality in interactions towards pupils, people, colleagues, and participants of the community (Sileo et al., 2008). Defining disposition in the context of developing an educational philosophy (Brown, 2007) presents its own set of complications. Disposition can be defined as the nature of responses to diverse learners, and the skill demonstrated in those responses, or as the underlying set of beliefs and attitudes held by that teacher, that presumably cause the desired responses. In practice, however, no reliable inference can be made either way. A teacher may have the desired beliefs and attitudes, but simply lack the skill to realize goals for equitable academic gains. Another teacher may not have the desired attitudes or beliefs, but teach skillfully in response to the fact that such behavior forms a basis for evaluation. So the disposition to respond in a particular way does not necessarily imply a particular philosophy, nor does a particular philosophy necessarily predict the disposition to respond to students in desired ways (Covaleskie, 2007). An exploratory study of teacher beliefs casts dispositions in a construct of academic optimism, a general construct grounded in positive psychology. Academic optimism is composed of efficacy, trust, and academic emphasis (spending more time on educational responsibilities), is positively connected with student achievement. The related teacher behaviors were dispositional optimism, student-centered actions, beliefs and classroom management, and willingness to work beyond contract hours. Academically optimistic teachers believe they can contribute in students' effective learning by giving students on their own capacities of solving problems and to work hard to get success. (Hoy, 2008) The cognitive, cultural and experimental approach to dispositions leads to a definition of dispositions as the cognitive and affective attributes that filter one's knowledge, skills, and beliefs, and influence the actions a teacher takes in the classroom or professional setting. These attributes are differentiated from factors and qualities of effective teaching, which may be due to dispositions, but are not dispositions themselves (Thornton, 2006). Preparing teachers to respond to diverse student populations cannot be reduced to a set of dispositions; it requires a broad approach including knowledge, understanding how children learn, pedagogical expertise, the abilities to diagnose difficulties and tap into resources and strengths, and proficiency with assessments. These qualities compose the disposition to teach all learners equitably (Villegas, 2007). The three descriptors that arise frequently in the InTASC and NCATE documents – 1) fair-mindedness, 2) the faith that every student could study, and 3) respect for diversity – tend to be the foundation for most working definitions of disposition. Teacher education units are permitted to add other professional dispositions, but must articulate them in their frameworks, and systematically assess them based on observable behaviors in educational settings. These dispositions must have merit in educational practice (Koeppen & Davison-Jenkins, 2006); 16 consequently, disposition definitions draw heavily on characteristics of effective teaching. They draw particularly on observable teaching behaviors. Because belief statements have little link to efficacy, and personality traits are relatively immutable, attempting to directly assess dispositions themselves is unhelpful and potentially risky. Additionally, the inference of particular beliefs based on observed behavior is questionable at best (Burant et al., 2007; McNight, 2004). Finally, restricting definitions of dispositions to observable behaviors could prevent legal problems resulting from unfair biases.

2.3 Standards for Teacher Dispositions

Literature in the educator disposition consists of individual institutions reporting their process in operationalizing these dispositions, designing instructional activities for their development, and implementing assessments. These reports suggest some similarities in processes experienced around the country. Once a faculty agreed upon a working definition of dispositions, teacher education programs generally chose specific dispositions for course goals. These goals led to assessments of behaviors ranging from those believed to be indicative of general professionalism, such as punctuality, meeting deadlines, and dressing professionally (L'Allier, Elish-Piper, & Young, 2007), to behaviors believed to

be indicative of less tangible ideals, such as an orientation toward social justice (Villegas, 2007). Once items were selected for instruction and assessment of pre-service teachers, then studies were conducted in attempts to validate either the items themselves as constructs of disposition, or to validate measurement instruments. This section summarizes these reports, working from a framework of the applicable principles in the InTASC draft standards, and looking at three general areas: the desired dispositions, the teaching skills or behaviors that exemplify those dispositions, and the teacher education instructional practices being developed to foster growth in both skills and dispositions. (There are ten standards in all, but this review omits those that are not represented in the literature.)

