

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

Introduction

This assignment will discuss the relationship between teacher’s subject knowledge and the relationship it has with children’s learning. The assignment will compare key literature around the topic highlighting similarities and contrasts. Within the reflection I will use my experience from PTE 1 to reflect upon my own subject knowledge referring to specific incidents which took place during my PTE 1 placement. The school I was placed in for PTE 1 was an urban school based in Cardiff with 523 pupils on roll at the school. The catchment area for the school is largely prosperous but has an element of social deprivation. The schools’ latest published Estyn report was good; the most recent Estyn report (undertaken In November 2018 whilst I was on my PTE 1 experience) has not yet been released to the public. Currently 9.1% of pupils are eligible for free school meals with the budget per pupil being £3718. For safeguarding reasons, I shall not name the school or refer to any children or staff from within the school. The class I was assigned to was reception, there were 30 children in the class with two teaching assistants. For this assignment my ethical considerations are in guidance with BERA (2018).

Literature review

This section will discuss different perspectives on the relationship between teacher’s subject knowledge and children’s learning.

When looking at the relationship between teacher subject knowledge and effective learning and teaching in primary school; it is important to look at this relationship in the context of the environment that the teaching and learning takes place in i.e. Wales. Graham Donaldson’s (2015) review of the curriculum in Wales is the greatest proposed reform since the Education Reform Act 1988, when the National Curriculum was implemented across England and Wales. Appreciating the need to review the Welsh educational system given the poor rankings of Wales in the PISA results and the OECD report 2014 on Welsh education meant that the Welsh Curriculum and education system needed a complete overhaul. Consequently, new

professional standards for teachers in Wales (Welsh Government, 2017) put effective pedagogy at the heart of school improvement. The OECD report (The Welsh Educational Reform Journey: A rapid policy assessment, 2017) stated that developing a high-quality teaching profession was the key to Wales' improvement as was developing a new curriculum.

The new curriculum 'Successful Futures' proposed by Professor Donaldson would be a bottom up approach looking at a continuum of education from the ages 3-16. It would not only look at the subject content to be taught in the curriculum but also look at pedagogy and the best way to implement the curriculum, it would focus on six areas of learning all of which should underpin continuity and progression coupled with three cross curricular responsibilities across those areas i.e. that of literacy, numeracy and digital competence which were regarded as the foundations for learning so that young people can be successful and confident in the future. It would look to minimise those previous transition periods which had hindered progression in the past as it was a continuum of learning from ages 3-16 without phases or key stages, where a child's achievement was looked at each of the five progression steps.

There had been a great deal of debate on whether the curriculum should focus on teaching pupils knowledge or teaching them skills, Christodoulou and Caxton are two such opponents, Christodoulou (2014) argued that skills must be broken down and taught in their component parts often without the need for the child knowing what the skill being taught was, whilst Caxton a cognitive scientist believed that children should be taught in an environment where they can build resilience, resourcefulness and reflectiveness, where teachers design targeted activities to build greater confidence and a willingness and self -belief to meet future challenges. Certainly, Donaldson (2015) with his recommendations has advocated the middle ground, i.e. both a direct teaching approach where skills are specifically broken down and taught coupled with enabling children to develop an enquiring mind where they develop their ability to generically learn i.e. discovery learning/constructivism. Principles 3 and 4 of his pedagogical principles show this. Principle 3 "Good teaching and learning means employing a blend of approaches including direct teaching", whilst principle 4 maintains, "Good teaching and learning means employing a blend of approaches including those that promote problem solving, creating and critical

thinking” (Donaldson 2015). Shulman (1987) agrees with this as he believed that pupils clearly need to learn how to become problem solvers, become creative, critical thinkers as well as being able to learn methods and facts.

The proposed new foundation phase curriculum looks to discovery learning as its primary method for facilitating exploratory learning, where the teacher designs activities that allow the child to experience new things developing their confidence and self-esteem so that when they face a new challenge they will be willing to try and tackle that new challenge developing resilience; the intention must be to create a whole-school strategy for critical thinking, creative thinking and problem solving. However, this does not rule out the need for direct instruction as and when required.

