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

In this essay I will be discussing the key literature of teacher subject knowledge and the importance of this within the primary school. I intend to debate and discuss the pros and cons of the literature and how this links to everyday life within a primary school setting. I will then go on to evaluate and analyse the literature based on my own personal experience whilst on Professional Teaching Experience (PTE) within a local primary school. The identity of the school and staff will remain anonymous at all times and for the purpose of this essay, the school will be referred to as 'School X' and names of the teachers and pupils have been changed to protect their identities. I have chosen to take ethical considerations in accordance with BERA guidelines. (BERA, 2019)

School X is an English medium primary school with a 94.5% average attendance. The school is populated by approximately 250 students aged 3 to 11. The school is considered to be situated within an affluent area, however does cater to some areas of deprivation. The school have an average of 28% free school meals and pupil/teacher ratio of 27:1. Whilst on PTE I was placed within a year 2 class of 31 pupils. Seven of the pupils within my class moved to the Year 1 class for Literacy and Numeracy, leaving me with a class of 24 pupils (14 male, 10 female). All children were between the age of 6-7 and have various backgrounds and ability levels. I was responsible for planning and teaching the class which were split into four ability groups. Within the classroom there were two support staff and the class teacher, and occasionally a college student who assisted within the class on alternating weeks.

Some practitioners believe that a teachers role in the classroom is to simply teach their pupils and impart knowledge based on what they should know within the curriculum. Others emphasise and highlight the importance of teacher subject knowledge and that this is the key to successful teaching. Hattie's views on the importance of subject knowledge are that 'teachers beliefs and commitments are the greatest influence on student achievement' (Hattie, 2012, p. 25) and that this was the key to a successful teacher. While subject knowledge is important, some see it as an essential part of teaching to ensure children are being taught a range of skills and knowledge. However some experts such as Donaldson, believe that subject knowledge is not simply enough to inspire and create the future leaders of our world. With the new 'Successful Futures' curriculum being rolled out in schools from April 2019,

Donaldson highlights that while for the past 50 years the curriculum has been focussed on subject knowledge, it may be time for a new outlook on teaching and education, and whilst he agrees that 'subject knowledge has stood the test of time' he suggests it may no longer be the 'best path to a sound and relevant education'. (Donaldson, 2015, p. 5) However, the implications of such a curriculum could potentially see teachers lose focus on the foundation of subject knowledge and see our curriculum lose structure and intention. One of the four purposes of Donaldson's new curriculum is the aim for all learners to be 'healthy, confident individuals' who 'are ready to be valued members of society.' (Donaldson, 2015, p. 30) These four purposes and characteristics of Donaldson's review (see appendix 1) have been running throughout our curriculum for many years as Grigg highlights in his work. He says that 'priorities have revolved around producing literate, numerate children who upon leaving school positively contribute to (rather than disrupt) society.' (Grigg, 2015, p. 142) However, it seems that these purposes are to become our main focus within our curriculum and teaching. If this is true, then teachers must be educated and informed as to what this means to ensure their subject knowledge and pedagogical content knowledge is accurate and current to ensure the best education for their pupils. Throughout Donaldson's curriculum review is a theme of children being given skills and knowledge. Donaldson believes the knowledge given to children is key to their future success and becoming well rounded members of society. While Donaldson suggests that subject knowledge is not wholly what we should be focussing on, he alludes to the fact that is plays a big part in day to day life and is something that should be focussed on daily within the classroom.

Others will argue that subject knowledge is the foundation that all new and experienced teachers should aspire to be. Shulman would argue that while subject knowledge is important, he created a seven step 'Knowledge Base' (Shulman, 1987) as a handbook for good teacher knowledge. One of the sections he highlights within this criteria is Pedagogical Content Knowledge (PCK). Shulman brings to light not only the importance of PCK, but the key point that PCK is based on teachers own unique form of professional understanding. Shulman sees PCK as the category that is 'most likely to distinguish the understanding of the content specialist from that of the pedagogue.' (Shulman, 1987, p. 8) Shulman goes on to state that the difference between novice and experienced teachers is not so different. He says 'Teachers themselves have difficulty in articulating what they know and how they know it'. (Shulman, 1987, p. 6) What Shulman is alluding to here is that the relationship between time and subject knowledge is not explicit, and that teachers can have a good subject knowledge

without years of experience. Therefore, in a world where children are constantly asking the question 'why?', are teachers really imparting the knowledge and understanding to children that they both need and deserve? He continues to say that the way teaching begins is simply a teachers understanding of 'what it is to be learned, and how it is to be taught' (Shulman, 1987, p. 7) and he believes that teaching is a learned profession. If what Shulman is suggesting here is that as teaching is a learned profession, then student teachers and experienced teachers should both have an understanding of what it is to learn and be empathetic to the pupils whom they are teaching. Teachers must be able to relate to their students and what it is like to be the child that has no understanding, and the process needed to become the child that can comprehend and break down the information they have learned.

