

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

Introduction

This assignment will critically analyse the relationship between teacher subject knowledge and effective learning and teaching in the primary school. Grigg (2010) emphasises that good subject knowledge makes an effective teacher throughout the ideas of pupil voice, suggesting that a great teacher should be knowledgeable, skilled at making lessons and interesting. Pupil voice within Grigg's text also depicts a great teacher as being clever, being able to explain, teaching maths and language, and having the ability to help with mistakes (2010). Pupil voice suggesting that a 'great teacher' needs to be knowledgeable raises the idea, how does good subject knowledge make an effective teacher?

I intend to consider literature within this assignment, considering the question of what is subject knowledge? And, how does subject knowledge affect teaching and learning in the primary school? I will synthesise literature offering different perspectives of subject knowledge and highlight similarities and differences within the literature. I will also look further into the current curriculum documents of Wales such as the Literacy and Numeracy Frame Work, and compare this to the new Successful Futures document, influencing the new curriculum in Wales, recommended by Graham Donaldson (2015), and think about what role subject knowledge plays within the curriculum.

Furthermore, I will analyse and evaluate my own subject knowledge using Rowlands, Hucksteps and Thwaites' (2003) The Knowledge Quartet to structure my reflection. I will draw upon my experiences within Professional Teaching Practice 1 (PTE 1) and consider ways I can develop my own subject knowledge. For my PTE 1 I was placed in a small urban school in Swansea in the Foundation Phase. There were 21 children in the class of a mixed ability. The identity of the school and the learners discussed will be kept anonymous and be referred to as School X and Learner A, Learner B and so on.

A Consideration of the Literature

Shulmans (1987) seminal educational review on subject knowledge has shaped the way that subject knowledge is now considered within teaching and learning. Shulman poses the question, 'Isn't teaching a little more than style, artful communication and knowing some subject matter?' (Shulman, 1987, p. 4) which built the foundations of his influential idea of 'The Knowledge Base'. Following the style of Piaget of observation, Shulman observed those learning to teach and doing so categorised teacher knowledge into: content knowledge, pedagogical knowledge, curriculum knowledge (tools of the trade), pedagogical content knowledge (professional understanding), knowledge of learners and their characteristics, knowledge of educational concepts (group work, community and culture) and knowledge of educational ends, purposes and values. Among the categories, pedagogical content knowledge (PCK) is of special interest as it represents the blending of content and pedagogy (Shulman, 1987). PCK highlights the idea that subject knowledge is more than just curriculum and content knowledge, and in order to become an effective practitioner PCK is crucial for learning and teaching in the primary school. The Knowledge Base answers Shulmans own question of 'isn't teaching a little more than knowing subject matter?' as it highlights the importance of the cross curricular blend of content and practice.

Pollard and Bourne (1994) refer to teaching as a professional activity of which 'teachers possess a body of specialised subject knowledge' (Pollard and Bourne, 1994, p. 8). When discussing teacher's subject knowledge, the ideas from Pollard and Bourne (1994) fit into the categories of Shulmans (1987) knowledge base. Pollard and Bourne (1994) suggest teacher's knowledge and classroom expertise are closely intertwined, and so this blend of content knowledge and pedagogical practice would fit into Shulmans category of PCK. Pollard and Bourne (1994) suggest another term of 'knowledge in action'. This describes knowledge which is embedded into the skilled action of the professional, similar to PCK suggesting that the two fundamentals of knowledge and skill are closely linked in order to create an effective learning and

teaching experience. Within the literature of both Shulman (1987) and Pollard and Bourne (1994) PCK stands at the forefront of knowledge for education. Another idea of PCK lead by Shulman however found within the text from Pollard and Bourne, is that PCK is the understanding of what makes the learning of specific topics easy or difficult (Pollard and Bourne, 1994). PCK therefore is the leading force behind the ability to differentiate work appropriate to the abilities of learners, and so without this seminal category of Shulmans knowledge base it could be said that effective learning and teaching in the primary school cannot be achieved.

