

Impact of Subject Matter Knowledge of a Teacher in Teaching and Learning Process

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Abstract

Teaching involves the imparting of knowledge, skills and attitudes to an individual. The inclusion of subject matter knowledge of teacher in teaching and learning process has many dimensions. In this paper, whether the subject matter knowledge of teachers has impact on teaching and learning or not was examined, and found in literature and surveys that the subject matter knowledge of a teacher impacts on teaching and learning process in schools. Although it appears self evident that teachers must know what they are teaching, agreement does not exist in the idea of knowing subject matter for teaching. In this paper, the writer wants to offer a framework for renewing interest in the subject and also to encourage further research that can significantly reveal the degree of the impact of subject matter knowledge on teaching and learning. The methodology was a survey based on literature reviews of research reports on this topic. The paper concluded that understanding of subject matter by a teacher implies that teachers are able to teach the main points of the subject matter to students, and to clarify misconceptions of knowledge depends to some extent on the teachers understanding of the subject matter through which impact is made on learning when students are able to use the subject matter taught in class to actively participate in their environment.

Keywords

Subject, knowledge, teacher, teaching, learning, impact

Introduction

The need for the teacher trainees' emphasis on adequate grasp of subject matter knowledge by the teacher trainee involves an in-depth and adequate knowledge of the teaching subjects both major and minor.

This paper will be of enormous benefit to teachers, student teachers, curriculum planners and pre-service teacher preparation programmes, as a reminder to teachers that they have a stake in the success of their students in examinations. The subject matter knowledge level of a teacher on topics has a direct bearing on the students' understanding of subject matter (Conant, 1963). Furthermore, student teachers will be motivated enough to read thoroughly their course of study upon reading this research paper. They will understand that knowing ones subject matter helps the teacher to impart knowledge to students in an efficient way. In addition, curriculum planners will be reminded enough upon reading this paper to enrich the curriculum of subjects so that teachers can help to shape students' cognitive, psycho-motor and affective domains.

This paper will enlighten to acquire knowledge but also help to prepare students to be active participants in their environments. Teachers help students to develop intellectual resources which students can use as tools to gain control over every day, real world problems. Furthermore, this paper can be use to convince sceptics both within the country and the outside world that knowing of subject matter impacts on teaching positively.

The purpose of this paper is geared towards providing evidences for the impact of subject matter knowledge of teachers in teaching and learning. It is made up of five sections: introduction, literature review, discussion, conclusion and recommendation for further research.

Methodology

The methodology was a survey based on literature reviews of research reports on this topic. This paper was written within a space of time less than two months. Enough reading materials were not available for the topic in the library. The Internet provided some reading materials but some were not easily available because of the nature of their files. Specifically, 22 authors were reviewed covering US, UK and Korea; for example Ball, (1988), Ball, (1991), Beagle, & Geeslin, (1972), Whitener, & Weber, (1997), Buchman, (1984), Conant, (1963), Cusick, (1983), Darling-Hammond (2006), Darling-Hammond (2000), Feiman-Nemser, (1983), Goldhaber, (2006), Grossman, (1989), Hashweh, (1987), Ingersoll., (2003), Leinhardt, & Smith, (1985), Lampert, (1986), Lampert, (1989), Schefflers' (1973), Peters, (1977), Shen, (2003), Shroyer (1981), Wilson & Wineburg (1988).

Literature review

We may ask the question, what makes a teacher effective? According to Hammond (2006), teacher preparation/knowledge of teaching and learning, subject matter knowledge, experience, and the combined set of qualifications measured by teacher licensure are all leading factors in teacher effectiveness.

Effects of Subject matter Knowledge in Education

This literature focuses on the subject matter knowledge of a teacher on teaching and learning.

If anything is to be regarded as specific preparation for teaching, priority must be given to a thorough grounding in something to teach, (Peter, 1977). According to Buchman, (1984:32) "it would be odd to expect a teacher to plan a lesson on, for instance, writing reports in Science and to evaluate related student assignments, if that teacher is ignorant of writing about Science, and does not understand what student progress in writing Science reports might mean". Helping students learn subject matter involves more than the delivery of facts and information (Debra Ball, 1986).

