

Instrument development and validation : educator characteristics scale

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Abstract

There are a number of factors based on which a teacher is assessed for performance and for best student outcome. This paper focuses on nine specific professional characteristics of educators and teacher efficacy, all of which has a significant impact on positive student outcome, to assess a teacher. A vigorous validation was made on the instrument to arrive at the Educator's Characteristics Scale. Content validity through expert opinion; construct validity through convergent and discriminant validity; and criterion validity was examined. The instrument had a reliability coefficient value 0.9172. The relationship between the variables was analyzed through path modeling and the strength was found as $R^2 = 43.4\%$.

Key words – *Educator Characteristics Scale, Professional Characteristics, Teacher efficacy, Instrument development, Instrument validation, Educators*

Introduction

Research shows that professional characteristics of educators influence student achievement either directly or indirectly. (Brophy 1986; Evertson 1979; Moore 1973; Love 2003; Molander 1992; Goldhaber and Brewer 1997; Goldhaber et al 2003; McNamara 1991; Snell and Swanson 2000; DeLong and Wideman 1996; Ingram 1997; Talbot 1997; Lavy 2002; Glickman 1990; White 1992; Wyatt 2004). Consistently high levels of correlation have been found between student achievement scores and teaching behaviors or skills (Harris, 1998). This research was commenced based on this premise that the educators' characteristics have a significant role to play in student achievement.

Teaching is viewed as a complex task, which can be analyzed in order to examine individual elements of the teaching process. Teaching is intellectually complex, difficult and demanding work. Not recognizing this, year after year we set eager

dedicated people to work without the equipment for the job and somehow expect them to learn it on their own. The fact is teachers are neither prepared to function at the high standards of a true profession nor do they inhabit workplaces structured so they can acquire that professional knowledge (Saphier 1995). Teaching needs formal training, to be executed as a profession. Teachers are expected not only to "cover the curriculum" but to create a bridge between the needs of each learner and the attainment of challenging learning goals. Policy makers increasingly realize that regulations cannot transform schools; only teachers, in collaboration with parents and administrators, can do that (Darling-Hammond 1996). In order to appreciate and develop such teachers, it is essential to have a systemic way of evaluation and assessment on important characteristics of the teachers. An attempt has been made to develop a new model of professional characteristics of educators and an instrument to measure the same was developed and validated.

Professional characteristics of educators

A Profession has certain recognizable attributes like, they have an acknowledged knowledge base, the nature of which is area of performance, repertoire and matching. Professions have a rigorous training and certification of members; a workplace culture of high consulting and collaboration; systematic enculturation of new members; required and continuous learning regularly built into the work cycle; high public accountability; internal maintenance of high standards of practice; have members who are responsible for client results; have members who make autonomous decisions guided by a canon of ethics. (Saphier 1995). Studies show that a number of characteristics have been ascribed to a profession.

A teaching profession too is expected to satisfy the above demands. It is ought to possess a number of specific and significant features that would have a positive relationship with the outcome of the students. Professional educators should develop as lifelong learners, reflective thinkers, and ethical leaders exemplifying the ideals of literacy, scholarship, and social justice in a diverse and ever-changing world. (Albee and Piveral 2003). NCATE – National Council for Accreditation of Teacher Education (2001) has defined dispositions of a teacher as the values, commitments and professional ethics that influence behavior towards students, families, colleagues, and communities, and affect student learning, motivation, and development as well as the educator's own professional growth. The dispositions or the characteristics of the educator thus have a direct impact on all with whom he connects.

A number of studies have been done in demarcating the characteristics of an educator. Literature (Ingersoll, 1997; Whitehurst, 2002; Phelps, 2006; Auger et al 2000; Squires, 2004; Packard, 1993) reveals that various studies have dealt with the different professional features of teaching and they have

focused on one or few professional characteristics of educators. In spite of the immense amount of literature on educator characteristics, a comprehensive study that would encompass the vital professional characteristics of an educator in total was lacking. This study identifies the educator characteristics using student outcome as a boundary criterion to select the characteristics from among several that are available in the literature. These characteristics are studied to assess a teacher.

The professional characteristics of an educator were derived from a wide collection of literature review. The characteristics are Subject Knowledge (Mc Namara 1991; Ingersoll 1997; Lusch and O'Brien 1997; Stephens 1967; Tirri and Puolimetka 2000), Teaching Prowess (Munoz et al 2000; Kouzes and Posner 1993; McNamara 1991; Koutsoulis 2003; Snell and Swanson 2000), Updating knowledge (Rose 2002; DeLong and Wideman 1996; Stenhouse 1981), Collegiality (Snell and Swanson, 2000; Ingram 1997), Empowerment (Phelps 2006), Teacher - student relationship (Analoui 1995; Koutsoulis 2003), Remuneration (Hodson and Sullivan 1995; Loeb and Page 2000; Lavy 2002), Commitment (Naik 1988; Ashburn 1989; Anderman 1991) Self development (Cheung and Cheng 1997), and Ethical code of conduct (Shestack 1998; Raelin 1991; Kerr and Smith 1995; Kleyn and Kapelianis 1999). The basis of selecting these characteristics of the educators in specific was due to the fact that all these characteristics lead to positive student outcome. However on due course of the research it was found that 'ethical code of conduct' is an integral part of each of the other nine characteristics and hence was excluded as a separate characteristic but was considered as part of the all the other characteristics.

