A critical analysis of the relationship between teacher subject knowledge and effective learning and teaching in the primary school.

Word Count:

Introduction

There is some research to suggest that primary school teachers lack Content Knowledge (CK) regarding some subject areas (Kratz and Schaal, 2015). Particular interest has been focused on adequate subject knowledge because the lack of it has been seen as a barrier to effective learning (Johnstone and Ahtee, 2006). In this essay, I will cover a number of areas around teacher subject knowledge. I will first evaluate and discuss the literature surrounding teacher subject knowledge (TSK). Looking directly at how CK based research has allowed Pedagogic Content Knowledge (PCK) to become a talking point in this area of educational research. Taking into account the impact it has on successful teaching. I will then evaluate my own knowledge base for a career as a primary school teacher. I will base the evaluation on my Professional Teaching Experience (PTE). I will be following GDPR and university regulations by removing the school, staff and pupil names from my analysis. The school itself will be referred to as 'School A' any reference to a staff member or a pupil will be referred to accordingly. Any reference to a previous bridging school will be referred to as 'School B'.

School A is located in a suburb of Swansea. It is a large school with 2 ½ form entry, students age from 3-11, with a number of extracurricular activities provided for all ages. In the most recent Estyn report, it was reported that 11% of children receive free school meals with 31% of pupils having English as an additional language (Estyn.gov.wales, 2013). I was placed in a reception class with children aged 4-5 years old. There are 68 students spread across 3 registration groups, the 3 registration groups work as 1 cohort throughout the week. There are 3 class teachers with 6 additional adults at any one time, with a student on a week rotational basis.

Review/Analysis

It is stated that the most effective teachers have a deep knowledge of the subjects they teach (Coe et al., 2014), Coe among others (2014) express that if a teachers knowledge falls below a certain level there is a significant impact on student learning. It is initially very clear

how important Teacher subject knowledge is thought to be. Teacher Knowledge (TK) research is stated to have become prominent in the 1980-90s, this research started to revolutionise how educators thought about classroom practice (Connelly, Clandinin and Ming Fang He, 1997). Connelly (1997) goes on further suggesting that TSK is central to student learning. There have been a number of important studies regarding TSK, Evens among others (2018) state that there is empirical research regarding this topic, some of this will be explored to evaluate the general belief stated by the literature and what should be included in this knowledge base.

What a teacher knows is one of the most important influences on what is done in classrooms and ultimately what children learn (Fennema and Franke, 1992). The scaffolding created by teachers is crucial for progression. Ball among others (2008), suggest that teachers themselves who do not know a subject well are less likely to enable a child's learning to progress. Hattie (2009) acknowledges the achievement of pupils is dictated by the professionalism and the adequateness of lesson plans provided by a teacher. Three cases studies following three teachers Alice, David and Carolyn support this thinking. They planned a module collaboratively and taught it individually to different classes. Through three interviews each the researchers were able to gather that both David and Carolyn improved their PCK, from the collaborative planning, they all reported back that their students benefited from different teaching methods because of this strategy (Wu and Yu, 2017). This more recent day research supports ideas suggested almost thirty years ago, providing support for Shulman's early work and the strategies suggested for effective teaching and learning.

Shulman's initial review, Knowledge and Teaching: Foundations of the new reform (1987), is prominent in the majority of research regarding TK. Initially referring to the case study of 'Nancy' the review stresses how TK allowed Nancy to teach in an exciting way. Initial links were drawn between TK and classroom management, Nancy's knowledge of the literature studied allowed her to use different ways to teach her students. This initial and early research in terms of TSK research case study support ideas that were later presented. These state that the most important area is what teachers know and how their knowledge is expressed in

teaching (Connelly, Clandinin and Ming Fang He, 1997). Supporting the validity of Shulman's work. Shulman quotes the Holmes Group and Carnegie Task Force suggesting that TK should frame teacher education and directly influence teaching practice (Shulman, 1987). Showing support for the initial thinking of TK research. However, Shulman's initial work doesn't tell us how or where this knowledge base comes from only that it is important. Suggesting that TK is important to teaching and learning.

Shulman's review (1987) suggests the idea of seven categories for a teacher knowledge base. Specifically, Pedagogical content knowledge, directly quoting Shulman (1987) 'it represents the blending of content and pedagogy into an understanding of how particular topics are adapted to the diverse interests and abilities of the learners'. There is some debate on which of these seven categories are the most important, there is also a level of debate concerning the formation and the structure of the knowledge base. Shulman (1987) stated that content knowledge and pedagogic knowledge are the most important, however, at the time of writing the review, there was minimal support for this view presented by Shulman. Later research does not completely disregard this view, but it creates a view on how this knowledge base is formed and implement into successful teaching strategies. It's stated that a teacher develops part of their knowledge base through reflection and with the collaboration of others, incorporating content knowledge and pedagogic knowledge for successful teaching (Leijen et al., 2014). The case study of Nancy supports this point of research.