The goal of teaching is to assist students in developing intellectual resources to enable them to participate in, not merely to know about, the major domains of human thought and enquiry. These include the past and its relation to the present; the natural world, the ideas, beliefs and values of our own and other peoples; the dimensions of space and quality; aesthetics and representation; and so on.

Philosophical argument as well as "common sense" supports the conviction that teachers' own subject matter influences their efforts to help students learn subject matter. Conant (1963) argues that "if a teacher is largely ignorant or informed he can do much harm". When teachers possess inaccurate information or conceive of knowledge in narrow ways, they may pass on these ideas to their students. They may fail to challenge students' misconceptions; they may use texts uncritically or may alter them inappropriately. Subtly, teachers' conceptions of the knowledge shape their practice –the kinds of questions they ask, the ideas they reinforce, the sorts of tasks they design.

Although early attempts to validate these ideas, to demonstrate empirically, the role of teachers' subject matter knowledge, were unsuccessful (Begle 1979), various research on teaching and on teacher knowledge has revealed ways in which teachers' understanding affect their students' opportunities to learn (e.g Bell, in press; Grossman, 1988; Lampert 1986; Lienhardt and Smith, 1985, Winebura and Wilson, 1988, Shulman 1986). What teachers need to know about the subject matter they teach extends beyond the specific topics of their curriculum. Scheffler (1973) writes that this kind of subject matter understanding "strengthens teachers' powers and heightens the possibilities of his art. When teachers are capable of explaining their lessons well, the likelihood of students to understand their lesson is high. Shulman, (1986:9) argues that teachers must not only be capable of defining for students the accepted truths in a domain. They must also be able to explain why a particular proposition is deemed warranted, why it is worth knowing and how it relates to other propositions.

Lampert (in press), writing about her own teaching of fifth- grade Mathematics, provides a vivid picture of the role that this kind of subject matter plays in teaching. She describes a series of lessons in which her students were learning to compare numbers. Written as decimal fractions: which is greater-0.0089 or 0.89? Or are they equal? While part of her goal was for her students to develop conceptual understanding of place value with decimal numbers. According to Lampert, she intended to present Mathematics as a subject in which legitimate conclusions are based on reasoning rather than acquiescing to teacher authority---"I wanted to enable the students themselves to question their own assertions and tests their reason-ability with a Mathematical framework".

Teachers' subject matter knowledge underlies their power and strength as pedagogues. Wineburg and Wilson (1988) describe two very different but equally excellent high school history teachers, Mr Price and Ms. Jenson, teaching their students about the American Revolution. Wineburg and Wilson noted that the juxtaposition of Price and Jenson offers a study in contrasts. By watching Price, we see what Cuban has called "Persistent instruction"- Whole group recitation with teacher at the centre, leading discussions, calling on students, and writing key phrases on the chalkboard. Jenson's classroom on the other hand, departs from the small groups replace whole-group instruction; students debate and presentation overshadow teacher recitation; and the teacher's voice, issuing instructions and dispensing information, is largely mute.

Despite differences in their pedagogues, these teachers conceive of history and of what is important for students to learn about history in similar ways. Both want their students to understand that history is fundamentally interpretive. "Learning history means studying accounts of the past that have already been constructed as well as learning about alternative account of the same phenomenon and how such accounts are constructed". Scheffler's (1973) argues that these teachers' knowledge of history underlies their power and strength as pedagogues.

Sometimes teachers faced learners who do not understand certain complex intellectual tasks; as a result they feel pulled to simplify content, to emphasize algorithms and facts over concepts and alternatives (Cusick, 1983). However, teachers' understanding of subject matter affects their capacity to simplify content to help students to understand. Surprisingly, teachers capacity to increase, deepen, or change their understanding of their subject matter for teaching depends on the personal understandings of the subject matter they bring with to the classroom (Wilson and Wineburg, 1988). Teachers' knowledge of subject matter affects their ability to answer questions from their students. Shroyer (1981) studied how junior high Mathematics teachers coped with student difficulties or unusual responses and found that the teachers with weaker Mathematics backgrounds had more difficulty generating alternative responses to these critical moments.

