

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

Introduction:

During this assignment, I am going to critically investigate the relationship between subject knowledge that a teacher has and their effectiveness as a classroom practitioner. This will begin with a review of previous studies that have looked into effective teachers and how their subject knowledge has played a part in them being effective. Although the literature review is a critical review of the available literature, there are no authors who disagree that subject knowledge is linked with quality teaching. What is interesting within the literature, is how different academics view the importance of subject knowledge. With Wales edging closer towards a new curriculum, that is due to be implemented country wide by 2022, reference will be made to how Professor Donaldson has determined how teachers will be judged as effective within the new curriculum and how subject knowledge plays a role within ‘Successful Futures’ (Donaldson, 2015). The second part of this essay will be a reflective analysis and evaluation looking into how I have viewed my subject knowledge during my first block of my first professional teaching experience. The reflections that will be discussed were acquired at an urban school within South Wales that has over 200 pupils, with 45% of those being eligible for the ‘free school meals’ initiative. The age group I worked with predominantly, were pupils aged between ten and eleven years old. The structure for this section will be in the form of the knowledge quartet proposed by Rowland et al. (2003). Conclusions will then be made on what has been discussed in the reflections, and targets will be put in place to allow for my teaching to be improved.

Part 1 – Literature Review:

For a teacher to be classed as 'effective', it is of great importance that they have a solid understanding of the subject they are going to teach (Kleickmann et al., 2013). Many other authors prior to Kleickmann et al. (2013) have investigated teaching quality and agree that content knowledge is one of the key features in an effective teacher (Alexander et al., 1992; Prestage and Preks, 1999). Shulman (1986) was one of the main contributors into looking at what factors are needed to allow for quality teaching. He suggested that not only does the educator need to understand the content of which they are going to teach, but they also need to understand further, why it is of importance (Shulman, 1986). Shulman revisited the importance of looking at effective teaching in 1987, with a study that explored the categories within the knowledge a teacher possesses. The categories came under the label of the 'knowledge base' (Shulman, 1987). There were seven categories that were identified, with the 'pedagogical content knowledge' being of great interest to the author as it connects the knowledge a teacher has of a subject and the knowledge of the pedagogical principles. This allows for a teacher to understand how they can change their teaching to meet the needs of individual learners (Shulman, 1987). This study opened the door for other researchers to explore the links between content knowledge and effective teaching, but it is not free of its criticisms. Although the findings can be transferred to primary education, the study solely looked at secondary school teachers. It could be argued that it is vital that secondary school teachers have a great understanding of their subject. However, this can have an impact on primary teachers as they are delivering a wider range of subjects at a lower level. If it is vital that a teacher (primary or secondary) has excellent content knowledge in all areas they are going to deliver, then primary teachers would need to have a longer training programme to allow them to reach this standard. Admittedly, content knowledge is of great importance, but there are other areas that carry equal weight when dissecting effective teaching.

More recently there have been studies that have considered what specifically are the ingredients of an effective teacher. Coe et al. (2014) reported that there are six key features of a quality classroom practitioner. These include, appropriate

assessment of students, excellent rapport with pupils, a well-established behavioural management system, and strong beliefs to do with their teaching and having professional links with parents. The sixth imperative element from their findings was the teacher's pedagogical content knowledge. This links to what Shulman (1987) identified in his study and shows that it is still valued as a key feature today, as it was thirty years ago. What is interesting is that there are other components that work alongside a teacher's pedagogical content knowledge to shift them from being adequate to outstanding. Within Coe et al.'s (2014) study they found that there was strong evidence for students progressing academically whilst a teacher employed excellent questioning and assessment techniques as well as having a wide range of knowledge around the subject area they were teaching. The other components they identified either showed a moderate or slight progression in academic performance. Although subject knowledge showed a strong link with progressing students academically, teachers will be judged on their effectiveness as a practitioner through how well the pupils have achieved. This is mostly found whilst the teacher has assessed the pupils. So, unless a teacher has an excellent approach to student assessment, they are unlikely ever to be judged as an effective teacher (Coe et al., 2014). The study undertaken by Coe et al. (2014) used over 200 pieces of research to come to their conclusions, therefore it could be argued there is a strong validity to this study. On the other hand, it is not totally clear which educational phase (primary or secondary) the data has been derived from. For this reason, it could be argued that this study should be viewed with caution.