What is key is that the only way that this can work is when teachers utilise their professional judgement and skills to select the appropriate teaching methods to ensure effective learning takes place. Even Shulman and Keislar in 1966 believed that even when using a discovery approach to teach a concept, a teacher needs to understand how pupils learn and how to construct the learning environment so that it is conducive to learning which is crucial in a discovery led environment.

Historically teachers were encouraged to view themselves as a teacher of children first as oppose to a subject teacher; which supported the National Curriculum in that it believed strongly in the view that skills were generic and taught through a specific subject. This certainly didn't consider any advancement or developments made in any specific subject's knowledge and the impact that it could have on children's future knowledge and understanding.

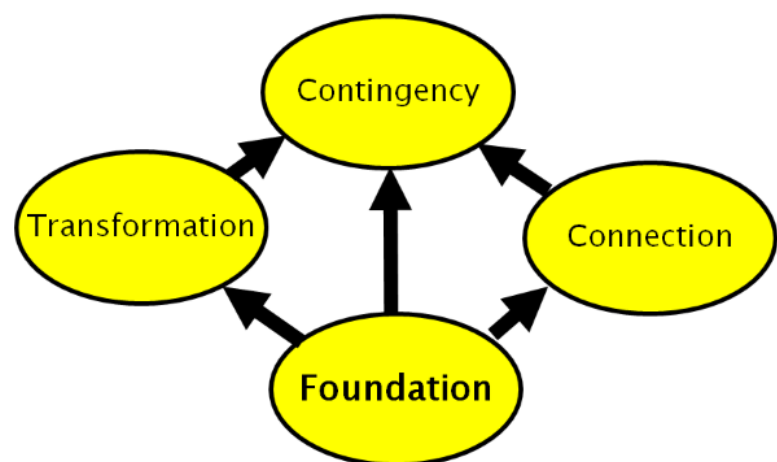
However, effective teaching has been linked to the importance of a teacher's subject knowledge and pupils' outcomes. Shulman et al (1986) believed that the role of content in teaching was the key to getting teaching recognised as a profession, in 1987 he categorised teacher knowledge into seven categories, teachers had to have a technical knowledge, a professional knowledge far beyond the ability to give high quality instruction and understand the need for good classroom management techniques. The last three of these categories being content knowledge, knowing your subject; the next curricular knowledge understanding what is to be taught at appropriate levels of pupils' ability etc and the most important pedagogical content knowledge where a teacher knows how to distil and break down the content into

meaningful and manageable parts utilising a variety of techniques, examples, diagrams, picture etc to illustrate the point. The teacher can anticipate where the pupils will experience difficulties and be ready to deal with any misconceptions. This one was regarded as the most fundamental element of teachers' knowledge and has been studied widely since. Despite being an essential component to developing teacher's general pedagogical knowledge has not been the object of many research studies.

The Independent review of the Primary Curriculum emphasised the importance of subjects in planning for progression across the curriculum. Consequently teachers; subject knowledge is key as it underpin the purpose and content of the curriculum. A report by Ofsted in 2009 looked at Improving Primary teachers' subject knowledge across the curriculum acknowledged the benefits to pupils of the good subject teaching they witnessed.

Research into the quality and effectiveness of primary trainee teachers and their mathematical knowledge highlighted what has been condensed and named as the Knowledge Quartet, this is a tool which enables us to think about how subject knowledge is utilised in the classroom. The quartet is broken down into four key areas.

Figure 1.- Four-dimensional framework for the analysis of mathematics teaching.
(University of Cambridge, 2004)



- a) Foundation: - This looks at the competency of the trainee and their mathematical subject knowledge. (This can be adapted to cover all subject

areas.) It looked at the fundamental values and beliefs each trainee had in their teaching of mathematics. It looked at the trainee/teachers' understanding of the subject, their regard for the subject and how they could create the correct environment for learning to take place. Shulman (1986) referred to the "special amalgam of content and pedagogy" needed for teaching the subject as PCK, Pedagogical Content Knowledge. It was then that research began to focus on content knowledge and on PCK, believing that they need to not only know what to teach but also to know the subject content and be able to teach it.