Research Evidence on the Impact of Subject Matter Knowledge on Teaching and Learning

The significance of subject matter knowledge is underscored by the 2008 Ofsted report, which acknowledges the diverse backgrounds and qualifications of primary school teachers, and suggests that expert subject leaders be given access and schools do the following:

- Try to provide access to an expert subject leader or the resources to nurture one for each subject
- review their policies on the role of a subject leader so that these are comprehensive and include the role of training other staff
- within the context of the school development plan, develop teachers' subject knowledge, taking account of the demands of different subjects identified in this and Ofsted's subject reports
- seek links with neighboring schools to share good practice and capitalize on local expertise
- take advantage of subject-specific opportunities for continuing professional development

In a study “what makes a teacher effective” by The National Council for Accreditation of Teacher Education (NCATE), 2010 the findings cited in the text revealed the following:

- High Quality Teacher Preparation Helps Candidates Develop Essential Knowledge and Teaching Skill
- Teacher Preparation Increases Beginning Teacher Retention as shown below

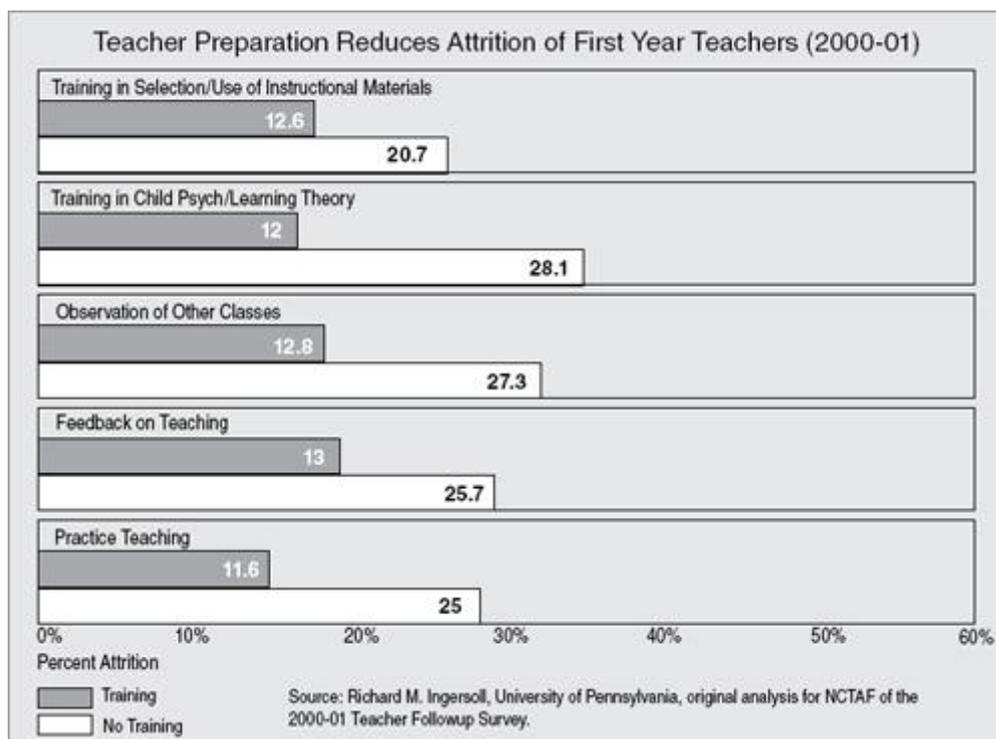


Figure 1 Source: “what makes a teacher effective” (NCATE) 2010

Ingersoll (2003) finds that when teachers are prepared according to six key elements, attrition of first year teachers is cut in half. The rates of beginning teacher attrition are almost half the level found in beginning teachers who have not had this kind of preparation.

