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Teaching Practices and Student Achievement: A Review

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ABSTRACT

Teaching practices is very much important for teaching profession. Teaching practices is also related for student learning. Teaching practices make a good and experienced teacher. However the present study has conducted to review about teaching practices and student achievement and its related terms. The study was documentary analysis type. Information and data were collected from secondary sources. Information and data were collected from books, research reports, journals, different annual reports, different government and non government websites and different websites. A literature review was conducted by using the internet search, google databases with the virtual classroom. A hand search was also undertaken to relevant journals identified by the electronic search and additional articles identified from the reference list of the key articles. A number of articles have been found on teaching practices and student achievement. From the result it was found that teaching practices are very much essential for becoming an ideal teacher. Without teaching practices a teacher will not be able to teach students in large scale even a single student. In English there is a proverb that "Practice makes a man perfect." So, teachers should practice more before going to take any class. Student achievement is the ultimate result of a teacher's teaching. When a teacher will teach properly, students will learn properly, student will understand properly and will enter in to his or her brain and the student will never forget the lesson. So teachers should teach in such a way that student can achieve his or her teaching easily and properly.

Key words: *Teaching, Teacher, Teachers' Training, Student, Practice, Learning, Achievement, Knowledge, Education, Evaluation.*

INTRODUCTION

Bangladesh, a part of the Indian sub-continent, was under the British colonial rule for nearly 200 years (1757–1947), a fact which has left indelible scars in the fabric of its educational history. With the end of the British rule in 1947 following the Second World War, the sub-continent was divided into two independent countries based on religious majority: India primarily accommodated Hindus, while the two geographically separated exclaves of East and West Pakistan mainly accommodated Muslims. Despite the similarity in religious demographic, these two exclaves had different languages, cultures and traditions and were geographically separated by a long stretch of about 2500 km in between. Over the next few decades, as a result of economic deprivation and socio-political suppression from the militarily dominant West Pakistan, the East built up momentum in support of democracy and economic and political autonomy, culminating in the War of Liberation in 1971. After a prolonged 9-month war, in December 1971 East Pakistan achieved independence with the name of the modern nation of Bangladesh.

Bangladesh is a developing country with a dense population. The current area of land is 148,460 km^2 accommodating about 160 million people with a growth rate of 1.04% (Central Intelligence Agency [CIA], 2017). CIA reports that currently, an estimated 31.5% of the population live below the poverty line. The current literacy rate stands at 72.8% and education expenditure is 2.2% of total GDP, ranked at 161th in the word (CIA, 2017).

A total of seven National Education Commissions have so far been formed in post-independence Bangladesh and while critics have pointed out that they were used by ruling political parties to advance their agenda and ideology, they have also shaped the general direction of the country's education and the educational needs of its learners over the last four and a half decades. The first Education Commission report in Bangladesh, led by Dr. Qudrat-e-Khuda, proposed primary education from Grades 1 to 8 and secondary education from Grades 9 to 12 (Qudrat-e-Khuda et al., 1974). This report emphasised secular education at all levels, future work-relevant technical and vocational education, and an improved assessment system with letter grading in assessment. This Commission report, however, remained largely unimplemented due to an abrupt change of political power in 1975 which saw the Father of the Nation, Sheikh Mujibur Rahman, assassinated (Ministry of Education, 2010).

A number of Education Commissions were formed in the next three decades during the period of 1975–2003; however, these commission reports were successively shelved and nullified with the changes in the political scenario (Chowdhury & Kabir, 2014). The current education policy document the National Education Policy 2010 was eventually formulated and is currently in the process of implementation (Ministry of Education, 2010).

OBJECTIVE OF THE STUDY

The Objective of the study is as follows:

1. To review about teaching practices and student achievement.
2. To explore terms related to teaching practices and student achievement.

METHODOLOGY OF THE STUDY

The study was documentary analysis type. Information and data were collected from secondary sources. Information and data were collected from books, research reports, journals, different annual reports, different government and non government websites and different websites. A literature review was conducted by using the internet search, google databases with the virtual classroom. A hand search was also undertaken to relevant journals identified by the electronic search and additional articles identified from the reference list of the key articles. A number of articles have been found on teaching practices and student achievement.