3. Objectives of the Study

This study will be conducted:

1. To assess dispositions of mathematics teacher's at secondary schools.

4. Research Questions

The research questions will be investigated given below:

1. What is the level of teacher's dispositions?
2. Do the teachers differ in their dispositions on the basis of gender?
3. Do the teachers differ in their dispositions on the basis of their qualification?

5. Research Methodology

The nature of the research is quantitative. Data was gathered by using survey. The sample was selected in quantitative phase. The population for this study was more than 800, therefore, selected sample was 120 teachers.

5.1 Quantitative Phase

For quantitative phase, two stage stratified random sampling technique was used. At first stage, the schools were selected randomly from different districts. From each district twenty male and twenty female schools were selected. Therefore, one hundred and twenty teachers from secondary schools were selected.

Table 1
T-test scores difference between male and female group on sub-scales

Groups	N	Mean Score	SD	t-value	Sig.
Disposition					
Male	120	117.18	15.364	-3.238	.001
Female	120	123.79	16.282		
Self					
Male	120	50.03	7.864	-3.605	.000
Female	120	53.66	7.712		
Colleagues					
Male	120	15.16	2.846	-.605	.546
Female	120	15.39	3.123		
Student					
Male	120	51.98	7.150	-2.860	.005
Female	120	54.74	7.780		

$P < 0.05$, $P > 0.05$ for colleagues

Above table shows that there was significance difference in the mean score of male of ($M=117.18$, $SD=15.364$) and female ($M=123.79$, $SD=16.282$) at $p < 0.05$. It shows that, both groups have significance difference between mean scores of gender. So it can be concluded that male and female have significant difference mean scores on disposition. Whereas there was no significance difference in the mean score

of male of ($M=50.03$, $SD=7.864$) and female ($M=53.66$, $SD=7.712$) at $p<0.05$. It shows that, both groups have no significance difference between mean scores of gender. So it can be concluded that male and female have no significant difference mean scores on self. Above table shows that there was no significance difference in the mean score of male of ($M=15.16$, $SD=2.846$) and female ($M=15.39$, $SD=3.123$) at $p<0.05$. It shows that, both groups have no significance difference between mean scores of gender. So it can be concluded that male and female have significant difference mean scores on colleagues. There was significance difference in the mean score of male of ($M=51.98$, $SD=7.150$) and female ($M=54.74$, $SD=7.780$) at $p<0.05$. It shows that, both groups have significance difference between mean scores of gender. So it can be concluded that male and female have significant difference mean scores on students.

Table 2
T-test scores difference between disposition and self

Groups	N	Mean Score	SD	t-value	Sig.
Disposition	120	117.18	15.364	-3.238	.001
Self	120	50.03	7.712	-3.605	-.000

$P<0.05$

Whereas, above table summarizes the results of disposition ($Df=12.59$) and self ($Df=.238$). Results indicated a significant association was found between them.

ANOVA

Table 3
Difference of dispositions among different levels of qualification
One Way ANOVA on Qualification

	Sum of Squares	<i>Df</i>	Mean Square	F	<i>Sig</i>
Between Groups	.729	2	214508.14	8.274	0.000
Within Groups	56338.205	236	238.721		
Total	62263.933	239			

* $p<0.000$

The F value (8.274) for all subjects of four levels of qualification was significant at $p<0.000$. It is indicated that dispositions were significantly different between and within groups.

Table 4.
Difference of dispositions among different levels of qualification
Post hoc test (LSD)

Qualification	Qualification	MD	Standard Error	Sig.
BA/BSC	MA/MSc	13.473	3.281	.000
	MPhil	8.904	3.699	.017
	PhD	23.923	5.749	.000
MA/MSc	MPhil	-4.569	2.467	.065
	PhD	10.450	5.045	.039
MPhil	PhD	15.019	5.327	.005

* $p<0.01$

The mean difference (13.473& 8.904&23.923) among respondents of MA/MSc, MPhil, PhD on disposition were significant at $p<0.01$ respectively.