Ingersoll’s findings strengthen an earlier study by Shen. Shen (2003) examined attrition rates among 1,702 teachers who had graduated from college within five years, and found that 34 percent of the sample had left teaching. In comparing teachers with pedagogical training and those without it, he found that teachers with no training were more than three times as likely to leave teaching during any given year. Those who completed student teaching, acquired certification, and participated in induction were 111 percent more likely to stay in teaching than those who had no training (Shen, 2003).

In addition, reinforcing both Ingersoll and Shen’s findings, Boe *et al.* (1997) analyzed data from the *Schools and Staffing Survey* and found that teachers with full certification (including preparation in content and pedagogy) were less likely to leave teaching than those who were only partially certified.

High Quality Teacher Preparation Makes a Difference in Student Achievement

Studies on unprepared and underprepared teachers versus fully prepared teachers consistently show that the students of teachers who are prepared show stronger learning gains.

Goldhaber (2006) analyzed ten years of student test scores linked to individual classrooms and teachers. He examined over 700,000 student records in grades 4–6 and the licensing records for almost 24,000 teachers.

Goldhaber found that teacher education makes a difference. He concludes that “students of teachers who graduate from a North Carolina-approved training program outperform those whose teachers do not” i.e., those who get a degree from an alternative state program or a program from outside the state (Goldhaber, 2006). The effect is significant.

High Standards for Teacher Preparation in Leading Industrialized Nations Lead to High Student Achievement

International surveys of student achievement have sparked interest in the educational systems of other countries, since their students often outperform students in America. In 2002, the Council for Basic Education undertook a comparative analysis of teacher preparation, induction, roles, and rewards in nine industrialized nations including the U.S.

All of the countries surveyed require formal undergraduate or graduate training in content and pedagogical knowledge, and all require student teaching/practicum experiences prior to licensing. Several of the other countries have significantly more rigorous requirements than the U.S.

The report concludes that, other countries stress teacher training and support. Teachers are required to know more and to be well qualified. According to Darling-Hammond, “this emphasis may be a reason for stronger student achievement and less public concern with teacher effectiveness” (Darling-Hammond, 2000).

Negative effects of lack of subject matter knowledge

In the process of teaching a subject matter the misconception and doubts of students about it should be clarified. But this will become almost impossible for a teacher if he/she is largely ignorant or uninformed. Moreover, a teacher who is largely ignorant or uninformed about a subject matter can pass inaccurate ideas to students, use texts uncritically and even change them unsuitably. A teacher will find it extremely difficult to answer varied questions from students about a subject matter if the teacher has little knowledge about it.

Discussion

Since teaching involves the imparting of knowledge skills and attitudes to individual, it is therefore very necessary for a teacher to understand his subject matter before teaching it. Understanding of subject matter of a discipline enables teachers to plan their lessons and also to evaluate their students’ assignments. Making a lesson plan requires teachers to simplify their teaching process so that the facts and information of a particular lesson passed onto students in an efficient way. Evaluations of students’ work on a particular lesson are based on specific criteria which are key about that lesson. For a teacher to be able to evaluate students’ work on a particular lesson he/she must understand that lesson.

Understanding entails being able to use intellectual ideas and skills as tools to gain control over real world problems. Students should see themselves either alone or in cooperation with others, as capable of figuring things out-of using Mathematics to define and reason through a problem; of tracking down the origins of current social policy, of interpreting a poem or story of recreating in a feeling, ideas or experience. They should both be able and inclined to challenge the claims in a politician's speech, to make sense of and criticize presentations of statistical information and to write an effective letter to the editor. A conceptual mastery of subject matter and capacity to be critical of knowledge itself can empower students to be effective actors in their environment. In addition, teachers' subject matter knowledge influences their capacity to help students learn subject matter. The knowledge of a teacher about a subject matter influences his/her ability to teach it, set question on it and give work to students' base on it.

Knowledge of teachers about a subject matter should exceed the limits of the curriculum they teach. When teachers possess knowledge about it in this way the likelihood of them to explain it for students to understand is high. This kind of understanding encompasses an understanding of the intellectual fabric and essence of the subject matter itself. For example, while English teachers need to know about interpretation and criticism (Grossman, in press). A Maths teacher needs to know how to solve calculus problems but must also understand the importance of calculus in industries. Moreover, History teacher needs detailed knowledge about events and people of the past but must also understand what history is the nature of historical knowledge and what it means to find out or know something about the past.