More vocabulary used to discuss subject knowledge comes from Rowland, Turner, Thwaites and Huckstep (2009). They describe PCK similar to the ideas of Pollard and Bourne's (1994) knowledge in action, saying that PCK refers to how practitioners transform their own knowledge into an accessible form for learners, agreeing with Shulmans approach of the ability to differentiate work amongst learners, being able to break down ideas and concepts appropriate to the learners needs. Another term discussed by Rowland, Turner, Thwaites and Huckstep (2009) is subject matter knowledge (SMK). They suggest that SMK is concerned with both substantive and syntactic knowledge. Substantive being the facts and concepts of a subject, and syntactic being the process of establishment. Rowland, Turner, Thwaites and Huckstep (2009) do not preference either PCK or SMK yet hold them of equal importance. However, within the text the term common content knowledge is also explored meaning knowledge which non-teachers are expected to know. Specialised content knowledge is knowledge which only teachers are expected to have. It could be said that teachers are expected to have both common content and specialised content knowledge in order to be able to fulfil the needs of the learner within the classroom, and that PCK falls within the specialised content category, yet SMK may fall within the common content category as SMK does not totally depend on being in the classroom.

The Knowledge Quartet is a tool for thinking about the ways that subject knowledge comes into play in the classroom (Rowland, Huckstep and Thwaites, 2003). Again, influenced by Shulmans educational reform, The Knowledge Quartet divides subject knowledge into four sub headings, like Shulmans categorisation. The four subheadings of The Knowledge Quartet are: foundation, transformation, connection and contingency. These divisions break down subject knowledge into bite size pieces in order to digest the purpose and role of subject knowledge. Like Shulman, organising subject knowledge in such a way works efficiently for teachers to be able to identify areas of their own personal subject knowledge they may have a deficiency of and therefore be able to develop further that area in order to increase effective teacher and learning in the classroom. The first step of the quartet which is foundation of knowledge includes understanding subject content and pedagogy, (linking to SMK and PCK), transformation which entails being able to appropriately demonstrate and explain so learners can understanding (similar to Shulmans thoughts on PCK meaning the ability to differentiate to ensure meaning), connection including making links between concepts, ideas and processes and the final part of the quarter being contingency which means responding to the learners ideas (much like Shulmans category of knowledge of learners and their characteristics). Graham and Kelly (2003) agree that what is needed from a teacher is informed facilitation involving intervention to guide and model a clear pedagogy which draws on the linguistic, cultural and psychological processes involved in learning. Looking at this view point in relation to The Knowledge Quartet, informed facilitation would be the foundations of subject knowledge, intervention, modelling and guidance would be transformation of knowledge and finally drawing upon links of learning would fit into the third step of The Knowledge Quartet which is connecting links and concepts together. Graham and Kelly also express that:

‘In order to provide effective intervention and support, teachers must establish a set of regular, well-understood, purposeful classroom writing routines which will permit the understanding of all elements of the writing process to develop.’ (Graham and Kelly, 2003, p. 65)

This statement from Graham and Kelly (2003) suggests the ideal teacher which would provide an effective learning environment through intervention and support. Therefore tying together the ideas from The Knowledge Quartets foundation and transformation and linking back to Griggs' (2010) perception that an ideal teacher for effective teaching and learning should possess knowledge to establish purposeful routines which enhance development. This then draws together Shulmans (1987) seminal PCK, as PCK itself is a multidimensional construct that incorporates both a teacher's knowledge about pedagogical processes as well as the knowledge of subject matter (Lucero, Petrosino and Delgado, 2017).

Ward and Roden (2016) offer a different opinion of teaching and learning, and the role which teachers subject knowledge plays in an effective learning environment. Ward and Roden (2016) understand that a traditional subject based curriculum depends upon a behaviourist approach to learning where teachers adopt an instructional role in transmitting information and knowledge, agreeing with The Knowledge Quartet's steps of foundation and transformation. Although, an idea which hasn't been explicitly explored within the literature is the contrasting idea of a socio-cultural learning theory which suggests pupils learn and create their own knowledge through collaboration, questioning and making cross curricular subject links. The formation of students making cross curricular links within subject knowledge may relate back to the connection of The Knowledge Quartet, blending ideas and processes together in order to enrich subject knowledge further. Again, Ward and Roden (2016) express that children should be encouraged to learn through exploration and that the skill of the teacher is to meet this desire by providing materials, time and space to enable children to answer their own questions about the world (Ward and Roden, 2016). Shulmans constructivist approach when observing learners to aid his educational reform recognised the categories of the knowledge base including PCK of which he explained was a teachers professional understanding, and teacher's knowledge of learners and their characteristics (1987). These two categories coincide with a constructivist approach to teaching, suggesting that the effectiveness of this category of subject knowledge aids teaching and learning in the primary setting as it is not necessarily transmitting