In general, research supports Shulman's PCK. There is however a relevant point to note. Ball et al (2008) suggest that Shulman's work is to subject-specific, they also suggest that the findings are to scientific. With question marks over the importance placed on the child. With changes to the curriculum and Donaldson (2015) suggesting we should focus on areas of learning and not specific subjects, with importance being placed on to the individual pupils. With the new curriculum being developed to include Donaldson's (2015) thinking, the question arises how we should consider PCK initial foundation when considering effective teaching and learning in the future.

However, even with some small contrast, the review led the way for more teacher knowledge base research. A huge amount of research centred around his PCK (Pedagogic content knowledge) idea. In 2018 one-hundred preservice german teachers were split up into Five groups. The two control groups were each fed content knowledge or pedagogic knowledge. It was found that the group fed CK made small improvements overall of PCK. However, the group fed PK showed medium improvements (Tröbst et al., 2018). This suggests that pedagogy is as valuable as CK. This research takes PCK further and implies that a high level of PCK allows teachers to teach topics they haven't before.

A study in 2016 looked exactly at this. It concentrated on how primary school teachers develop CK for subjects they haven’t taught before (Hultén and Björkholm, 2015). It was suggested that Primary school teachers have three habits developed from previous experience. Hultén and Björkholm (2015) found that the two experienced teachers were able to use previous PCK to inform CK on the technology topic they were tasked to teach. They believe that believe that their study underlines the importance of reflection on teaching, making the teachers owners of their professional development and collaboration between teachers (Hultén and Björkholm, 2015). This conclusion leans on The Knowledge Quartet (2003), where experience impacts PCK, improving effective teaching and learning.

Rowland’s, Knowledge Quartet (2003) is more recent thinking Shulman’s PCK. Rowland along with others (2003), state that there are 18 categories to a teacher's Knowledge Base, split into 4 units, Foundation, Transformation, Connection and Contingency. Their research suggested that a knowledge quartet is a tool for thinking about how subject knowledge comes into play in the classroom (Rowland et al., 2003). They state that the unit Foundation includes beliefs and understanding, in relation to pedagogic knowledge. Transformation concerns knowledge in action, Connection centres around progress and joining all learning together with Contingency concerns responding to learners and deviation. The case study of ‘Naomi’ demonstrated a student teacher going through the stages of the knowledge quartet. The study

states that with access to the quartet that there may be improvements in the review, this can be linked to the idea of reflection and growing a knowledge base. The conclusion presented, suggest that a novice teacher goes through a period of reconciliation of pre-existing beliefs, new theoretical knowledge, practical advice from various quarters (Rowland et al., 2003). This suggests that under the knowledge quartet, teachers classroom experience to help build their own knowledge base, and in turn will improve the effectivness of lessons.

Stated above are keys theories regarding subject knowledge. Both note that a teachers classroom experience is crucial for a knowledge base to grow, however, shown through both the Nancy and Naomi case studies a pure knowledge base is not enough for effective teaching in the primary school. Shulman (1987) references the blending of content knowledge and pedagogic knowledge. When looking at student teachers like Naomi this point is proven. Naomi struggled to implement her knowledge. During the lesson observed, Naomi was unable to deliver a specific point to a child, after trying a number of different ways. The Knowledge Quartet would suggest that Naomi's connection was not good enough. Research supports this area for implications in teaching as a whole and the effectiveness of learning upon limited pedagogic knowledge.

Research has found that there needs to be a focus on the scope and coverage of subject knowledge, combined with the understanding of this knowledge within a classroom and how that is effectively transferred over to a child (McNamara, 1991). This supports the idea that basic or comprehensive subject knowledge is not enough for effective teaching, however, it suggests that with a knowledge base including pedagogy there will be more effective learning.

Researchers have linked subject knowledge research to cognitive psychology. Cognitive psychology states that knowledge is not solely one thing but knowledge is 'knowing what' and 'knowing how' (Guerriero, 2017). Guerriero (2017) goes on to suggest that it is the knowing how rather than just the knowing what (subject knowledge) that increases teacher

performance and effective learning. This assumption of cognitive psychology strongly supports the idea of blending content knowledge and pedagogy for effective teaching.

By analysing the literature presented it is evident to see that the research presents a combination of both good levels of content knowledge and an understanding of pedagogy for effective teaching and learning. However, there is some need to understand this relationship better to improve teaching and learning. Ball (2008) through research provides this assumption, content knowledge is immensely important to teaching, whilst pedagogic knowledge should not be taken as a given. Despite the relevance of PCK for instruction and student outcomes, causal evidence about the mechanisms underlying its formation is scarce (Tröbst et al., 2018).