Concretely, this means that Lampert chose not to teach her fifth graders the familiar algorithm "Add zeroes after the digits to the right of the decimal points until the numbers you are comparing have the same numbers of decimal places. Now ignore the decimal point and see which of the numbers is larger. This common approach-"line up the places and add zeroes"-is not essentially Mathematical: students arrive at an answer "through a combination of trust in authority, memory and mechanical skill". Lamperts own understanding of the substance of Mathematics as well as its nature and epistemology shape what she is trying to help her students learn. She believes that students must have experience in developing and pursuing Mathematical hunches and learning to make Mathematical argument for their ideas within the context of a discourse community. This requires her draw simultaneously on her substantive understanding of Mathematics in this case place value and decimal numeration-and her knowledge about the discourse, activities and epistemology of Mathematics.

The knowledge of the teachers about a particular subject matter enables them to teach it by using different teaching methodologies. When teachers fully understand the subject matter they teach, they will know which pedagogy is best for them to help students learn subject matter.

Sometimes, dedicated students challenge teachers to simplify subject matter for them to understand. The extent to which a teacher can do this depends on his/her personal understanding of the subject matter.

Finally, for a teacher to give varied and alternative answers to students questions about a subject matter depends on the strength a teacher possesses over it.

Conclusion

In the process of delivering a subject matter students impact is made. Understanding of subject matter by a teacher implies that teachers are able to teach the main points of the subject matter to students. Example, a teacher that is knowledgeable in Equations, is teaching this topic he/she should be able to define an equation. He/she should be able to solve the variables in the equation and should be able to solve equation by elimination and transposition. Conversely, a teacher will not be able to teach the students all the main points of the equations. This difference in knowledge of subject of a teacher affects his/her teaching and consequently affects students' understanding of the subject matter.

Ability to clarify misconceptions of knowledge depends to some extent on the teachers understanding of the subject matter. When teacher clarify misconception of subject matter they make positive impact on students' learning. In this case, they do not clarify misconception and even contribute to students' misconception of subject matter they impact negatively to students' learning.

Results of evaluation of students' work impacts on learning. For teachers to evaluate students' work requires them to have substantial knowledge of it. Teachers mark students' assignments based on specific criteria of knowledge. Students learn when they receive their assignments. They are able to know where they went wrong and are able to know what they can do next time to get it correct. On the other hand, teacher understands students in the process of evaluating students work. Based on this, they can come up with alternative teaching methodologies to make students understand a particular subject matter next time.

Impact is made on learning when students are able to use the subject matter taught in class to actively participate in their environment. Students are enable to do banking, teaching, nursing and even solve current economic crises their country undergo. Understanding of subject matter also enables teachers to impact on teaching and learning. Understanding enables them to use different teaching methodologies to help students learn subject matter, usage of different methodologies impact on teaching and learning.

In view of the above, the paper concludes that subject matter knowledge of a teacher impacts positively on teaching and learning process in schools.

Recommendations

The author wish to recommend the following points:

- Curriculum planners should develop the curriculum to an extent that teachers are enabling to better shape students cognitive, psychomotor and affective domains of students on different subjects.
- Teachers should be able to use subject matter to enable students to contribute effectively in their environment.
- Teachers should endeavour to learn subject matter thoroughly so that they are able to enable their students to effectively participate in their environments.

- Knowledge of subject matter should be made a priority in teaching in Lower Basic, Upper Basic and Senior Secondary Schools and in schools all over the world.
- Government should allocate loans to students and student teachers so as to enable them to obtain adequate knowledge of the various courses they are pursuing in their major and minor areas in Colleges and Universities all over the world.
- I recommend particularly to both Ministries of Secondary and Higher Education in the Gambia to provide continuous content knowledge training to their teachers (each teacher should receive such training once in a year or once in every two years).

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