information didactically onto learners, but using PCK to enable learners to independently learn for themselves. The Knowledge Quartet's category of contingency also aids the ideas of a constructivist spin on the role of teacher's subject knowledge in the classroom. The Knowledge Quartet suggests that contingency is the ability to think on one's feet and deviate from the agenda to exploit opportunities to enhance learning (Rowland, Huckstep and Thwaites, 2003). Exploring these additional learning opportunities which stray away from the curricular norms may include independent investigation of the world in and outside the classroom, and the ability to facilitate independent learning requires the knowledge of PCK.

Lucero, Petrosino and Delgado (2017), also explore a constructivist perspective of subject knowledge and suggest that students build their own subject knowledge upon multiple concepts based upon existing knowledge and information. Therefore, as a component of PCK, knowledge of student conceptions (KOSC) is essential to teacher knowledge base. Lucero, Petrosino and Delgado (2017) advise that teachers familiarise themselves with their learners' conceptions so that they may be identified and used as tools within the learning environment.

Through analysing the literature around subject knowledge, it is now evident that the role teacher's subject knowledge plays within the National Curriculum of Wales is vital. The Foundation Phase Framework (2015) says that practitioners should 'acknowledge prior learning and attainment, offer choices, challenge children with care and sensitivity, encourage them and move their learning along' (Gov, 2015, p. p4). This statement is closely linked with the philosophy of Shulman (1987) and The Knowledge Base consisting of content knowledge, PCK, curriculum knowledge and knowledge of learners and their characteristics. This rationale from the framework is also closely tied with Rowland, Huckstep and Thwaites' (2003) The Knowledge Quartet, in particular the areas of foundations of knowledge and contingency.

Using The Knowledge Quartet (Rowland, Huckstep and Thwaites, 2003) as a structural framework, I will now model a self-reflection of my own subject knowledge.

Analysis and Evaluation

Donaldson's (2015) *Successful Futures* explains that the current aims for the curriculum in Wales are: 'promoting the spiritual, moral, cultural, mental and physical development of pupils at the school and of society, and preparing pupils for the opportunities, responsibilities and experiences of later life' (Donaldson, 2015, p. 24). Furthermore, Donaldson (2015) also depicts the ideal teacher for Wales' new curriculum, stating that good teaching should include subject and methodological expertise, high quality classroom skills, an understanding of social and psychological factors that influences learning and the ability to promote learning in an engaging environment. Donaldson's recommendation for teachers in Wales is that subject and methodological knowledge should be at the forefront of priorities to achieve teaching excellence, which emphasises the importance of sound subject knowledge to achieve effective teaching and learning. Furthermore, Donaldson recommends that individual teachers teaching the new curriculum will draw upon the different Areas of Learning and Experience (AoLE) and work creatively and collaboratively to blend curricular links together in a cross curricular approach to learning. Donaldson says that teachers should be able to help learners to make their own links between learning and bring together different aspects of learnt and prior knowledge to apply to situations and environments outside the classroom learning environment. Donaldson's emphasis on cross curricular learning to create individuals whom are ready to become efficient members of society links to the category of connection from The Knowledge Quartet (Rowland, Huckstep and Thwaites, 2003). The current Foundation Phase Framework (2015) is also structured in a way which puts cross curricular learning at the forefront of learner's development, stating that the current areas of learning must complement each other and work together to form a practical relevant curriculum and that topics should not be isolated. This philosophy is currently

only prevalent within the Foundation Phase Framework and is not extended into Key Stage 2 in Wales.