RESULTS AND DISCUSSION

1. Teaching practice

Teaching practice is a supervised instructional experience; usually the culminating course in a university or college undergraduate education or graduate school program leading to teacher education and certification. Student teaching is part of pre-service teacher education programs such as Early Childhood (Birth-Grade 3), Middle Childhood (Grades 4-9), and Adolescence to Young Adult (Grades 7-12). It is required by those earning a Bachelor of Education or Master of Education degree, as well as liberal arts Bachelor of Science or Bachelor of Arts degrees with a major in education. Student teaching is required for students who are not yet certified to teach. It is different from a practicum, which is required when a student already holds certification to teach, yet wants a certificate extension to teach another area of specialization; they are both college-supervised field-based experiences.

The student teaching experience lasts about the length of a school term, semester or quarter; long enough to fulfill the college's assigned tasks. It is an unpaid internship. This experience gives the prospective teaching professional an opportunity to teach under the supervision of a permanently certified teacher.

The student teacher is usually placed in a neighboring or participating school. The student teacher is monitored by the cooperating teacher from the school, as well as a supervisor through the college. The supervisor acts as a liaison between the cooperating teacher and the head of the college's student teaching department. The student teacher normally initially shadows the cooperating teacher, eventually gaining more responsibility in teaching the class as the days and weeks progress. Eventually, the student teacher will assume most of the teaching responsibilities for the class including class management, lesson planning, assessment, and grading. Thus, the student teacher is able to more fully experience the role of the teacher as the classroom teacher takes on the observation role in the class. There is sometimes a "phasing out" week when the student teacher returns the teaching role back to the regular teacher.

The supervisor, as well as cooperating teacher, monitor the progress of the student teacher throughout the experience, ensuring satisfactory work. A grade of Pass or Fail in student teaching, as well as satisfactory completion of a school's education program, is an indication as to whether the college recommends the student for certification to teach.

2. Student achievement

Student achievement is the measurement of the amount of academic content a student learns in a given time frame. Each instruction level has specific standards or goals that educators must teach to their students. Achievement is usually assessed through frequent progress and comprehension checks and examinations; however, there is no consensus on how it is best evaluated or which elements of it are most important. Student achievement refers to the extent to which a learner has attained their short or long-term educational goals. Individual differences in academic performance are strongly correlated with differences in personality and intelligence. As well, students' levels of self-efficacy, self-control and motivation also impact levels of achievement.

3. Teacher knowledge

From the beginning of research into teacher knowledge, there have been differences in opinion about the kinds of teacher knowledge. Researchers investigating teachers knowledge have also aimed to develop a knowledge base for teaching and, where possible, translating it into a recommendation for teacher education (Reynolds, 1989). Stimulated by Shulman's work and his categories of knowledge bases (Shulman, 1986, 1987), researchers (Killen, 2013; Turner-Bisset, 2001) tended to develop model of knowledge base to sketch the requirement of the all the knowledge bases in effective teaching including defining the knowledge bases.

For example, Killen (2013) categorized all the knowledge bases into four broad types: content knowledge, learner and learning knowledge, pedagogical knowledge, and pedagogical content knowledge.

According to Killen (2013), Content knowledge is the knowledge of the subject or the discipline. This knowledge comprises of understanding the subject deeply (the concepts, principles and relationships that define the subject) and flexibly to help students create cognitive maps, link ideas, address misconceptions. Pedagogical knowledge is referred as how to guide students' learning in appropriate ways in specific circumstances, for example, how to attract and hold attention, and how to manage resources. Learner and learning knowledge includes how students learn that consists of different elements: empirical knowledge of learners and cognitive knowledge of learners to interpret learners' statements and actions and to shape productive learning experiences. Empirical knowledge is the knowledge in children physical, social and emotional domains. Cognitive knowledge of learner has two elements- knowledge of child development which informs practice and the other one is context-bound to a particular group of learners. Pedagogical content knowledge (PCK) is conceptualized as an overarching knowledge base comprising all of the knowledge- content knowledge, knowledge of learner and learning, and pedagogical knowledge and derived from the interaction and intersection of all these knowledge (Killen, 2013).