Table 5.
Difference of dispositions among different levels of qualification

	Sum of Squares	Df	Mean Square	F	Sig
Between Groups	1578.931	3	526.310	2.047	.108
Within Groups	60685.003	236	257.140		
Total	62263.933	239			

* $p > .108$

The F value (2.047) for all respondents of four levels of qualification with dispositions was significant at $p > .108$. It is evident that post-hoc test was used on it.

6. Results and Discussion

This research discovered teachers' dispositions towards arithmetic's with respect to their four sub-scale. Also, the study aimed at comparing the results of this study with previous similar study there were noticeable variances between men and women in their dispositions towards mathematics. Therefore, educators might undervalue women's arithmetic skills by means of to display additional arithmetic anxiety than men if they have extraordinary capacity (Kyriacou & Goulding, 2006). In the US, study suggestion specifies that gender break in arithmetic accomplishment were being thinning (Perie, Moran, & Lutkus, 2005) so females touched uniformity with males in arithmetic and calculations (Hydea & Mertz, 2009).

The non-significant male and female variance in numerical capability on other side in concurrence with past investigation discoveries (Awofala and Anyikwa, 2014; Fatade, Nneji, Awofala and Awofala, 2012) in up-to-date arithmetic among prospective mathematics instructors and grown-up students however negated other past discoveries (Awofala, 2011; Ozofo, 2001; Ogunkunle, 2007) which uncovered the presence of huge male and female contrasts in mathematics. Then again, the critical male and female variance impact on school students' presentation in arithmetic's re-repeated the deteriorating speech that guys were preferable in arithmetic over females. Samuelsson (2010) found that there was no critical impact of male and female on every one of the elements of numerical capability. The suggestion of the current investigation discoveries with respect to sex is that male and female orientation contrasts in numerical capability are not, at this point significant yet that ordinary contrasts may in any case exist in execution in arithmetic. This distinction may be the variance in study on gender basis as a rule supported the male and female study in the arithmetic lecture hall.

In this piece of research there was also seen a difference between of dispositions on gender basis. Furthermore post hoc results signifies difference among teachers qualification such as BA/BSC, MA/MSC. MPhil, PhD. This concurred the discoveries of Wu (2008) that appeared the theoretical comprehension, practical familiarity, key competence were related. The little relationship between the measurements of numerical capability appeared unique. The findings coincide by the conclusion of Samuelsson (2010) which shown little and noteworthy associations relationship between such abilities but relationship among theoretical comprehension and vital competency were extraordinary.

Attitude plays a vital role in teachers practices in a way what one belief or thinks he does the same. Behavior means how a person thinks, acts and reacts which also has positively and negative influence on teacher's performance, his strategies, lesson planning and pupils achievements (Omolar & Adebukola, 2015). It was further revealed that there was significant strong positive correlation was existed between teachers' disposition and teaching methods at $p \leq 0.05$ level of significance. Disposition is an important thing of 21st century higher order thinking abilities required for critical thinking and in favor of its procedure (Beyer, 1987; Facione, 1998). More emphasis is on enhancing dispositions qualities should be given prime importance (Çubukçu, 2006). The aim of research to find out mathematics teacher's disposition with four subscales. Research identified arithmetic teachers have found significant statistical difference towards dispositions self and students except colleagues. The results were quite similar with

the finding of Çetinkaya (2011). But there were some researchers who have different finding such as Tümkaya (2011), found experienced had significant high scores than new ones on self-assurance. Whereas, Akgün and Duruk (2016) found that any significant association among male and female basis, grade institutions factor with dispositions.

Comparable outcomes were apparent with the results (Zayıf, 2008). Çetinkaya (2011), stated that feminine understudies are altogether greater than boy's understudies on liberality reality-chasing scales scores. Additionally set up that administration mathematics educators' manner levels show huge contrast dependent on sex for female understudies in receptiveness subscale (Yenice, 2011).

7. Recommendations

Research looked at mathematics teachers dispositions at secondary level in Govt. schools in Pakistan. It is suggested that population could be size larger for forthcoming researches and it could be applied to other level of teachers in different subjects as well as in private and public schools as well. Researchers should investigate further factors that may enhance development of dispositions in mathematics teachers.

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