- b) Transformation: - Knowledge in action, both in the context of planning and teaching the subject. This clearly links in with Shulman's work on the ability that an effective teacher must transform that concept and transform it into a form e.g. diagrams, examples, demonstrations etc which the child can access and clearly understand. Providing such detailed explanations of the concept being taught was seen by Rosenshine (2012) as the trainee/teacher having excellent subject knowledge. Willingham (2009) believed that by using a wide variety of different techniques pupils can understand abstract concepts. The most important aspect of the 'transformation' quarter is the choices the trainee/teacher makes during their planning in order to teach the concept. Estyn (June 2018) supports this as its report into Improving Teaching highlights that the most effective teachers have deep subject knowledge and choose the best approach for the activity and subject.
- c) Connection: - This looks at how the trainee/teacher connects the new learning to what's been previously taught. The planning is key to ensuring that progression happens both in the lesson and between lessons. It will look at how the examples etc link together indicating the subject knowledge the trainee/teacher has. Coe et al (2014) in their review of research found that a teacher's understanding of how pupils learn, and their subject knowledge had a positive correlation to those pupils' outcomes. Similarly, Hill et al (2008) found that there is strong evidence to support that pupils' attainment is linked to the teacher's subject knowledge as this affects their practise and effectiveness in the classroom. Planning is key as is building those connections; pupils' need many examples to check their understanding and

ensure that what they are learning is being built on solid foundations prior to moving onwards, otherwise they become overwhelmed. Hattie (2012) believed an effective teacher helped pupils to develop an understanding of the methods and language of mathematics.

- d) Contingency: - This looks at what cannot be directly planned for. A trainee/teacher needs to respond to questions that may arise or misconceptions which may occur. It requires the trainee/teacher to veer from the plan as and when required, thinking on their feet. Consequently, being secure in their subject knowledge would support the trainee/teacher so that they don't feel anxious. This means that they need to be able to spot the misconception and explain what the student was doing wrong i.e. unpicking their method in order to ensure learning could take place.

Following on from Shulman's work (1986), when he emphasised the importance of both content knowledge and pedagogical understanding and skill in effective teaching; researchers have built on his idea that pedagogical content knowledge bridges the gap between content knowledge and the practise of teaching. Most of that research has looked at the subject of mathematics teaching and the role of the subject content in effective teaching- what content teachers need to know in order to have an effective impact on pupils' outcomes. Ball et al (2008) refined Shulman's initial categories of subject knowledge and pedagogical content knowledge as seen below

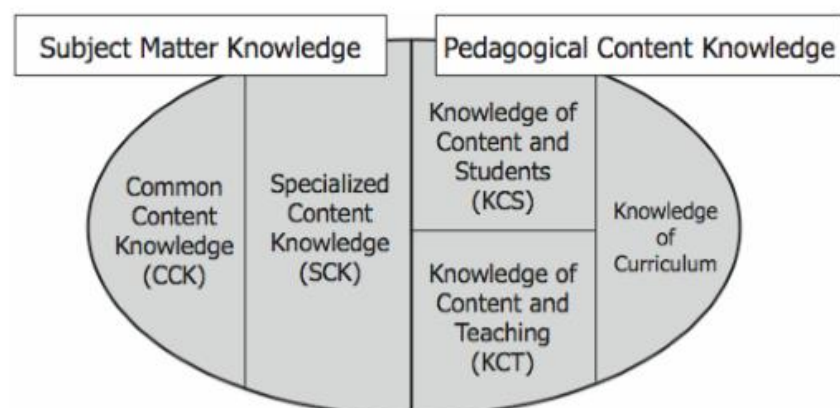


Figure 2 -Shulman's Original Category Scheme (1985) compared to Ball *et al* (2008).

Just as the contingency component in the quartet of knowledge advocates, the importance of teachers being able to react to what happens in the classroom, Ball et al (2008) believe that this comes through familiarity when the teacher knows the content and their students i.e. KCS, knowledge of content and students, in this case combining a knowledge and understanding of maths and their students mathematical thinking. KCT is when a teacher has the knowledge of mathematical content plus that of teaching; knowing when it is right to extend that students learning etc linked with the 'connections' component. Lastly, Ball et al (2008) discusses SCK, specialised content knowledge where he discusses the need to be able to utilise the specific subject knowledge to de-mystify the mathematical concept being taught, by planning for any misconceptions similarly linked with the 'transformational' aspect of the quartet of knowledge. All of which utilises the teachers' knowledge and understanding of their subject to unpick the concept they are trying to teach.