Another study that felt that there is more to effective teaching than excellent subject knowledge, was a research project undertaken by Murphy (2012). She looked into trainee teachers and their approaches to teaching the topic of 'area' within mathematics. All the trainee teachers involved had varied levels of mathematical background, one trainee had gone as far as having a General Certificate in Secondary Education at Grade C, whereas another trainee had an Advanced Level General Certificate of Education in Further Mathematics. The initial feelings prior to the study were that within mathematics, teachers should understand the topic to allow for the students to become active learners (Murphy, 2012). What was found within the study slightly disagreed with this. The prospective teachers who had less confidence within the topic of 'area', tended to research pedagogical ways to teach the topic to overcome

issues they may have had (Murphy, 2012). This links to results found in Shulman (1987) and Hill et al. (2005) that there is a need for pedagogical content knowledge and specifically the knowledge of 'how' to teach a topic to allow for a teacher to become effective. Although this study is insightful into looking at the links between subject knowledge and effective teaching, it may not be the most relevant piece of research. This is due to the small sample size (4) and the fact that trainee teachers were involved, who (more often than not) would have less subject knowledge naturally than a more experienced teacher. The research also only looks into the subject of mathematics. For these reasons, it could be argued that the results from this study should not be used to over generalise all primary school teachers (Murphy, 2012).

Prior to Murphy (2012) looking into trainee teachers and their subject knowledge, Rowland et al. (2003) wanted to investigate how content knowledge is revealed within trainee primary school teachers whilst they are teaching. They reviewed 24 videotapes taken of trainee teachers (Huckstep, Rowland and Thwaites, 2003) teaching mathematics. One of their (Rowland et al., 2003) main focusses was the pedagogical content knowledge (Shulman, 1987) that the trainee teachers had. They were able to use the results from their study to create four units that were used to identify how content knowledge came into effect while the trainee was teaching. These units can be seen as a process of how a teacher teaches and why they teach in a certain way (Rowland et al., 2003). The four components of the process directly link to the findings from Shulman (1987). The first part of the unit is 'foundation', which is all to do with the trainee's beliefs and understanding which have been developed over time. These 'foundations' allow the trainee to set up the conditions for how they believe the pupils will best learn, through the pedagogical theories and strategies they have learnt themselves. This particular component links closely to the 'content knowledge' section within Shulman's (1987) 'knowledge base'. The second unit of the process is 'transformation'. Within this section the teacher would use their prior content knowledge to create examples that the pupils would be able to understand (Shulman 1987). The third element comes under the heading 'connection'. This relates to how the teacher orders particular tasks within their lesson and how they link lessons together. The final section of their process is named 'contingency'. It refers to moments within a lesson when the teacher finds themselves in situations out of their control. Their subject knowledge can have an impact during these types of moments (Rowland

et al., 2003). The findings from their study allowed for teachers to dissect their practice using the process and with reflection they could improve their teaching to become as effective as they possibly can be. The only criticism with this research is that it only looked at teachers delivering mathematics lessons. On the other hand, they did specifically use primary school trainee teachers, and this is arguably the most relevant piece of literature that has been critiqued in this review.

It was mentioned earlier that Wales as a nation, are currently in the process of reforming their curriculum that is due to be implemented into every classroom within the next 3 years. Professor Donaldson (2015) believed that up until recently, the curriculum has been heavily based on the belief that content knowledge and descriptions as to what should be covered in each subject are the best way to an appropriate education. He felt that within the new curriculum there was a need to discard individual subjects and turn to a system that is shaped in terms of key skills and particular areas of learning (Donaldson, 2015). Within the new curriculum, every teacher is going to have the same three curriculum responsibilities they are expected to implement into their lessons, regardless of what they teach. These are literacy, numeracy and digital competency. Also, all teachers will need to have the four key curriculum purposes (ambitious and capable learners, creative contributors, ethical citizens and healthy individuals) in their mind when they plan their lessons, if they are going to be judged as effective (Donaldson, 2015). With this in mind, it is quite clear that if all educators are going to have a duty to improve their pupils in these areas, they are going to need to have a great breadth of knowledge (Rowland et al., 2009). He reported further on what would be classified as an effective teacher within this new curriculum. He argues that there are 12 key features that define effective teaching. The main feature that flows through all his aspects of a quality teacher is the need for the teacher to have a sound understanding of pedagogy (Donaldson, 2015). This links with other authors (Shulman, 1987 and Rowland et al., 2003), who all believe that the need for a teacher to have a great understanding of pedagogy allows them to have a positive impact upon pupil performance. Although he argued that the current curriculum has been built on the certainty that subject knowledge is one of the best ways to lead to a suitable education, he does state that subject expertise is an element of a good teacher (Donaldson, 2015).