4. Teacher Education

Several institutions provide education for teachers at different levels. BANBEIS (2018) reports that there are currently 59 Primary Training Institutes (PTI) that provide a 1-year certificate in education course for primary school teachers. Recently they introduced a 18-month diploma in primary education (DPEd) course for primary school teachers. A total of 118 Teachers' Training Colleges (TTC) offer a 1-year bachelor of

education (BEd) and 1-year master of education (MEd) courses or teachers of secondary schools. In addition, five Higher Secondary Teacher Training Institutes (HSTTI) provide in-service training for teachers at the higher secondary level. There are also institutes which provide training exclusively for teachers working in technical and vocational institutions and madrasahs. There are 30 physical education colleges offering training to physical education teachers.

However, the take-up of formal teacher training remains low. The World Bank (2016) estimates that currently only 58% of secondary teachers were fully trained and accredited with a bachelor of education qualification. Such training still promotes he age-old transmissive mode of learning, and in-service training is limited to a small number of teachers and is 'sporadic' (Thornton, 2006, p. 182) in nature.

At the higher education level, teacher training is largely absent, although this has been acknowledged as a barrier to ensuring quality education. Considering the importance of teacher training in higher education, the University Grants Commission (UGC), in cooperation with the British Council, has established the Centre of Excellence in Teaching and Learning (CoETL) at six Classroom assessment Classroom assessment is a part of good teaching. Classroom assessment is defined as any planned method or strategy used in the classroom to establish the level of students' difficulties or understanding of a particular concept or idea with the purpose of helping students to succeed in learning (Ainscow, 1988). Susuwele-Banda (2005) mentioned that classroom assessment helps teachers to confirm what students already know and what they need to learn. Classroom assessment is an important part of science teaching and learning. Most assessment of science learning are carried out by teachers of science in classrooms, it is the teacher who is responsible for either initiating or implementing changes in assessment in the classroom and it is teacher who has to ultimately judge the educational worth, significance, and use of different assessment practice (Bell, 2002).

There are two types of assessment in general, formative assessment and summative assessment (Ahsan, 2009). Wiliam (2010) stated that formative and summative are two broad types' purposes of classroom assessment. When assessment is used for a formative purpose it focuses on enhancing instruction and improving learning whereas summing up learning achievements is the focus of a summative purpose. Stiggins (1991) stated that teachers use assessment in their classrooms to serve at least three different categories of purposes:

(a) as a means of informing decisions (e.g., they diagnose students' needs, select students for special services, group students for instruction, and assign grades);
(b) as teaching tools (e.g., to communicate achievement expectations to students, to provide practice for students, to involve students in self and peer evaluation to help them become better performers); and
(c) as a classroom management or behavior control mechanism to keep students in line.

When classroom assessment is frequent and varied, teachers can learn a great deal about their students. Earl and Katz (2006) suggested that teachers can gain an understanding of students' existing beliefs and knowledge, and can identify incomplete understandings, false beliefs, and naive interpretations of concepts that may influence or distort learning. Teachers can observe and probe students' thinking over time, and can identify links between prior knowledge and new learning. Chappuis and Stiggins (2002) stated that teachers need to engage students in the process of classroom assessment and focused on enhancing learning for encouraging them to learning instead of only measuring their achievement. Brown (2004) also suggested that importance should be given on why assess along with what and how assess. The ways teachers assess students can really make a difference to how students learn. Classroom assessment's main application is to facilitate learning which can be described as assessment for learning.

Assessment for learning occurs throughout the learning process. Earl and Katz (2006) stated that assessment for learning is designed to make each student's understanding visible, so that teachers can decide what they can do to help students progress. In assessment for learning, teachers use assessment as an investigative tool to find out as much as they can about what their students know and can do, and what confusions, preconceptions, or gaps they might have. So, teachers use variety of strategies to assess students in the science classroom which includes observation, questioning, exercises, projects and investigation, library and web-based research assignment, and portfolios (Hackling, 2004).

The wide variety of information that teachers collect about their students' learning processes provides the basis for determining what they need to do next to move student learning forward. So, Chappuis and Stiggins (2002) suggested that assessment for learning means more than just assessing students often, more than just providing the teacher with assessment results to change revise instruction. In assessment for learning, both teacher and student use classroom assessment information to modify teaching and learning activities.