Teacher efficacy

Apart from these nine Professional Characteristics, the authors also took into account the efficacy of the teacher which has a significant impact on the student

outcome. Measuring the professional characteristics and the teacher efficacy was to give a wholesome assessment of the teacher. The study of teacher efficacy is nearly three decades old and began with RAND researchers' evaluation of whether teachers believed they could control the reinforcement of their actions (Armor et al 1976). This early work was founded on Rotter's (1966) locus of control theory, and it was assumed that student learning and motivation were the relevant reinforcers of teaching action. Historically, the Bandura (1977) and Rotter (1966) traditions have influenced the study of teacher efficacy.

Tschannen-Moran and Woolfolk Hoy (2001) defined teacher efficacy as a teacher's 'judgment of his or her capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated'. Tschannen-Moran et al (1998) also argued that teacher efficacy is actually a joint, simultaneous function of a teacher's analysis of the teaching task and his or her assessment of his or her personal teaching competence or skill. It has been also defined as 'the extent to which the teacher believes he or she has the capacity to affect student performance' (Berman et al 1977), or as 'teachers' belief or conviction that they can influence how well students learn, even those who may be difficult or unmotivated' (Guskey and Passaro 1994). Ashton (1984, 1985) defined

teachers' sense of efficacy as 'their belief in their ability to have a positive effect on student learning'.

Teacher assessment

'Educator Professional Characteristics Scale' was developed to measure the professional characteristics and teacher efficacy of the educators. This scale would evaluate or assess a teacher as these qualities define the teacher in terms of producing positive student outcome. A new model of professional characteristics of educators and teacher efficacy was proposed as given in Figure 1. The model depicts that the professional characteristics are related to teacher efficacy. The model also shows inter-relationships between the professional characteristics, where subject knowledge and updating knowledge lead to teaching prowess (Hart and Marshall 1992, Carter 1990 and Shulman 1987); collegiality and teacher student relationship leads to commitment (Helms 2001, Darling-Hammond and Goodwin 1993; Ingersoll 1997). Hence upon validating this model, the teacher efficacy of a teacher can be enhanced by improving their professional characteristics. During Teacher Assessment, when a teacher is identified as a less efficacious teacher, the professional characteristics of the teacher may be focused on to improve his efficacy. The model and the questionnaire are validated using a pilot data where the irrelevant items are eliminated.

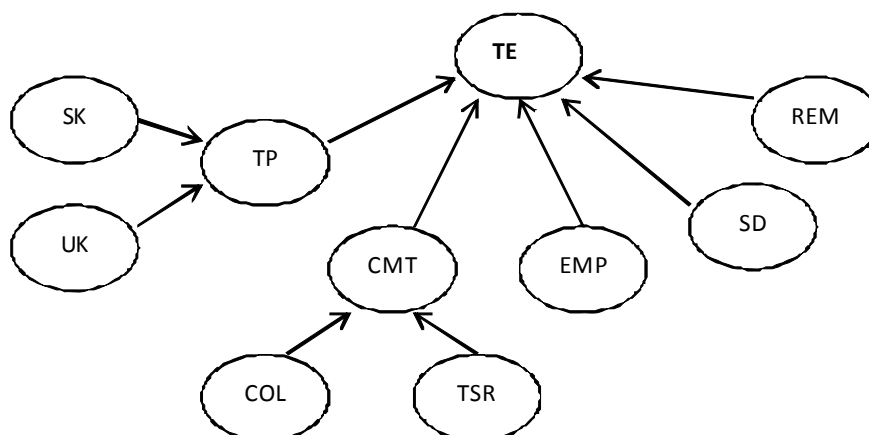


Figure 1: Theoretical model depicting inter-relationships between the professional characteristics constructs and that with teacher efficacy

Instrument development

This paper describes the validation of the theoretical model (Figure 1) and the 'Educator Professional Characteristics Scale' which was developed to measure professional characteristics of educators. The instrument which is intended to measure professional characteristics was developed with inputs from a wide range of literature studies (McNamara 1991; Ingersoll 1997; Kouzes and Posner 1993; Rose 2002; Snell and Swanson 2000; Ingram 1997; Koutsoulis 2003; Hodson and Sullivan 1995; Anderman 1991; Cheung and Cheng 1997). The professional characteristics was measured through its various constructs, subject knowledge, teaching prowess, updating knowledge, collegiality, commitment, teacher student relationship, self development, empowerment, remuneration and ethical conduct. These constructs were tested for validity and reliability with a pilot data using SPSS (statistical package for social studies) data analysis and PLS path modeling, where the irrelevant items were eliminated for the final study and the model was validated for further research.

Methodology of instrument development and validation

Based on the literature survey on the professional characteristics and teacher efficacy, a theoretical model was constructed which depicts the inter-relationships between the professional characteristics constructs and with teacher efficacy. The following methodology was used in validating the instrument.