Therefore, to fulfil Donaldson's vision of the new curriculum in Wales a teacher must possess subject knowledge to be able to connect and blend together areas of learning and experience.

During PTE 1, I was given multiple opportunities to explore the Foundation Phase Framework (2015) and plan and teach lessons and prepare enhanced provisions of a cross curricular nature. Doing so, this enabled me to divulge in the world of cross curricular learning which is at the core of Donaldson's (2015) new curriculum.

Foundation

The knowledge I had before beginning PTE 1 was a broad knowledge of the Foundation Phase Framework (2015), the Literacy and Numeracy Framework (2015) and Donaldson's Successful Futures document (2015). This prior knowledge I had before beginning in the Foundation Phase fits into Shulmans category of curriculum knowledge (1987) and could be considered to be specialised content knowledge as suggested by Rowland, Turner, Thwaites and Huckstep (2009) as it is a form of knowledge that teachers are expected to have, as apposed to non-teachers. Foundation knowledge which shaped my pedagogical choices whilst being in the Foundation Phase came from Learning Outcomes from the Foundation Phase Framework (2015) which gave an indication what milestone each child would need to reach before moving forward into the next year group. The Foundation Phase Framework (2015) explains that teachers should judge which Learning Outcome description best fits the child's performance in order to decide that child's outcome at the end of the Foundation Phase. Being able to judge the description which describes the child best, the subject knowledge required to do so comes from Shulmans knowledge base (1987) by having the knowledge of learners and their characteristics. The children in the class were grouped by the class teacher dependent on ability and worked in their ability-based groups. The teacher subject knowledge I needed to develop when working with ability set groups was the capability to differentiate work dependent on ability.

Pollard and Bourne (1994) discuss that PCK is the understanding of what makes the learning of specific topics easy or difficult and so PCK is an important part of foundation knowledge. When I was planning lessons, I chose Learning Outcomes from the Foundation Phase Framework for each child dependent on their ability.

Within an example of a lesson plan shown in Figure 1 shown in the appendices, I prepared for a lesson on Knowledge and Understanding of the World. I used two outcomes as a starting point for my learning objectives for the lesson. I chose Outcome 2 for the two lower ability groups, and Outcome 3 for the two higher ability groups. Using curriculum knowledge and knowing the learner's different needs and characteristics, I was able to differentiate the lesson accordingly. My use of PCK also came into play when choosing Learning Outcomes to base my lessons upon, as I blended my content and pedagogical knowledge to cater to the learner's different capabilities. Creating differentiated lessons for the groups enhanced the conditions which the children best learnt under, as the work was catered to their own knowledge base.

Transformation

Shulman observes that the knowledge base for teaching is distinguished by the capacity of a teacher to be able to transform content knowledge into powerful pedagogy (1987). When working in the Foundation Phase, it was important to pitch the lessons appropriate to their age and interests. I learnt that by delegating responsibility to the children during the lesson introduction engaged them more than a lesson which didn't have a practical and functional purpose behind it. When presenting ideas to the children I found it important to use consistent language which they could understand and relate to and use innovating and interactive props and images to stimulate their thinking. An example of a lesson which I planned and taught which I believe to have been pedagogically powerful was a Christmas themed numeracy lesson focusing on addition.

Shown in Figure 2 is an example of a Christmas themed numeracy lesson plan for the children achieving Learning Outcome 3. Here, I transformed my content and curriculum knowledge of addition of numbers into an accessible session to assist the children's concept formation. I introduced the lesson by receiving a phone call from Santa, I then used a letter from Santa placed in a pile of snow in the cloak room to inform the children what they needed to do. The importance of presenting the lesson this way determined the lessons success as I used my PCK to promote engagement of the learners through giving each child a role of responsibility. The lesson was interactive, and included adding together carrots, mince pies and sprouts to create snack bags for the reindeers, and the children then recorded how many snacks each reindeer needed. My decision to do this came from my own PCK, I knew the content which needed to be taught, taking Learning Outcomes from the Foundation Phase Framework, and transformed these outcomes into appropriate lesson objectives using a theme which would promote engagement and pupil voice and interaction. For the next part of PTE 1 when I am in KS2, I will be teaching The Victorians. I am aware that the way I transform my content and curriculum knowledge into power pedagogical processes will differ greatly from teaching in Foundation Phase. I will need to ensure a high-level foundational subject knowledge for this topic, in order to successfully blend the content and pedagogical knowledge together smoothly.