There is lots of evidence that there is lack in practice of classroom assessment in secondary level of Bangladesh. Most of the teachers are reluctant in assessing students properly. They mainly highlight on students' performance in the examination rather than emphasizing on students learning. Teachers are not oriented with effective classroom assessment strategies and for this reason students are focused on result rather than learning.

Ahsan (2009) found that our assessment culture promotes assessment of learning and inhibits assessment for learning. Black and Wiliam (1998) mention it as "a poverty of practice" (p.2). Therefore, it is important to examine how teachers practice classroom assessment using different strategies and tools in science classes. As classroom assessment enhance students learning, the study will find out to what extent the current classroom assessment practices are useful for students learning.

5. Measuring Teacher Effectiveness

5.1 Measuring Teachers' Classroom Practices

Teacher evaluation has traditionally been done by district and school administrators. Historically the criteria were varied and largely subjective, training was poor, and the research basis was under-developed (Stronge and Tucker (2003), Medley, Coker and Soar (1984)). In the early 1980s several districts, including Toledo, Ohio and Rochester, New York launched "peer review" systems (Kahlenberg (2007)). The introduction of peer review systems in which teachers are evaluated by other teachers from the same school or other schools was accompanied by an effort to be more consistent and clear about scoring rubrics, training scorers, and record-keeping. Existing literature suggests that quality observation systems should be based on clear, objective standards of practice; be conducted by multiple, trained evaluators; and consider multiple observations and sources of data collected over time (Donaldson (2009), Goe and Croft (2009), Toch and Rothman (2008), Danielson and McGreal (2000)).The accumulation of detailed measurement of the classroom practices provides an opportunity for validation studies, such as this one.

5.2. Cincinnati's Teacher Evaluation System

Cincinnati's Teacher Evaluation System (TES) program grew out of a 1997 collective bargaining agreement between the Cincinnati Federation of Teachers and the Cincinnati Public Schools. During the 1999-2000 school year Cincinnati Public Schools field tested the TES system that utilizes trained evaluators, a specified and research-based evaluation rubric, and includes multiple classroom observations of teachers during a year. During the TES process, teachers generally receive four evaluations throughout the school year by trained peer evaluators. Local school administrators are also trained on the same rubric used by the external evaluators, and conduct one additional observation. In order to serve as a peer evaluator, a qualified "lead teacher" must complete extensive training that includes guidance and practice on how to collect and record evidence, and they must accurately score a videotaped teaching exercise prior to beginning their term as a peer evaluator. All new teachers are required to participate in TES during their first year in the district, and must do so again to achieve career status (in common parlance, "tenure protection"). Career status teachers are required to participate in TES every fifth year.

The TES rating system is based on Charlotte Danielson's *Enhancing Professional Practice: A Framework for Teaching*. The rubric associated with the "Danielson framework" includes four domains, fifteen standards and 32 elements that describe the practices, skills, and characteristics that effective teachers should possess and employ. The domains cover four practice areas including preparation, classroom management, pedagogical and content knowledge and application, and collegial responsibilities and engagement. The four domains in which a teacher is evaluated are: (Domain 1) planning and preparing for Student Learning, (Domain 2) Creating an Environment for Student Learning, (Domain 3) Teaching for Student Learning, and (Domain 4) Professionalism.

Within each domain, teachers are evaluated against a set of standards, which themselves are subdivided into elements. Each element has language that describes performance at each level of the rubric: Distinguished, Proficient, Basic, and Unsatisfactory, with evaluators assigning respective scores of 4, 3, 2, and 1 to these rubric levels.

As a example, the standard and element language provided for Standard 3.2 which resides in Domain 3, "Teaching for Student Learning." Standard 3.2 has only one element "Instructional Strategies & Content Knowledge," which, in turn, has two components (the bullet-level items). A teacher will be evaluated on both components within the element and the result will be a standard-level score for that observation.

For example, if an evaluator records that a teacher provides accurate information to students in a way that supports learning then that teacher would receive a score of 3 from the evaluator for that observation. Data from classroom observations are used in evaluating a teacher on domains 2 and 3, while evidence for domains 1 and 4 comes from the collection of documents such as lesson plans and goes into a portfolio that is reviewed by the evaluators. Only the first observation in an evaluation cycle is announced, the remaining observations may be unannounced, and evaluators are required to submit the evaluation report to the teacher being evaluated within ten working days of the observation.