- ◆ Item generation
- ◆ Content validity
- ◆ Reliability testing using alpha and CITC score
- ◆ Construct validity through convergent validity, discriminant validity and confirmatory factor analysis
- ◆ Criterion validity
- ◆ Path validity

Item generation

Item generation for professional characteristics was done through literature review followed by structured interviews with experts. The topology developed by Tschannen-Moran and Hoy (2001) was used for measuring the teacher efficacy construct. Proper generation of measurement items of a construct determines the validity and reliability of an empirical research. The literature bases for items in each construct are briefly discussed below. A list of initial items for each construct was generated based on a comprehensive review of relevant literature. The items for various professional characteristics were generated based on previous literature that had taken either one or more of these characteristics for their study.

Subject Knowledge was identified as the foremost characteristic of an educator as professions are characterized by the need for and possession of particular kinds of knowledge, that are abstract and practical, massive in extent, difficult to master and lengthy to acquire (Wall 1998). Subject knowledge mostly covered skill in handling the subject (Molander 1992), aware of proper subject content (Goldhaber and Brewer 1997) and confident in the knowledge they possessed (Molander 1992; McNamara 1991). Various other studies (Ingersoll 1997; Snell and Swanson 2000; Goldhaber and Brewer 1997), depicts the outcome of enriched subject knowledge as student basic core skill and student achievement in different forms. Hence the educators' comfort with respect to the content, handling of subjects and their confidence are the three categories that measures subject knowledge aspect.

Teaching Prowess, the ability to teach includes pedagogical skills, communication skills and expertise in subject. Expertise in subject is taken cared by subject knowledge. Experiences of teaching shapes pedagogic content knowledge and subject knowledge (McNamara 1991). This when combined

with classroom management skills results in the credibility of the teacher (Kouzes 1993) and in more effective teaching (Stanford et al 1983). Thus teaching prowess is brought out by pedagogical skills, communication skills and expertise of the educator.

Updating Knowledge emphasize on lifelong learning which results in enriched aptitude and dexterity of the educator. This may be achieved through classroom environment (Stenhouse 1981) and through conferences, workshops, professional training, professional organization and research (Black and Armstrong 1995). Rose (2002) refers the need in which the schools operate, the efficacy of teaching and the processes of learning and updating getting greater these days. This improves the quality of teaching and learning within the classroom so that all students can achieve required learning expectations (Delong and Wideman 1996). Therefore updating knowledge is achieved through the various media and with the self interest of keeping posted with the advances in the industry as well as within the classroom.

Collegiality frames a significant relationship of an educator in his profession. Ingram (1997) explains higher order needs, such as achievement and collaborative decision making, which reflects collegiality, leads teachers to take on greater responsibility to achieve shared goals and visions. As per Snell and Swanson (2000), collaborative teachers value consensus and compromise rather than competition. They recognize that collective expertise offers the possibility of generating optimal solutions to the complex problems of teaching and learning. The concern of the educators in interpersonal relationship and collaborative activities with their colleagues are taken as the measures of collegiality.

Commitment is a preference for remaining in the job and a sense of identification with the organization (Louis 1998). It includes acceptance of and loyalty to

the school as an organization and measures a sense of pride and ownership in the school, teacher engagement or persistence on the job (Ashburn 1989). As per Naik (1988), teachers' accountability involves moral, professional and contractual aspects that deal with their responsibility towards the persons they connect, the profession and the employing institution respectively. Commitment towards their profession, students, institution and society are quantified to measure commitment.

Teacher- student relationship is a significant factor as teacher is a powerful source of either satisfaction or frustration in students and the teacher's enthusiasm, competence and interpersonal and communication skills should be a role model that both cognitive and affective motives can co-habit side by side (Talbot 1997). Student Expectations (Koutsoulis 2003); Teacher Credibility (Knight 1994); Mentor-Protégé approach (Super 1953) and Teacher Influence (Talbot 1997) are the main impacts of the teacher and student relationship. The mutual trust between the educator and the student, educators' respect for student feelings, having a positive control over them and executing impartiality in their rapport with the students were the categories identified for generating indicators of teacher student relationship.

Empowerment is a process where teachers develop their competence to take charge of their own work and resolve their own problems. Maeroff (1988) insists that the three important elements of teacher empowerment are improved status; increased knowledge and access to decision making. It has effectively resulted in teacher efficacy, job enrichment and professional autonomy (Bredeson 1989, Klecker and Loadman 1996); student learning (Glickman 1990); effective schools (Dondero 1997) and lot more. Empowerment not only enjoys discretion, autonomy, power and control but also information sharing (Lashley 1999). Hence the decision making ability and responsibility of the

educator would be measured to examine their empowerment.

Self-development is a corollary that develops in one’s professional life. The educator monitors his performance and amends necessary changes for his personal and professional growth. According to Cheung and Cheng (1996), the type of self-management that can encourage continuous self-learning and development to ensure quality of work in a changing environment should be a cyclical process consisting of five sequential stages: environmental analysis, planning and affiliating, developing and directing, implementing, evaluating and monitoring. Aspects of self-evaluation and change, and importance given to time management will be measured to assess self-development of the educator.