In part conclusion, there is a whole range of knowledge base needed for effective teaching, subject knowledge dirceted specifically to subject content knowledge is not enough. Ben-Pertez (2011) can't state this better, within-subject knowledge you have to have knowledge of, the curriculum, how people learn; different learning strategies to suit the learners. The opinion formed from the research presented would state that you need a wider knowledge than just subject-specific content knowledge i.e. Pedagogic knowledge as well.

Analysis and evaluation of my subject knowledge

I will specifically discuss a number of areas where my subject knowledge was questioned, whilst noting an occasion where more subject knowledge helped to develop a child's learning further; discussing what happened and how this could be overcome in the future, drawing these examples back to theory where appropriate.

Whilst on teaching practice (School A) there was one specific session that stands out to me where I feel that my content knowledge lacked significantly and didn't allow the session to progress as planned. This was our EPIC session looking at the class topic of Let us entertain you. This particular session was with the entire reception cohort the aim was to introduce and explain the class topic to the children and have them feedback with ideas about what they

wanted to learn. Donaldson (2015) states that children should have a say in what they learn and benefit from personalised learning. The aim of the session was to allow the children to have their say on exactly what they thought the topic meant and how they want to learn about the topic.

Going into this session I felt I had effectively planned (See LP 1) and was prepared for what needed to happen. I introduced the topic and allowed the children to think independently and in pairs to ensure everyone had an answer. After asking the children what they thought the topic meant and what they wanted to learn, I quickly realised that the children didn't understand what we were trying to do. At this point, I found that my subject knowledge was not enough to try and explain the topic and re-guide the children on to the correct path. This to me presented the realisation that I can't take subject knowledge for granted, I need more than a basic understanding of a topic (See ARC 1).

This session could have gone differently by widening my understanding of the topic beforehand. I also think that speaking to the class teacher beforehand about the structure of this session would have been more beneficial, I had not observed a session like this, it was also the first time I had taken charge of all 68 reception students. I believe the key point of the session was when I was unable to present the limited knowledge I had to the children when they started to find difficulty with the task. This is where If I had a greater subject knowledge which would have allowed me to put an explanation across that made greater sense to the children. The challenge is having a coherent and causal explanation that makes sense to the children (Parker and Haywood, 2000). By understanding this I think I would have been able to overcome the shortcomings in this particular session.

During my time in school A, I was tasked with planning phonics continuous provision. After going through all phase two letters throughout the weeks, I used a ‘car park’ activity (see LP 2) to familiarise the children with phase two tricky words whilst also doing teacher guided exercises during registration sessions. For one particular child, this activity was easy, they were

more concerned as to why these were ‘tricky’ words. This was something I struggled to explain to this pupil, I understood the concept of tricky words and why we call them tricky words but portraying to a child that they are called tricky words because the letters make a different sound than the sound they had previously learnt for that letter I found difficult on that day. Early on in PTE, I took my subject knowledge for granted and was caught out. I planned a data handling session which included an outdoor nature hunt (See LP3 & R1). I identified 6 things that I wanted the children to find whilst outside, however, I was not prepared for a number of questions asked about different items they found, I as well as the children also struggled to find some of the items I had put on the nature hunt resource. I started to rush this portion of the lesson rather than engage in these questions because I was unsure of the answers.

The two points above are easily overcome, I felt assured that I had the content knowledge about tricky words and why they were stated this way. The problem was effectively explaining this to the child. To overcome this I would look towards widening my knowledge on phrasing and presenting the information to children. This provides evidence of Shulman’s (1987) PCK research findings. I had the content knowledge however I didn’t have pedagogic knowledge to explain this to the child effectively. Regarding the nature hunt data handling session, the easy way to overcome the problems I had here and improve my subject knowledge was to improve preparation and pre-walk the area I was going to take the children. This would have allowed me to research anything I wasn't sure of and plan my resources accordingly. To link this to theory appears straightforward, Rowland’s Knowledge Quartet (2003) would suggest that this links into the contingency are of the knowledge quartet. Research surrounding The knowledge Quartet suggest contingency plans develop over time. Research suggests that the reflection of a teaching event can significantly contribute to future planning and instruction (Hall and Smith, 2006). I hope to remember this teaching experience to improve future practice in all areas.

There was an area that I was concerned about before starting PTE when directly thinking about subject knowledge. I was most worried my subject knowledge would be tested

when teaching Welsh lessons. I was also concerned about the use of incidental Welsh throughout my teaching. Throughout PTE I took time to grow my foundation of basic Welsh for everyday use. I felt that this had developed considerably through my time on PTE. It had been noted how my Welsh had improved and for the age, I was teaching it was adequate. The first Welsh lesson I taught was centred around 'Sut wyt ti heddiw?'. I felt I was prepared for this because it was a question I asked the children every day, during morning check inns. I always received the same responses from the children so I felt suitably prepared for this session. I did minimal research for this lesson but created some emoji faces as resources to help the children express the feeling they were trying to say.