At the end of the year evaluators consider evidence from all observations and submitted evidence for a given teacher in arriving at a final formal standard score for each of the fifteen standards within domains 1-4. These end-of-year scores are based on a "preponderance of the evidence" and can take into account improvement in observed practice over the year and thus are not necessarily simple averages of the scores that a teacher received across all observations for the year. Once final standard scores are determined, evaluators use those scores to determine final Domain level scores, which are very close to the simple average of the standard scores within each domain.2 In their final end-of-year report teachers are provided with the final domain-level scores.

5.3 Measuring a Teacher's Effect on Student Achievement Gains

Education researchers have long been interested in measuring a teacher's contribution to student achievement (for example Armour (1976), Hanushek (1971), Murnane and Phillips (1981), Sanders and Rivers (1996), Rockoff (2004), Rivkin, Hanushek and Kain (2005), Gordon, Kane and Staiger (2006)). While empirical strategies differ somewhat, the common objective is to isolate an estimate of a teacher's contribution to student achievement separate from the student, class, school, and other contributors.

Researchers have made considerable progress in the empirical methods of estimating a teacher's contribution to student achievement. Several strategies are now widely practiced; for example, modeling *growth* in achievement as opposed to achievement *levels*, and taking into account the hierarchical structure of school systems (McCaffrey, Lockwood, Koretz and Hamilton (2003)). This progress owes much to the proliferation of student achievement data (particularly due to No Child Left Behind requirements), and advances in the software used to estimate models (e.g., hierarchical and Bayesian approaches). Nevertheless, a number of important statistical and interpretive questions remain (Todd and Wolpin (2003), McCaffrey, Lockwood, Koretz, Louis and Hamilton (2004), Raudenbush (2004).

Researchers recognize the possibility that non-random assignment of students to teachers could distort measures of teacher effectiveness. Some teachers, the ubiquitous example states, are assigned better students who would have achieved highly in many different classrooms. Some researchers have questioned whether a teacher's specific contribution can be accurately estimated given the possibility that students are assigned to teachers based on unmeasured characteristics not captured by test scores and demographics (Rothstein (2009). Other researchers, recognizing the potential for bias, are more optimistic (Koedel and Betts (2009).

One recent study compared experimental (i.e., classes randomly assigned to teachers) and non experimental estimates of teachers' effects on student achievement growth for a small sample of teachers in Los Angeles. In that sample the non-experimental or observational measures predicted the experimental measures with

little bias as long as the observational models controlled for each student's prior achievement (Kane and Staiger (2008).

In a number of studies the effect of teachers in one grade fade out as students progress through subsequent grades (McCaffrey, Lockwood, Koretz, Louis and Hamilton (2004), Kane and Staiger (2008), Jacob, Lefgren and Sims (2008), Rothstein (2009)). Hypotheses for fade out range from artifacts of empirical strategy to the heterogeneity of teacher quality within schools to the relevance of skills gained this year for skills tested next year (Kane and Staiger (2008).

Understanding the causes and structure of fade out is an emerging area of inquiry. A few recent studies have found a relationship between a teacher's measured effect on student achievement and overall subjective administrator ratings ((Jacob and Lefgren (2008), Rockoff and Speroni (2009), Rockoff, Staiger, Kane and Taylor (2009). However, those studies do not identify the criteria or behaviors principals used to make their judgments. Using data from the early years of Cincinnati's evaluation program, Holtzapple (2003) and Milanowski (2004a and 2004b) demonstrated a positive relationship between teachers' final overall scores and student achievement. Our primary contribution to the literature is to link student achievement gains to specific teaching practices and behaviors as opposed to general judgments by principals.

6. Research on Teacher Training and Teaching Skills

Researchers had explored the effect of teacher education or teacher training effectiveness using different approaches. Some researchers (for example, Farooq & Shahzadi, 2006; Palardy & Rumberger, 2008) had attempted the effect of teacher training program by investigated direct relationships between student achievement and teachers' participation in teacher training and teacher education programs.

The study of Farooq & Shahzadi (2006) in Pakistan evaluated effectiveness of teaching of trained and untrained teachers by comparing the mathematics achievement of 400 students by the teachers. Using descriptive survey design the study found significant differences in the teaching of trained and untrained teachers of mathematics and stressed that the teaching of trained teachers had significant impact on the mathematics achievement of the students.