Reflection of own subject knowledge

When reflecting on my first placement and my effectiveness as a classroom practitioner and my own subject knowledge I am reminded that this is an area which needs to be developed as I have had little experience of working in a primary establishment prior to beginning my PGCE course.

Utilising the tool Knowledge Quartet (Rowland, 2005) I am going to reflect on my subject knowledge to determine any inadequacies I may have in the classroom and how this can impact on the quality and effectiveness of my teaching. I understand that primary teaching requires a depth of knowledge across many subject areas, not only knowing the curriculum content but having a deep understanding of the subject matter to be delivered, so that possible misconceptions can be planned for as much as possible and the content broken down into manageable parts that pupils can access i.e. transformed into meaningful portions. It was also evident from my placement experience that as Shulman had said earlier, pedagogical knowledge was also important as I need to be aware of where the pupils were at in terms of their individual stage of development in order to pitch the lesson content at an appropriate level. Obviously, none of this can happen unless the right climate for learning is created one

which is supportive and non- threatening, where the children feel comfortable, happy and safe, a place where they have positive relationships with their teachers. Children need to be 'happy' in their learning if they are to be successful, creative and develop that imagination and curiosity.

1st Quartet: - Foundation level, my own personal subject knowledge I believe was more than adequate to teach the curriculum content to reception class in all six area of learning and experience including the cross curricular areas of the curriculum as outlined in Successful Futures. However, two of the subject areas, the expressive arts and humanities areas are ones where I supported the class teacher working with individual children or small groups as oppose to directly teaching these areas of the curriculum.

However, in relation to pedagogical content knowledge PCK (Shulman, 1986), I believe this is where I experienced some issues with the quality of my practise e.g. Languages, Literacy and communication, as a non-Welsh speaker this is something that I am working hard to improve on and look for opportunities to practise and utilise the subject across curricular activities e.g. In my numeracy/mathematics lesson on the introduction of the number 8 i.e. place order, I used the opportunity to have the students count both forward and backwards in Welsh. I am also aware that I need to work on my phonics work i.e. with read write Inc., as whilst this seemed to go well, I was consciously anxious that I may not be as effective as I would like to be. Literacy is an area that I am aware I need to work on across the primary sector.

2nd Quartet: - Transformation level. Throughout the practice this was probably the most difficult ensuring that the content was broken down sufficiently enough to support the child's developmental stage, yet ensuring that learning, challenge and progression could take place. Understanding that decisions made during planning the lesson can impact on whether a child grasps that concept is fundamental to learning happening. During the maths lesson I spoke of earlier I used a variety of resources to transform my content into manageable appropriate pieces of information, as Willingham (2009) said this would mean that children could grasp the concept, such as the Number Blocks DVD, which gave auditory and visual opportunities, this proved to be a very effective resource as it both engaged and enthused the children helping them to retain their concentration on the task we were working on- as the concentration span of my

reception class could be minimal. I then used multilink cubes supporting kinaesthetic style of learning where the children had the practical opportunity to count and make the number eight in a variety of ways, e.g. 8 single cubes, 4 rows of 2, 2 rows of 4, an L shape with 6 and two cubes linked etc. Using all three types I found was effective, people learn in a manner of different ways and crossing between each style allowed the children greater access to learn. The practical aspect was to aid their understanding and get them to realise that 8 single link cubes have the same number of cubes as a 4x2 model- giving the opportunity to understand that it is the same amount. I also deliberately built in mistakes, asking the children to spot 'where I had gone wrong,' by counting and missing out objects etc as I counted and asking them what I had done wrong? What should the number be? I also used this idea of deliberately making a mistake in an ICT lesson to check if students were following what we were doing and communicate what was wrong. As Rosenshine (2012) stated the most effective teachers ask students to explain how the answer was found. Utilising this method to support oracy is important as pupils develop their reasoning skills. Donaldson (2015) explained the need for teachers to create a learning environment where pupils were confident enough to engage and explain what they were learning about in order to develop those communication skills. Throughout the maths session I used open questioning to check their understanding, Ko and Sammons (2013) believed this to be an effective mechanism to do this e.g. How can you make 8? What does octo mean? Encouraging sentences such as eight is one more than 7 etc. Doherty (2018) believed that questions are an essential part of a teachers' tool kit as research by Rubie-Davies's (2007) shows that teachers who ask more open questions have higher expectations of their pupils. Modelling was another feature I used effectively in a digital competence lesson on collecting and representing data to transform the learning and make it more accessible to my pupils.