Remuneration is an undisputable characteristic that an educator has to give significance for the reason that the studies show a number of desirable effects of this factor. Given the complexity of the knowledge and skills required, relatively high levels of compensation are necessary to recruit and retain capable and motivated individuals (Etzioni 1969; Hodson and Sullivan 1995). Studies disclose remuneration has striking effects on retaining capable individuals (Ingersoll 1997); increasing teacher quality (Rivkin et al 1999); reducing teacher drop outs (Loeb and Page 2000) and improved students’ outcomes (Lavy 2002). The importance

given to remuneration in general to the educators and specific to the self is measured to compute the characteristic of remuneration.

Teacher sense of efficacy is defined as a teacher’s “judgment of his or her capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated” (Tschannen-Moran and Hoy 2001). Teacher efficacy is related to a range of variables, such as student achievement (Armor et al 1976), student motivation (Midgely et al 1989), teachers’ adoption of innovation (Berman et al 1977; Guskey 1988; Smylie 1988), superintendents’ ratings of teacher competence (Trentham et al 1985), and teachers’ classroom management strategies (Ashton and Webb 1986). The items for this construct were adopted from a previously validated questionnaire on Teachers’ sense of efficacy scale developed by Tschannen-Moran and Hoy from Ohio State University. The instrument consisted of 24 items that included both general teaching efficacy and personal teaching efficacy items. It was decided to take only the 12 items that measure the personal teaching efficacy, as the instrument concentrates on self perception of the characteristics. Hence the personal teaching efficacy items that measure the teacher efficacy as self perception statements were taken for the study. However, only the relevant 11 items out of the 12 were selected for the instrument. The items categories derived from the literature are summarized in Table 1.

Table 1 : Item categories generated through literature review

S.No	Construct	Content categories
1	Subject Knowledge	Handling subjects
		Content
		Confidence
2	Teaching Prowess	Pedagogical skill
		Communication skill
		Expertise

3	Updating Knowledge	Various media
		Self interest
4	Collegiality	Collaboration
		Interpersonal Relationship
5	Commitment	Profession
		Institution
		Society
6	Teacher student relationship	Mutual Trust
		Respect
		Positive control
		Being impartial
7	Empowerment	Decision making
		Responsibility
8	Self-development	Self-evaluation and correction
		Time management
9	Remuneration	Self
		General
10	Teacher efficacy	Personal teaching efficacy

Content validity

The very basic requirement for a good measure is content validity, which means the measurement items contained in an instrument should cover the major content of a construct (Churchill 1979). Content validity is the degree to which the instrument items represent the universe of the concept under study. It is usually achieved through a comprehensive literature review and interviews with practitioners and academicians. It is the representative-ness or sampling adequacy of the content of the measurement instrument.

The total number of items generated comprising the eleven constructs of teacher efficacy was 89. Once item pools were created, items for the various constructs were reviewed by two academicians and re-evaluated by another expert. The focus was to

check the relevance of each construct's definition and clarity of wordings of sample questionnaire items. Based on the feedback from the academicians and experts, redundant and ambiguous items were either modified or eliminated. New items were added whenever deemed necessary. Thus content validity was ensured. The discussion with the academicians has resulted in eliminating 4 items-one each from subject knowledge and teaching prowess and two items from teacher efficacy and rewording 11 items. Hence the instrument used for pilot study had 85 items.

The instrument was then administered to 78 educators spread across different levels from a reputed institution for a pilot study. This pilot data was used in ensuring the reliability and validity of the instrument.

Reliability

The Cronbach alpha value and the corrected item total correlation were used to measure and improve the reliability of the constructs. Reliability is the degree to which a set of latent construct indicators are consistent in their measurements. The indicators of highly reliable constructs are highly inter-correlated, indicating that they all are measuring the same latent construct (Hair et al 2003). The reliability (internal consistency) of the items comprising each dimension was examined using Cronbach alpha. A commonly used threshold value for acceptable reliability is 0.70, although this is not an absolute standard, and values below 0.70 have been deemed acceptable if the research is exploratory in nature (Hair et al 2003; Boudreau Gefen and Straub 2000). Purification was carried out by examining the corrected-item total correlation (CITC) score of each item with respect to a specific dimension of a construct. The CITC score is a good indicator of how well each item contributes to the internal consistency of a

particular construct as measured by the Cronbach's alpha coefficient (Cronbach 1951). Items were deleted if their CITC scores were below 0.5, unless there are clear reasons for keeping the items in spite of low item total correlation. On the other hand, certain items with CITC scores above 0.5 may also be removed if their deletion can dramatically improve the overall reliability of the specific dimension.

As the instrument measured qualitative data, the value of cronbach alpha was examined to be above 0.6. The corrected item total correlation score and Cronbach alpha which reflects on reliability were taken for further analysis for retaining or deleting items from the constructs. Based on these analyses, one item was reworded, one was newly added and 24 items were removed from the instrument. The Table 2 shows the Cronbach alpha value for each of the constructs in the two iterations made. The second iteration was done upon removing the less contributing item to the construct.