Guarino, Hamilton, Lockwood & Rathbun (2006) conducted a study using data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K) collected by National Centre for Education Statistics (NCES) in the USA. The study examined the relationship of teachers' background variables (teaching certification, coursework in pedagogy, employment status and, teaching experience) and instructional practices and student achievement (in reading and mathematics) during the kindergarten year. Using two level hierarchical linear modeling (HLM), the study showed only teachers' amount of coursework in pedagogy had a positive relationship with instructional practices (in reading and mathematics) that were associated with higher students' achievement in both subjects. Also, the study found instructional practices were positively associated with student achievement gains in both subjects but, no direct relationship between the qualifications of teachers and student achievement with the exception of teachers' employment status (part time and full time).

A part from the above, other researchers investigated the relationship or the influence of teacher training with teaching practice in the classroom. For example, in eastern Australian schools, Rowley (2002) conducted a study to examine whether the specialized teacher training in gifted education assisted teachers in developing teaching skills, competencies and classroom climates identified as effective in teaching gifted and talented students. Differences were observed among 56 trained, 31 currently undertaking training and 80 untrained teachers in their classroom, and both trained and currently undertaking training teachers were found to demonstrate better teaching skills than the untrained group.

Subsequently, Bambico (2004) evaluated the effectiveness of in-service teacher training for 70 elementary mathematics teachers in the Philippines by using pre and post-tests and found that the teachers teaching skills improved after the training and the performance of the 2144 students from grade 1 to 4 improved after their teachers' participation in the training. Similarly, Mohsin (2004) in Bangladesh using survey method had revealed teachers education.

A wealth of research tries to link measurable teacher characteristics to student outcomes using observational data. The typical approach to this problem is to set up an education production function in which student achievement as measured by some form of standardized test is related to teacher experience, education and certification. Evidence from the associated regressions points towards a positive effect of teacher certification on test scores (Clotfelter et al., 2010; Dee and Cohodes, 2008). However, teacher experience and education - the variables most frequently used to inform hiring and salary decisions - are generally found to have no significant effect on student achievement (Hanushek, 1971, 1986; Hanushek and Rivkin, 2006). Evidence from recent studies which examine the impact of teacher gender is also inconclusive (Dee, 2007; Holmlund and Sund, 2008). An alternative approach that has become popular during the last decade therefore avoids the focus on particular teacher characteristics and attempts to identify a generic measure of teacher quality instead. Studies which adopt this approach typically exploit longitudinal data sets in which teachers face different groups of students over time. In an equation of student achievement gain, a value-added measure of teacher quality is then calculated as a teacher fixed effect. Researchers conclude that there is substantial variation in teacher quality and that its impact on student achievement is large. However, consistently with the evidence from the education production function approach, teacher experience and education are found to explain only very little of the variation in estimated teacher quality (Aaronson et al., 2007; Rivkin et al., 2005).

The elusiveness of measurable determinants of teacher quality and the availability of new and richer data has prompted researchers to shift the attention from teacher characteristics to what teachers do in the classroom very recently. Two studies from this emergent literature are particularly closely related to this paper. First, Schwerdt and Wuppermann (2011) use data from the TIMSS 2003 wave for the United States to contrast the effect of lecture-style teaching with that of solving problems in class on standardized test scores. The authors find that teachers who spent relatively more time on lecture-style teaching are associated with higher student achievement.

Second, Lavy (2011) uses student survey data from Israel to examine the effect of five aggregate teaching practices on standardized test scores. He finds that two of these practices, “instilment of knowledge” and “instilment of applicative, analytical and critical skills,” which he likens to “traditional teaching” and “modern teaching,” respectively, are positively related to student achievement. The author concludes that traditional and modern teaching approaches do not necessarily crowd out each other as is commonly thought, but that both may coexist in the education production function.