In light of reviewing a sample of the literature, I will now reflect upon my own practice during my most recent professional training experience.

Part 2 – Analysis & Evaluation:

Whilst I was on my first professional teaching experience I was teaching around fifty percent of the allotted teaching time available. During this time, I taught two mathematics lessons per week on average. From reviewing the background literature (above), I feel that it would be appropriate to use the 'knowledge quartet' to review my mathematical experiences whilst I have been on my first teaching placement. This is due to the research conducted by Rowland et al. (2009), which used the 'knowledge quartet' as a method of reflecting upon trainee teachers experiences within the teaching of mathematics. I will structure my reflections using the four main elements of the 'knowledge quartet' process.

Foundation: I am very interested in mathematics and studied the subject up until I began my undergraduate degree in 2011. I achieved an Advanced Level General Certificate of Education at Grade C in Mathematics. With this qualification I feel confident with my subject knowledge within most topics within the primary mathematics curriculum. Whilst on my first teaching practice my tutor asked if I would be able to deliver the topic of 'area' over the next week. My pedagogical beliefs in reference to teaching the introduction to the topic of 'area', are that it is best to deliver the lesson through a behaviourists approach. This belief has arrived from researching authors such as Skinner (1957) and others (Pound, 2006), who have agreed with that a behaviourist approach works effectively within the teaching of mathematics topics. Once the students have understood the methods of working out the 'area' of a shape, then a social constructivists approach (Vygotsky, 1978) would be beneficial to get the pupils to engage with the topic. As well as my pedagogical knowledge beliefs, I used my knowledge from studying the literacy and numeracy framework (Welsh Government, 2014) and the specific textbook that the teacher uses to teach mathematics. I found that the target for the pupils I was working with, was the ability to calculate the area of squares and rectangles. I also used my knowledge from

observing the students in the class during my observation week and worked out what engages and interests the pupils. From reflecting on this component of the quartet, I believe that the information I gathered from observing the pupils and working out what engages them, was beneficial to get me to understand how best to deliver the lessons I had planned (Rowland et al., 2003). I feel that it was of more use to me to find out what engaged them rather than how much I personally knew about the topic.

Transformation: Within this section of the process I needed to use what my beliefs and prior knowledge were for the topic 'area' and try to 'transform' it into examples or activities that the pupils will understand and engage with. From the knowledge I gained from observing the pupils, I found out that one of the ability groups were very interested in an online game called 'Fornite'. Within this game, there are different areas where the players can visit and explore. Using this information, I felt that to get the pupils to engage with the topic I needed to integrate this game within my lesson. I printed off 'bird's eye views' of a couple of the different areas within the game and added labels detailing the length and widths of these areas. I also found that the highest ability group seemed to have a common interest in sport. For this group I found two pictures of two rival premier ship football club pitches and added labels detailing the length and widths of these pitches. For the final ability group, there was a common interest in the singer 'Ariana Grande'. For this group, I found where she has performed recently and got a picture of the stage she performed on and labelled the length and width on the picture. It was a positive sight to see these pupils 'light up' once the worksheets were handed out. They were instantly engaged in the task and wanted to work out the area of the pictures as quickly as possible. This was interesting, as I had observed the teacher deliver an introduction to the topic 'area' during the last mathematics lesson, using the textbooks in the classroom. The pupils were disengaged in this lesson and one of the reasons I feel they were, was down to the tasks within the textbook were not relevant to them personally. For this section I feel that made a positive impact on learning by creating resources that were personal to the class rather than generic resources such as the textbook. My resources linked directly to the target in the literacy and numeracy framework (Welsh Government, 2014), as all the pictures were either squares or rectangles. The task also built on prior knowledge they had gained from the introduction lesson to 'area' with their teacher, in the maths lesson before. I followed a social constructivists approach to the delivery of the task as the pupils understood

the method and all I needed to do was act as a facilitator (Vygotsky, 1978). For me to improve my practice within this area I feel that I need to improve my questioning techniques. For this I will use Bloom's (1956) taxonomy as a template to initiate higher order thinking and active learning.