Table 2 : Reliability coefficient of the Constructs

S. No.	Constructs	Alpha value 1 st iteration	Alpha value 2 nd iteration
1	Subject Knowledge	0.7265	0.7641
2	Teaching Prowess	0.6324	0.7361
3	Updating Knowledge	0.6642	0.7334
4	Collegiality	0.7751	0.8230
5	Commitment	0.6176	0.6511
6	Teacher Student Relationship	0.7673	0.8241
7	Empowerment	0.8217	0.8566
8	Self-Development	0.4149	0.7938
9	Remuneration	0.8249	0.8205
10	Teacher Efficacy	0.4940	0.6217

The Overall reliability of the instrument was found to be 0.9172. The final alpha score of the constructs and the instrument was found to be more than 0.6 and hence was assessed reliable. This final instrument, Educators’ Professional Characteristics scale, had 60 scale items.

Construct validity

Validity is the extent to which a measure or set of measures correctly represents the concept of study. It is concerned with how well the concept is defined by the measures. Construct validity was ensured through convergent validity, discriminant validity and confirmatory factor analysis. Construct validity is the

degree to which a measure confirms a hypothesis created from a theory based upon the concepts under study.

Convergent validity is the degree of association among different measurement instruments that purport to measure the same concept. The Average Variance Extracted measures the percent of variance captured by a construct by showing the ratio of the sum of the variance captured by the construct and measurement variance (Boudreau, Gefen and Straub 2000). As the instrument measures qualitative constructs, the average variance extracted were above 40 % (Table 3) and hence ensured convergent validity.

Table 3 : Composite Reliability and Average Variance Extracted

Construct	Composite Reliability	AVE
TE	0.678	0.461
TP	0.843	0.574
SK	0.848	0.533
UK	0.784	0.392
CMT	0.760	0.390
COL	0.867	0.489
TSR	0.866	0.484
EMP	0.898	0.638
SD	0.758	0.476
REM	0.807	0.465

Discriminant validity is the lack of association among constructs that are supposed to be different. The constructs were analyzed for discrimination by calculating the average root mean square variance between the respective constructs that has to be greater than the correlation between them. This ensures discriminant validity. As SK and UK lead

to TP; and COL and TSR lead to CMT in the model, these relationships were not tested for discriminant validity. All other possible relationships between the nine constructs were tested for discriminant validity. Table 4 shows that all the constructs considered demonstrated discriminant validity.

Table 4 : Discriminant Validity between constructs

Sl. No.	Constructs tested for discriminant validity	RMS variance	Correlation
1.	Teaching prowess and Commitment	0.457	0.273*
2.	Teaching prowess and Empowerment	0.606	0.606*
3.	Teaching prowess and Remuneration	0.519	0.251*
4.	Teaching prowess and Self development	0.525	0.289*
5.	Commitment and Empowerment	0.489	0.375*
6.	Commitment and Remuneration	0.403	-0.028*
7.	Commitment and Self development	0.408	-0.108*
8.	Empowerment and Remuneration	0.552	0.129*
9.	Empowerment and Self development	0.557	0.286*
10.	Remuneration and Self development	0.471	0.314*
11.	Subject knowledge and Empowerment	0.585	0.520*
12.	Subject knowledge and Self development	0.504	0.312*
13.	Subject knowledge and Remuneration	0.498	0.403*
14.	Updating knowledge and Empowerment	0.511	0.495*
15.	Updating knowledge and Self development	0.431	0.073*
16.	Updating knowledge and Remuneration	0.424	0.057*
17.	Collegiality and Empowerment	0.562	0.525*
18.	Collegiality and Self development	0.482	0.163*
19.	Collegiality and Remuneration	0.476	0.224*
20.	TSR and Empowerment	0.535	0.204*
21.	TSR and Self development	0.454	-0.056*
22.	TSR and Remuneration	0.448	-0.096*
23.	Sub knowledge and TSR	0.483	0.133*
24.	Subject knowledge and Collegiality	0.511	0.452*
25.	Updating knowledge and TSR	0.436	0.227*
26.	Updating knowledge and Collegiality	0.408	0.184*

* existence of discriminant validity

Factor loadings are the correlation between the original variables and the factors, and the key to understanding the nature of a particular factor. The factor loadings and cross loadings were analyzed for confirmatory factor analysis, where it was checked if the items have loaded highly on their respective constructs. This ensures construct validity. Each item should load more highly on its assigned construct than on the other constructs that ensures construct validity (Boudreau, Gefen and Straub 2000). When the cross loading is higher than the loadings, then the item was deleted after careful examinations and judgment of its relevance in the construct. The factor results are shown in Appendix 1. All items loaded on their respective factors and there were no items with cross-loadings value greater than the loadings except for items 34 (I complete cent percent of my syllabi) and 83 (if a student in my class becomes disruptive and noisy, I struggle to redirect him/ her quickly).