This particular session went well until a child mentioned the word 'cyffrous', this is where I noticed a significant gap in my subject knowledge. Although I had heard this word before I was unsure of the meaning, I just couldn't remember exactly what it meant. With fear of appearing to the children that I was unsure about this I quickly brushed over this comment and asked for them to give me a different explanation. In hindsight, I should have asked for the child to expand on this and asked them to tell me what it meant and be happy that a child at such a young age was able to use prior knowledge and relate it to the current session. This is reflected in the foundation stage of the knowledge quartet (Rowland, 2003), the knowledge base I had wasn't good enough. This could also be reflected in the contingency stage as I didn't positively react to what this child had said. To overcome this particular point more planning of the lesson to understand all answers that could be given, I think a wider knowledge of the Welsh language would have also helped me in this lesson. I will continue to try and learn more Welsh to make sure this does not happen in future practice.

In an evaluation of my own subject knowledge during my time in School A, I would suggest that areas of my subject knowledge were exposed on a couple of occasions. From the few examples referenced above, it's easy to see that on more than one occasion it was not my subject knowledge that was being exposed but getting this knowledge across to the children. The Knowledge quartet would suggest that it was the transformation and connection of my

subject knowledge that needed working on. This links directly into Shulman's (1987) theory of PCK, from my analysis of my own experience I can see how having content knowledge, is not enough and having knowledge without the ability to present it could be seen as useless. The effectiveness of some of my lesson was affected because I either lacked crucial areas of subject knowledge or failed to present that information to the children.

My belief that subject knowledge is important is hugely supported by a specific experience on PTE. I had planned for myself and additional adult to assess foundations phase pathways in maths and see if there was any development from the start of the year. As expected most children had made steady progress. However, one child had surpassed the foundation phase pathways. Prior to the lesson, I had done research on all levels expected at each year group. As a result of this content knowledge I had this particular child move on to do the specific pathway targets for year 3 and 4. As a result, this child was challenged and was able to take something out of the lesson. To analyze this incident is straight forward, the theory would suggest that I was able to implement all four stages of the Knowledge Quartet to allow this child to progress further. To me, it shows the importance of having more than just a foundation of specific content knowledge.

When returning to PTE I will be returning to School A where I have been placed in a year 5 class for the duration of my experience. I feel that my subject knowledge was adequate for the reception class I was previously in. On returning to the school I expect this to be stretched and challenged more on a daily basis in this new class than it was previously. From the analysis above I can see that preparation is going to be key for myself to improve my own subject knowledge, with future experience being crucial to the development of how I present this knowledge.

To part conclude this evaluation of my own subject knowledge it's important to return to successful futures. Donaldson (2015) suggest the inclusion of areas of learning in the new curriculum. With the new curriculum becoming implemented in the near future it is evident to

me that subject knowledge will become even more important for effective learning, as children will be able to independently explore, developing and asking more questions. In an evaluation of my own personal experience it is evident to see not just the importance of subject knowledge but the importance of being able to deliver this knowledge to the children, as stated without that ability the knowledge could be seen as useless.

Conclusion

It's important to state the prominent impact Shulman's PCK theory has had on teacher knowledge base research, Shulman's (1987) work is throughout modern research and its implications have been noted in a number of studies including Rowland's Knowledge Quartet (2003). It is clear to see that through this research there is an important link between subject knowledge and effective learning. The case studies presented show the links between subject knowledge and effective teaching and learning. However, in the case of Nancy, in particular, they show the links between subject knowledge and other factors. To support this assumption, it's important to include one final finding of recent research. Through Observations, it was noted that subject knowledge has been found to be effective to a teachers performance, but it is high levels of pedagogical efficacy and the ability to present age appropriately that positively affect children's learning (Fung et al., 2017). Through this analysis I have found there is a huge amount of research supporting the importance of subject knowledge with little research supporting the contrary, however, research does include other factors that can be seen to be as important.

Using a review of my own subject knowledge it's easy to see how my own subject knowledge helped to progress learning but also hinder the effectiveness of learning during stages of PTE. It is, however, a too simplistic conclusion to just state this. This is reflected by Shulman's PCK, even though content knowledge is seen as important there are still 6 other units which have an impact. To fully conclude, from my personal experience and the research presented it is clear to see that subject and content knowledge are important for the effectiveness of learning. However, both my experience and research presented highlight other

areas that are as prominent in the effectivness of teaching that should not be overlooked for the progression of teacher standards.

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