Practical learning was evident in my PE lesson as part of health and well-being, however, whilst this is one of my stronger subject content knowledge areas and whilst I have had experience of delivering PE lessons before; this proved a very challenging lesson, the sheer numbers i.e. 30 four year olds all supposedly working on ball skills (football) was at times chaotic, with them just running around doing what they liked, balls flying everywhere. On reflection I believe this was down to the fact that I had not planned well enough and had not shared that planning with my classroom assistants

as to what role and responsibilities they were to take. I thought my subject content knowledge would be enough, but it was soon evident that classroom organisation was vital to the success of this session.

3rd Quartet: - Connections Level. Like the transformation level this proved quite challenging, finding out what they had learnt at such a young age was important before planning could take place, communication with the classroom teacher was key as I could not assume any prior learning had taken place. However, I needed to plan for any connections 'hooks' which could be put in place for future learning to also take place. I found it easier when planning to look at the topic and determine where I wanted to get to was paramount to my thinking. This is where I think a deeper subject content level of knowledge is needed. In the maths lesson highlighted I looked for further connections, as Coe (2014) advocated, i.e. links with literacy e.g. octo- meaning 8 so octopus- eight legged creatures, I also showed the class a picture of an octagon and asking them to count how many sides the shaped had connecting number to shape. Looking for connections will help those pupils master these concepts. It was also important that I took any opportunity to extend the pupils' language and understanding of mathematical concepts i.e. more than and less than etc. was introduced e.g. 7 is 1 less than 8 etc this continued with them randomly picking out a card from a number pack 1-9 and working out what was one more or one less than the number shown on the card- I did not introduce the symbols for more than/ less than as this was not appropriate to the pupils' current stage of development. Which corroborates the importance of the teacher's decision making when planning any lesson, the teacher needs to be aware of their students, KCS/KCT and the subject content that they can cope with at that moment-too much and effective learning will not take place as Estyn 2018 highlighted.

4th Quartet: - Contingency Level. This level was not utilised as much as it might have been had I been teaching a different year group with a group of older children. However, when teaching a science lesson on ice and completing an experiment on the different ways ice can be melted. I did have to adapt my original lesson plan to make it more appropriate to reception children, I had wanted to use candles as a heat source but for health and safety reasons this was deemed inappropriate for 4/5 year olds, consequently I used a hot water bottle, which I had filled which wasn't as effective but did melt the ice. Another lesson which didn't go so well was one of the earliest

maths activities; I had to deliver to the class was counting forwards/backwards from 1-20. This worked so well that we had finished 15 minutes too early and I had not planned another activity, consequently the teacher took the class back. I quickly learnt that when planning, be ready to adapt and always have a backup plan. Plan for the unexpected!

Conclusion

From all the research I have read and my own personal experience of delivering lessons in my reception class, I am very aware of the need to develop my own subject knowledge to support the quality of my teaching and the learning of those pupils I will teach in the future. Although initially on my first placement I was with reception children, I am aware that as I work with older children, some of whom may be a more able/gifted mathematicians; I need to be able to stretch and challenge those young people and ensure that my own specific subject knowledge is such that I am skilled enough to be able to: break the work down sufficiently as I understand which parts are easy hard, build connections between past work and future learning, be able to utilise a variety of methods to illustrate the concept in a meaningful and accessible way to pupils, have the ability to spot any misconceptions that pupils' may have quickly, understanding why they have gone wrong is key and finally be able to determine as and when pupils are ready to push on to the next step- to further develop learning.

My limited experience has taught me that subject content knowledge is not enough, neither is pedagogical knowledge alone if quality learning is to take place. I agree with Shulman that it is the amalgamation of both aspects coupled with the right environment conducive to learning that is required if it is to happen. Current and future practitioners must be aware of the processes they must go through if they are to improve pupil outcomes i.e. enhance their learning; the Knowledge Quartet which resulted from Rowland's research (2005) into mathematics teaching has credence across all subjects and must be the classroom practitioners starting point when planning how to deliver an effective lesson.

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