Apart from that, the t-statistic of items 34, 60 (I am punctual to work) and 83, as resulted in the bootstrap estimate of the measurement model had values lesser than 1.96 and hence they load insignificantly on their constructs. As discussed in reliability analysis, they were found to be important in contributing to the constructs and therefore item 34 was reworded as 'I am well prepared for my classes'; item 83 was positively framed and item 60 was taken as it was found to be important for the construct.

The loadings and cross loadings shown in Appendix 1, depict that the items represent the respective constructs assuring confirmatory factor analysis and hence ensures construct validity of the instrument.

Hence construct validity is demonstrated through convergent validity, discriminant validity and confirmatory factor analysis.

Criterion validity

The PLS path analysis enabled bootstrapping by re-sampling of data. Bootstrapping the data resulted in a parametric normal data. The bootstrap samples were built by resampling with replacement from the original sample. The procedure has yielded samples consisting of the same number of cases as in the original sample. The number of resamples has to be specified. The default is 100 but a higher number (such as 500) has lead to more reasonable standard error estimates. The t values and R² values obtained after bootstrapping the data was used to examine the strength of association between the variables and the extent of the impact of independent variables on dependent variable.

Criterion related validity is the degree to which a measurement instrument can predict a variable that is designated as a criterion. It is concerned with detecting the presence or absence of one or more criterion considered to represent constructs of interest. Criterion validity for teacher efficacy was tested by examining the R² value obtained for the construct whose value depicts the extent of representation by the independent variables, namely the professional characteristics. Coefficient of determination (R²) is the percentage of the total variation in the dependent variable explained by the independent variable. It ensures the criterion validity of teacher efficacy as the professional characteristics serve as predictor variables for it. Therefore, the R-square value of teacher efficacy 0.434 describes that, 43.4 % of the variation of teacher efficacy is explained by the constructs which are shown in linear relationship with it. Proportions of variance above 25% are considered substantial (Heiman 1998). Thus, the instrument demonstrated high criterion validity. The R² value of the endogenous constructs teaching prowess and commitment are 0.611 and 0.558 which are satisfactory values depicting that the constructs leading to them do have significant strength of association and criterion validity.

Model Validation

A model is a specified set of dependence relationships that can be tested empirically. The purpose of a model is to concisely provide a comprehensive representation of the relationships to be examined. The model is formalized in a path diagram which gives the graphical portrayal of the complete set of relationships among the model's constructs. Path analysis is a method that employs simple bivariate correlations to estimate the relationships in a system of structural equations. It is a procedure for empirical estimation of the strength of each relationship or path depicted in the path diagram. When employed with multiple relationships among latent constructs and a measurement model, it is termed as structural equation modeling. This is a multivariate technique combining aspects of multiple regression and factor analysis to estimate a series of interrelated dependence relationships simultaneously. All

relationship in the path diagram can be estimated to quantify the effects between dependent and independent variables even if interrelated (Hair et al 2003).

The t-statistic of the various items from the measurement model was examined to ensure path validity. The t-statistic should be above 1.96, for a confidence level of 95 percent (Boudreau, Gefen and Straub 2000). Items with significant t values were retained and others were removed after careful examination of their relevance in the constructs. The path validity was ensured this way and the measurement model was used to confirm the final number of items in each construct and hence the instrument. The structural model depicted the significance of relationships between the constructs. The t value is analyzed to study the relationship between the constructs and their impact on teacher efficacy. The tested model with the R² values and t-values is given in Figure 2.

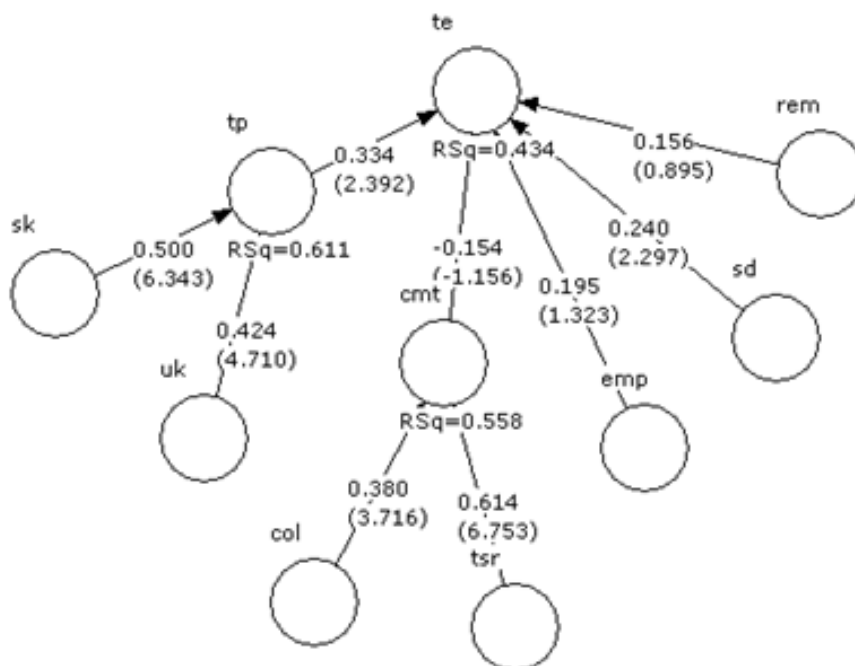


Figure 2 :Tested model depicting relationship between professional characteristics and teacher efficacy