In keeping with this recent line of research, this paper provides additional evidence on the link between teaching practices and student achievement. Similar to Lavy (2011), I use student survey data from the United States to construct two aggregate teaching-practice measures for traditional and modern teaching. I then relate these measures to standardized test scores in math and physics. While Schwerdt and Wuppermann (2011) also study the effect of teaching practices in the United States, this paper extends beyond their work in two ways. First, while their variable of interest is the relative intensity of two teaching practices, my data contains a large amount of teaching practices, which allows me to adopt a broader definition of traditional and modern teaching. Second, since this definition is in line with that of the standards movement, I am able to directly evaluate its policy recommendations.

The challenge in using observational data to identify the causal effect of a particular teaching practice on student achievement is to deal with the potential nonrandom assignment of students and teachers to classrooms. If students with high unobserved ability are systematically paired with teachers using a particular teaching practice, for example, then the estimated coefficient on this practice will be biased upward. Studies linking other teacher characteristics to student outcomes have typically addressed this issue by using panel data on students, where the fact that individuals are observed for several consecutive periods allows one to introduce student fixed effects which control for time-invariant unobservables at the student level. The matched-pairs nature of the TIMSS data - students are observed twice, once in math and once in science - lets me use a related identification strategy: between-subject differencing. As Rothstein (2010) points out in the context of panel data, the use of student fixed effects does not resolve the sorting problem when time-varying unobservable determinants of student achievement are correlated with classroom assignment.

Professional development and the promotion of good instructional practices are critical to the success of the initiatives. Research provides some evidence of the effectiveness of some of the individual practices endorsed by the reforms. An experiment conducted by Ginsbuurg Block and Fantuzzo (1998), for example, showed that low achieving elementary students who were placed in problem solving or peer collaboration situations achieved higher mathematics scores and reported higher levels of motivation than did students who received neither of these interventions. Several other studies have also demonstrated the value of peer tutoring and collaboration (e.g., Fantuzzo, King and Heller, 1992: Greenwood, Carta and Hall 1988; Webb and Palincsar, 1996), as well as the benefits of contextualizing instruction in real-world problems (Verschaffel and De Corte, 1997).

A few studies have focused on relationships between student achievement and teachers' use of combinations of these practices. Cohen and Hill (1998) studied teacher-reported use of several practices consistent with the college level after controlling for demographic characteristics. The set of teaching practices examined by the concerned authorities. Mayer (1998) found small positive or null relationships between a similar set of practices and student scores on a standardized multiple-choice test. Thus, there is some evidence that, in certain contexts at least, use of reform practices is related to higher student achievement.

7. Teacher effectiveness research and its relationship to student achievement

Over the past four decades, as new insights have been gained and successive researchers have endeavoured to overcome the weaknesses of preceding investigative approaches, the concept of teacher effectiveness has become broadened. In the early 1960s, researchers (e.g., Coleman et al., 1966) examined direct links between inputs such as teacher personality, and outputs such as academic achievement, ignoring the process variables (i.e., teaching practices), to explain differences in student performance, but had limited success (Borich, 1998; Muijs, Reynolds & Kyriakides, 2016). Hence, since the late 1960s most researchers (e.g., Brophy & Good, 1986; Emmer, Evertson & Anderson, 1980; Good, Grouws & Ebmeier, 1983; Mortimore, Sammons, Stoll, Lewis & Ecob, 1988) shifted the focus on investigating the relationship between teaching practices and student academic achievement by using an input-process-product framework. In an input-process product framework, the inputs are teacher characteristics, including teacher background characteristics such as teacher qualifications and experience. The processes are classroom teaching practices, whilst student academic achievement (most often measured by student performance on standardized tests) represents the 'output'. Teacher effectiveness research (e.g., Good & Grouws, 1979a; 1979b; Mortimore et al., 1988) based on the input-process product model have investigated the relationships between teacher characteristics, the actions and practices of teachers, and student achievement.

The literature of teacher and schools effectiveness research (e.g., Creemers & Kyriakides, 2012; Hattie, 2009) had established firmly that while schools are significant and important, the classroom level or the teacher explains a greater proportion of the variance in student learning and performance (Chapman, Muijs, Reynolds, Sammons & Teddlie, 2015; Houtveen, Grift & Creemers, 2004). Hattie (2009) in his meta-analysis noted that among the major sources accounting for student achievement are teacher, student, home, peer, school, and principal, and that the greatest source of variance is teachers (30%), next to the students themselves (50%).