Connection

Binding together choices and decisions when in Foundation Phase was important to ensure no specific topic was taught in isolation and that cross curricular links were achieved. The Knowledge Quartets conception of coherences includes the sequencing of topics within and between lessons (2003). Planning the enhanced provisions within the classroom gave me the opportunity to develop my cross curricular knowledge and make connections between the areas of learning to promote a holistic environment. Displayed in Figure 3 is a plan for the enhanced provisions. It shows clearly how numeracy and literacy can

be blended together in a cross curricular approach throughout the classroom, and not just specifically designated to group lessons. Again, using my own content knowledge and PCK I can fuse together ideas from a given theme (in this situation a Christmas theme), and integrate the curriculum throughout the classroom environment.

Figure 4 shows another example of how I created cross curricular connections in my lessons. Here is a language lesson focusing upon the reading and writing strands from the Foundation Phase Framework. However, using my curricular knowledge I drew upon connections which could be made with numeracy. Donaldson's (2015) recommendation that cross curricular learning should be the responsibility of all teachers: literacy, numeracy and digital competency is something which can be explored accessibly in the Foundation Phase I found, as using the enhanced provisions and blending the areas of learning together can achieve this goal. I look forward to comparing the difference in cross curricular learning when in KS2, as the areas of learning from the Foundation Phase Framework will be lost and replaced with isolated specialist subjects. Pound and Lee (2013) agree with Donaldson's vision of a cross curricular education for 3-19-year olds, suggesting that by placing a subject in the context of other areas of learning, learner's knowledge is enriched, challenged and affirmed. Pollard and Lee (2013) recommend that applying subjects in a variety of contexts ensures understanding is heightened and secured.

Contingency

The final category of The Knowledge Quartet (2003) and of this reflective analysis concerns learning events which are sporadic, and which cannot be prepared for throughout lesson plans. The readiness to respond to children's ideas is essential part of specialised subject knowledge for a teacher I have discovered, and to be able to have the ability to deviate from an agenda. In order to 'think on one's feet', it may be considered that an element of creativity and imagination is required to do so. Gardner (2006) suggests that creativity is a skill which will be needed in society now and in the future, which coincides again with Donaldson's

(2015) aspiration for learners in the new curriculum in Wales. If learners view their teachers as contingent and creative practitioners, hopefully this knowledgeable attribute will be passed onto to the next generation. Area's of learning which have required me to be contingent during PTE 1 include working with a learner with an additional learning need. Despite differentiating lessons for this child, the learner's behaviour changed daily and fluctuated from hour to hour. In order to meet the needs of this child, it was important that my knowledge base on my understanding of the learner and their characteristics took priority. Pedagogical knowledge is another area of Shulmans knowledge base which is needed in order to work efficiently and to be aware and prepared for the unplanned. In this circumstance, having a specialised awareness of the learner and the classroom was important to maintain a safe environment to learn in which promoted a positive well being for all learners. Moving into KS2, the children will be older and again may have needs which are different to those of the children in the Foundation Phase. With age, the questions which the children ask require a high quality of subject knowledge, and so it is important for me to be able to think on my feet. In doing so, it is vital that I am up to date with the KS2 curriculum and additional reading which is relevant to their age range, so that if a student asks a question which is not on the agenda, I can answer it to the best of my ability.

Conclusion

To conclude, throughout investigating the literature associated with subject knowledge and its relationship with teaching and learning, I have discovered that Shulmans (1987) seminal ideas of knowledge base have informed further explorations of subject knowledge, in particular The Knowledge Quartet (2003). It has shone through that PCK is a specialised form of subject knowledge which is essential for an effective learning and teaching environment. Throughout evaluation and analysis of my own subject knowledge, I have learnt that the content and curricular knowledge I had for the Foundation Phase was appropriate, however moving into KS2 I will need to develop my content and curricular knowledge. In doing so,