The values shown in parentheses are the t- values that assess the statistical significance between the constructs. This explains the structural model or the inner model executed through PLS. It is obtained after bootstrap and describes the relationships between the latent variables in the model. All values are significant except those from commitment, empowerment and remuneration to teacher efficacy. The t value between remuneration and teacher efficacy signifies that the importance that an educator gives to remuneration aspect does not have a significant impact on teacher efficacy. The teacher is said to be efficacious if he/ she believes in themselves to influence a student's achievement positively. Hence the teacher being interested in remuneration or not, is not reflected usually, in this quality of the teacher. Hence their relationship doesn't have any statistical significance.

The above model thus shows the impact of significant professional characteristics of an educator on teacher efficacy. The instrument and the model may be used for assessing educator characteristics in any segment of education and for any sample of educators. The scale items to measure teacher efficacy, as validated for this study is given in Appendix 2.

The measurement model and structural model derived from PLS path modeling were tested for validation using the relevant fit indices. The composite reliability values and the average variance extracted values (Table 3) were examined to test the measurement model. The composite reliability values were above 0.7 for all constructs except teacher efficacy which is 0.678. As it was a pre validated construct, this value was accepted valid. The average variance extracted values were 40 % which too were found valid. This ensures validity of the measurement model.

The structural model is tested by examining the R^2 value and t values of the path. The R^2 value of teacher efficacy was 43.4 % which is valid and statistically significant. Path validity was also ensured using the t

values as discussed before. Hence the structural model was also found fit. The validation of the measurement model and structural model validates the theoretical model making it pertinent for further study.

Conclusion

Teacher assessment shall be done by measuring specific professional characteristics and teacher efficacy that result in positive student outcome. Upon assessing the efficacy of the teacher, it is to be noted that an efficacious teacher is ought to produce phenomenal results and outputs in terms of positive and desirable student outcomes. A model depicting the relationship between the professional characteristics and teacher efficacy is also validated that ensures that the teacher efficacy of the teacher can be enhanced by enriching the professional characteristics of the teacher. When the teacher is found to be less efficacious, his professional characteristics may be measured and focused to improve that will produce desired upshots. This paper dealt with developing an instrument to measure professional characteristics and teacher efficacy and validating the same. The 'Educators' Professional Characteristics Scale' was developed and tested through rigorous statistical methodology including purification, factorial validity, reliability, content validity, construct validity and criterion validity. All the constructs are shown to meet the requirements for reliability and validity and thus, can be used in teacher assessment and in future research. The theoretical model is also validated relating professional characteristics and teacher efficacy which was estimated and found fit that may be used in assessment of educators.

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Appendix 1 : Factor Structure Matrix of Loadings and Cross Loadings

Items	TE	TP	SK	UK	CMT	COL	TSR	EMP	SD	REM
77	0.72	0.33	0.26	0.26	-0.14	-0.14	-0.27	0.20	0.38	0.39
78	0.60	0.53	0.47	0.53	0.14	0.13	-0.06	0.45	0.14	0.15
79	0.52	0.23	0.29	0.11	-0.01	0.30	-0.11	0.26	0.34	0.05
81	0.63	0.17	0.13	0.00	0.00	0.03	-0.07	0.22	0.28	0.25
82	0.34	0.16	0.16	0.05	0.08	-0.02	-0.06	0.07	0.26	0.15
83	-0.16	0.02	0.20	-0.13	0.27	0.03	0.23	0.02	-0.11	-0.01
84	0.51	0.23	0.18	0.03	-0.17	0.06	-0.20	0.23	0.22	0.13
85	0.37	0.32	0.30	0.55	0.18	0.36	0.00	0.25	0.12	0.15
7	0.36	0.76	0.48	0.35	0.18	0.13	0.22	0.64	0.44	0.21
8	0.40	0.71	0.65	0.33	0.09	0.19	0.13	0.42	0.35	0.25
9	0.36	0.81	0.54	0.47	0.29	0.30	0.18	0.66	0.21	0.04
12	0.48	0.75	0.40	0.73	0.26	0.16	0.09	0.40	-0.05	0.25
1	0.50	0.54	0.83	0.37	0.17	0.22	-0.02	0.30	0.27	0.49
2	0.36	0.55	0.80	0.46	0.09	0.17	0.14	0.38	0.31	0.11
3	0.18	0.36	0.61	0.21	0.14	0.45	-0.06	0.27	-0.02	0.02
4	0.36	0.58	0.78	0.33	0.07	0.20	0.17	0.59	0.30	0.49