Connection: Within this element of the process, the teacher makes decisions about when linking lessons together and uses prior knowledge to make these decisions. The theme for the half term whilst I was working in the class was 'Off with her head', which is a Tudor topic. The final mathematics lesson I planned whilst on placement was a lesson that would link the 'area' topic that we had been doing and the theme across the half term. I also made every effort to make Welsh connections for the pupils using the curriculum cymreig document (Welsh Government, 2003). I found out that one of the Tudor kings was actually born in Pembroke castle, and made sure I used that castle in the task. For this lesson I introduced the pupils to three castles that were occupied by someone from the Tudor family during their reign. The pupils were then tasked with finding out the areas of different rooms within each of the castles. They then had to justify which castle should hold the banquet (the castle with the largest area). The highest ability group had become very competent in the standard (the ability to calculate the area of squares and rectangles) for their age group within the literacy and numeracy framework (Welsh Government, 2014). To progress these pupils, I looked at the next standard on the literacy and numeracy framework (Welsh Government, 2014), which was, the ability to calculate the area of rectangles and triangles. I implemented this into the cross-curriculum lesson and the high ability group had to work out the shaded right-angled triangles within each castle. I feel that within this stage of the process I planned a lesson that developed the pupils understanding of the mathematical concept of 'area' further by creating a lesson that linked a number of topics together. They used their prior knowledge from the previous lesson when they were calculating the areas of places or things that are personal to them, and their prior knowledge of the Tudors that they had been doing in their 'theme' lessons. I feel that this skill is going to become very important when the new curriculum (Donaldson, 2015) is fully implemented. I feel that it is going to be more common for teachers to link topics together as the three curriculum responsibilities (literacy, numeracy and digital competence) are to be at the heart of all learning.

Contingency: This element of the process, links to situations within practice, that the teacher has no control over and could not have planned for (Rowland et al., 2003). During my experiences whilst delivering the topic of 'area' there was a time when I had to think quickly and come up with a solution that I had not planned for. During one of my lessons, I found that one particular pupil was working out the perimeter of the squares and rectangles rather than the area. They were using all the measurements on the shape (the two length measurements and the two width measurements) and using their prior knowledge and immediately adding all the measurements together. As the pupils had an introduction to 'area' the lesson previously, I had not assumed that any of the pupils would get confused and work out the perimeter instead of area. This could link to the findings from Allan (2007), who found that issues regarding difficulties in learning could have come from previous inadequate teaching. I decided at this moment to work closely with this pupil and revisit the introduction to 'area' and use key terminology such as, 'space filling' to gain their understanding. I also made sure I quickly adapted their worksheets so that they only were given one length measurement and one width measurement. I also put a grid within the shape, so this pupil could count the squares to work out how much 'space was being filled' and thus working out the area. I feel that in this moment it was very important for me to use my prior subject knowledge of the topic to understand how this mistake or confusion had arose and how best to correct it. I also feel that it was vital that I knew enough about that particular student to enable me to deliver the learning in a way that they would be able to relate to and understand.

Conclusion:

To conclude this assignment, I agree with Shulman (1987) and Rowland et al. (2003) that a teacher does need to have sufficient subject knowledge to become an effective teacher in the primary school. During my experiences with teaching mathematics whilst on placement, I was able to use my prior knowledge to help me overcome difficulties or situations quickly if the pupils were showing signs that they did not understand the task. I feel without this knowledge I would have found it difficult myself to help develop the students learning. However, I also agree with Coe et al. (2014) and Donaldson (2015) that there is more than one feature (excellent subject knowledge) to an effective teacher. When looking back at my experiences I would not have been able to plan my lessons as effectively as I did if I had not taken the time to observe the pupils and find out what interested and engaged them prior to undertaking my mathematics lessons. With a new curriculum upon the horizon for Wales (Donaldson, 2015), I feel that it is going to be fundamental for teachers to have sufficient pedagogical content knowledge (Shulman, 1987) to be deemed effective, as there is going to be a need for teachers to be teaching cross curriculum lessons more often. In reference to Coe et al. (2014) who found that teachers who had implemented a quality assessment for learning program within their teaching, would more than likely see a positive impact in student performance. I feel that this is an area I need to work on to improve my teaching. As I stated in my reflections for me to do this I feel that I need to improve my questioning techniques and to do this I will reference Bloom's (1956) taxonomy to allow the students to develop deeper thought and to become more active within my lessons.

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