developing a higher level of content and curricular knowledge I will be able to be prepare and teach more pedagogically powerful learning and teaching experiences. Moving forward, I will study the KS2 curriculum documents further so that I have a curricular awareness which will enable me to develop the knowledge quartets area of contingency. Drawing upon the ideas from Donaldson's new curriculum (2015), I aim to incorporate cross curricular links within learning in KS2. I found it accessible to adhere to a cross curricular approach to learning whilst in the Foundation Phase as I used the enhanced provisions and my PCK to do so. However I am aware that enhanced provisions may not be apart of the learning environment in the KS2 classroom. Relating back to the introduction of this assignment where I posed the question, how does subject knowledge make a great teacher? I have discovered that subject knowledge is not just subject matter knowledge, and that PCK is essential to not only making a great teacher, but a professional, pedagogically powerful and enriching practitioner.

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Appendices

Learning objectives/intentions:	KUW Outcome 2: Explore objects and materials within immediate and familiar environments KUW Outcome 3: Identify changes in their environment/materials/natural features	Success Criteria (Success Steps)	1. Ask the question 'why?' and use words, signs or symbols to communicate their observations 2. Begin to record their observations using symbols/pictures/simple signs or phrases 3. Through enquiry, they can identify changes in their environment/materials/natural features 4. They can follow simple instructions/directions 5. Make future predictions	Meeting learners' needs: EM will verbally physically and verbally explore the materials and participation and answers will be photographed and scribed.
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Figure 1

Introduction/plenary tasks	Main activities	Resources/ Key Vocabulary	Assessment for Learning (strategies and opportunities)
Introduction Santa phones the class and asks for help. Santa tells us that he has left a letter on a pile of snow in the cloak room. Ask one of the children to retrieve letter. In the letter, Santa explains that he needs our help. He is so busy preparing presents for Christmas he hasn't had a chance to prepare the reindeers snacks for their journey across the world whilst delivering the gifts to the girls and boys on Christmas Eve! Santa has given us a list of what 4 of the reindeers like to have as a snack, and so he wants us to work out how many snacks to put in each reindeer's snack bag, so he knows on Christmas Eve how many to prepare.	<u>Trainee focused task</u> (purpose, outline of trainee's role and children's learning): Explain to the children that Santa needs our help to prepare the reindeers snacks for their trip across the world. Look at the list, and count out the appropriate number of snacks for the first reindeer. E.g, 4 carrots and 6 sprouts. Place these into the reindeers bag. On the snack list in the box, write out the number sentence of $4 + 6 = 10$, and inform the children that the result of the number 10 will be important for Santa to know how many snacks to pack for the reindeer.	Reindeers Carrots Sprouts Mince pies Addings Equals Gift bags Snack lists Pens White boards and pens Maths books	Self assessment rag rating Green Sprout Orange Carrot Red Cracker

Figure 2

 Sand	 Water	 Paint Choose a letter and paint a Christmas picture beginning with this sound.	 Dough Using the dough, add the number of fairy lights on the card to the Christmas tree.	 Small World
 Construction Using the blocks, build Santa's sleigh or a Christmas tree. Record how many blocks you use each time on a white board.	 Role Play Santa's workshop/grotto. Using the resources such as wrapping paper, letters, gift bags and toys, prepare gifts ready for Christmas. Write Christmas cards and letters to Santa.	 Table top Match the Brussel sprouts to the numicon and the number pictures.	 Mark Making 	 Make it table
 Book Corner Chose a Christmas story to read.	 Finding Out Match the Christmas pictures to the matching words and sounds.	 Number Using the dough, add the number of fairy lights on the card to the Christmas tree.	 Music	 Physical

Figure 3

Curriculum coverage (range and skills) Foundation Phase Framework Outcome 3: Reading - Retell familiar stories in a simple way and identify information from texts using words and visual features Writing: Structure and Organisation - Sequencing content correctly	
Literacy (LNF) Foundation Phase Framework Outcome 3: Reading - Retell familiar stories in a simple way and identify information from texts using words and visual features Writing: Structure and Organisation - Sequencing content correctly	Numeracy (LNF) Ordering events Sequencing events (having to be familiar with numbering of events)

Figure 4