6	0.24	0.42	0.59	0.14	0.37	0.54	0.14	0.32	0.20	0.27
16	0.14	0.20	0.23	0.44	0.14	-0.11	0.13	-0.04	0.01	0.03
17	0.28	0.52	0.32	0.77	0.32	0.09	0.23	0.47	-0.17	0.11
18	0.32	0.57	0.39	0.84	0.17	0.16	-0.04	0.37	0.03	0.06
19	0.21	0.30	0.14	0.63	0.38	0.25	0.11	0.39	0.18	0.00
20	0.40	0.40	0.25	0.50	0.25	-0.04	0.06	0.26	0.37	0.13
21	0.22	0.20	0.21	0.45	0.32	0.53	0.03	0.49	0.04	0.11
31	0.14	0.27	0.38	0.38	0.61	0.43	0.30	0.41	0.20	0.05
32	-0.38	0.03	0.01	0.14	0.64	0.10	0.41	0.13	-0.45	-0.35
33	0.19	0.13	0.08	0.21	0.51	0.23	0.16	0.17	0.05	0.12
34	0.08	-0.12	-0.20	0.12	0.12	-0.23	0.19	-0.02	0.18	-0.08
36	0.09	0.30	0.12	0.49	0.70	0.16	0.41	0.37	-0.07	0.12
37	0.38	0.49	0.18	0.49	0.48	0.21	0.24	0.28	0.11	0.32
38	-0.19	0.04	0.08	0.03	0.79	0.41	0.66	0.16	-0.16	-0.14
22	-0.21	0.12	0.14	0.19	0.23	0.59	-0.01	0.28	-0.18	0.08
23	0.01	0.12	0.18	0.14	0.20	0.70	0.01	0.27	0.30	0.21
24	0.21	0.28	0.33	0.09	0.15	0.55	0.01	0.40	0.05	0.15
25	-0.06	0.00	0.18	-0.19	0.15	0.55	0.10	0.21	0.16	0.14
26	0.11	0.15	0.35	-0.06	0.43	0.82	0.11	0.31	0.11	0.27
27	0.16	0.16	0.27	0.24	0.38	0.87	-0.08	0.39	0.22	0.20
29	0.37	0.40	0.42	0.38	0.37	0.74	0.21	0.65	0.12	0.05
41	-0.14	0.05	-0.02	-0.05	0.38	0.30	0.66	0.12	0.10	-0.09
42	-0.19	0.25	0.27	0.08	0.34	0.05	0.67	0.03	-0.05	0.05
43	-0.02	0.32	0.14	0.18	0.43	0.00	0.73	0.34	-0.01	-0.15
44	-0.20	0.03	0.09	0.15	0.63	-0.01	0.71	0.08	-0.27	-0.05
46	-0.21	0.21	0.10	0.05	0.45	-0.06	0.86	0.23	0.16	-0.02
47	-0.37	-0.14	-0.26	0.14	0.30	-0.14	0.56	-0.16	-0.14	-0.12
75	-0.09	0.22	0.14	0.07	0.47	0.24	0.65	0.34	0.12	-0.05
48	0.34	0.48	0.36	0.42	0.53	0.51	0.36	0.82	0.28	0.10

49	0.40	0.46	0.38	0.40	0.32	0.46	0.18	0.84	0.20	0.04
51	0.33	0.61	0.54	0.48	0.25	0.40	0.08	0.75	0.32	0.14
52	0.42	0.59	0.33	0.56	0.27	0.39	0.06	0.80	0.09	0.15
53	0.32	0.62	0.52	0.21	0.15	0.33	0.26	0.79	0.30	0.09
55	0.49	0.30	0.32	0.09	-0.07	0.18	-0.09	0.32	0.86	0.23
56	0.29	0.21	0.19	0.00	-0.22	0.02	-0.06	0.10	0.80	0.28
58	0.23	0.16	0.22	0.15	0.01	0.20	0.13	0.20	0.69	0.32
60	0.05	-0.12	-0.06	0.01	0.11	-0.14	0.12	0.07	0.21	-0.18
63	-0.05	0.13	0.19	0.14	-0.11	0.15	-0.16	-0.19	-0.16	0.58
64	0.02	0.09	0.14	0.09	-0.22	0.07	-0.18	-0.21	0.09	0.67
65	0.07	0.31	0.26	0.13	-0.08	0.13	0.15	0.27	0.23	0.50
66	0.34	0.16	0.29	0.18	-0.02	0.18	-0.25	0.00	0.17	0.88
69	0.20	0.24	0.38	-0.06	-0.01	0.19	0.17	0.19	0.33	0.72

Appendix 2 : Indicators measuring Teacher Efficacy

1.	When a student does better than usually, many times it is because I exert a little extra effort.
2.	I have enough training to deal with almost any learning problem (of students).
3.	When a student is having difficulty with an assignment, I am usually able to adjust it to his/ her level.
4.	When the grades of my students improve, it is usually because I found more effective approaches.
5.	If a student did not remember information I gave in a previous lesson, I would know how to increase his/ her retention in the next lesson.
6.	If a student in my class becomes disruptive and noisy, it is easy for me to redirect him/ her quickly.
7.	If one of my students find it difficult to complete a class assignment I would be able to accurately assess whether the assignment was at the correct level of difficulty.
8.	My teacher training program and/ or experience has given me the necessary skills to be an effective teacher.

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