Moreover, some studies have attempted to determine the variability in student learning that can be attributed to the impact from a highly effective teacher. For example, Stronge and Ward (2002), in an urban Virginia school district, revealed that students of the most effective teachers scored at least 30 points higher than the state's standard score in mathematics whilst their peers with less effective teachers scored 24-32 points below the standard. Similar findings by Slater, Davies and Burgess (2009) showed that students of a highly effective teacher had almost a full year's learning growth over peers with less effective teachers. Kane, Taylor, Tyler and Wooten (2011) estimated that a student who began the academic year at the 50th percentile and was assigned to top-quartile teacher had three percentile points higher in reading and two points higher in mathematics by the end of the academic year, compared with a student who began at the same percentile but was assigned to a bottom-quartile teacher.

8. Research on teacher training and content knowledge

Researchers had explored the effect of teacher education or teacher training effectiveness using different approaches. Some researchers (for example, Farooq & Shahzadi, 2006; Palardy & Rumberger, 2008) had attempted the effect of teacher training program by investigating direct relationships between student achievement and teachers' participation in teacher training and teacher education programs. Farooq & Shahzadi (2006) study in Pakistan evaluated effectiveness of teaching of trained and untrained teachers by comparing the mathematics achievement of 400 students by the teachers. Using descriptive survey design the study found significant differences in the teaching of trained and untrained teachers of mathematics and stressed that the teaching of trained teachers had a significant impact on the mathematics achievement of the students. Guarino, Hamilton, Lockwood & Rathbun (2006) conducted a study using data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K) collected by National Centre for Education Statistics (NCES) in the USA. The study examined the relationship of teachers' background variables (teaching certification, coursework in pedagogy, employment status and, teaching experience) and instructional practices and student achievement (in reading and mathematics) during the kindergarten year. Using two-level hierarchical linear modeling (HLM), the study showed that only teachers' amount of coursework in pedagogy had a positive relationship with instructional practices (in reading and mathematics) that were associated with higher students' achievement in both subjects. Also, the study found instructional practices were positively associated with student achievement gains in both subjects but, no direct relationship between the qualifications of teachers and student achievement with the exception of teachers' employment status (part-time and full-time).

Investigating the relationship between teachers mathematical content knowledge, instructional quality, and students' mathematical score, several studies (Baumert et al., 2010; Harbison & Hanushek, 1992; Mullens, Murnane & Willett, 1996; Rowan et al., 1997) administered mathematical test/quiz to the teachers. For example, Baumert and colleagues (2010) in Germany investigated the extent to which content knowledge (CK) and pedagogical content knowledge (PCK) influenced instructional quality that, in turn, influenced students' learning gains in mathematics. The study was conducted in Germany for one year with a representative sample of Grade 10 students and their mathematics teachers. Students' pre-test and post-test was used to assess mathematics learning progress, a 13 items paper-and-pencil test to measure teachers content knowledge in mathematics, three knowledge dimensions (mathematical tasks, student thinking and multiple representation) to assess PCK, and different data sources (student's rating, teachers' task to students, expert coding and tapping perceptions) to assess instructional quality into three dimensions (cognitive activation, individual learning support, and effective classroom management). By using the multilevel structural equation model the study revealed that both the CK and PCK had a correlation with their instructional approaches as well as students' learning outcomes. On the other, some researchers (Ball, 1990; Heaton, 2000; Ma, 1999; Simon, 1993) used interviewing teachers in investigating teachers' mathematical content knowledge to provide a more informative picture. However, though research (Ernest, 1989, Rowan et al., 1997; Swafford et al., 1997) consistently shows the importance of content knowledge in regard to instructional quality and developed observation checklist to measure the content knowledge of teacher during teaching (for example, EED, 2014), there seem to have paucity of research that evaluated the teachers level of content knowledge using observation checklist.

CONCLUSION

From the above discussion it can be said that teaching practices are very much essential for becoming an ideal teacher. Without teaching practices a teacher will not be able to teach students in large scale even a single student. In English there is a proverb that "Practice makes a man perfect." So teachers should practice more before going to take any class. Student achievement is the ultimate result of a teacher's teaching. When a teacher will teach properly, students will learn properly, student will understand properly and will enter in to his or her brain and the student will never forget the lesson. So teachers should teach in such a way that student can achieve his or her teaching easily and properly.

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