However Hattie would argue that we should not be studying the differences between the 'novice' and the 'experienced' teachers, but the 'expert' and the 'experienced.' (Hattie, 2012, p. 27) While experienced teachers have been in the education sector for longer and can be seen to be more accomplished, this does not necessarily give them a good subject knowledge for teaching. While studying at the University of North Carolina and undertaking his research, Hattie came to find that in the expert teacher there were five major dimensions that define 'expert'. (See appendix 2) He believed that these five dimensions were the 'differences between the term "expert" and "experienced."' (Hattie, 2012, p. 27) Within these five dimensions Hattie argues that subject knowledge is important, however there are other attributes that are equally as important within the classroom and the expert teacher. Whilst Hattie recognises the importance of subject knowledge, within these five sectors he argues the status of other areas within teaching such as classroom environment and assessment for learning are equally as important. Hattie stresses the position of all five of his dimensions and does not pin a successful and 'expert' teacher to simply subject knowledge. Hattie found that 'subject knowledge had little effect on the quality of student outcomes' (Hattie, 2012, p. 28) and that expert and experienced teachers do not differ in the amount of knowledge they have. This suggests that whilst subject knowledge is important, it is not the most important thing to consider in teaching. There was a difference between how they organised their content knowledge and used this within the classroom which suggests that is how subject knowledge is put into practice is the real importance here and is what impacts upon classroom practice. Hattie believes that to be an expert teacher, you must introduce new subject knowledge to enhance what their pupils already know and build upon it. Hattie's views connect to and support Piaget's findings and research regarding his four stages of cognitive development.

Piaget's research shows that when children are in their Formal Operational stage they build on knowledge rather than change what is understood or what they already know. Through Assimilation 'new knowledge is incorporated into existing mental structures.' (Pritchard, 2009, p. 20) Therefore Piaget and Hattie's views and research support each other and introduce the significance of Pedagogical Content Knowledge in teachers and how they understand, is seen to be essential to be effective and successful teachers.

Whilst Hattie argues the difference between the experienced and the expert, this still does not settle the argument about the importance of a teachers subject knowledge. Based on Shulman's initial findings regarding pedagogical content knowledge and other research relating to subject matter knowledge (SMK) came a theory called The Knowledge Quartet. The Knowledge Quartet's investigation and findings resulted in four broad dimensions in which subject knowledge can be perceived. The Knowledge Quartet theory suggests that between the four dimensions you can create the framework needed for complete subject knowledge within mathematics. Their research states that the 'quartet is comprehensive as a tool for thinking about the ways that subject knowledge comes into play in the classroom.' (Rowland, et al., 2005, p. 97) What Rowland et al emphasise is it is the importance of teachers prior knowledge matched with how they portray and deliver this to the class; in addition to the importance of teachers being able to 'think on ones feet' that supports this theory. (Rowland, et al., 2005, p. 98) These four categories combined create the basis for identifying content knowledge in mathematics and how it plays out in the trainee's teaching. (See appendix 3) Within the 'Foundation' unit of the Knowledge Quartet it is suggested that this is the base, knowledge and beliefs that student teacher's gain from their training that prepares them for their classroom role. Within their research, the observation of Naomi's case study lesson shows that from her lesson plans Naomi wants her pupils to learn the partition and comparison models but demonstrates that she may not be aware 'of the possible tension between the difference model and the language.' (Rowland, et al., 2005, p. 100) What Rowland et al suggest here is that Naomi's subject and content knowledge puts her at a disadvantage and consequently forces Naomi into the Contingency section. While Naomi understands her subject knowledge and what she is explaining, her pupils do not. Therefore this creates issues for Naomi that possibly could have been avoided if she were aware of the confusion caused between what she is asking for, and what she means. There is a difference between the classes understanding of this and what she actually means.

Within the four categories what is apparent is the link between one section to another. Each section carries on from the previous and overall creates a system that not only could work with mathematics, but across the curriculum. Within their research the Knowledge Quartet highlight the importance of subject knowledge within the transformation process. This links heavily with Shulman and his view that content knowledge is imparted to pupils in an effective way. The use of examples is imperative within this section to ensure effective demonstration and understanding within a lesson. You can clearly see similarities between Rowland et al's Knowledge Quartet and Shulman's Model of Pedagogical Reasoning and Action. (See appendix 4) Shulman emphasises the importance of preparation, representation, selection and adaptation which fall under the 'Transformation' umbrella. Here there are subtle links between pedagogical reasoning in Shulman's suggestion of using examples, choices and the consideration of conceptions and the transformation section of the Knowledge Quartet. They say that the transformation unit 'concerns knowledge in action' and emphasise the importance of the 'behaviour that is directed towards a pupil which follows from deliberation and judgement.' (Rowland, et al., 2005, p. 98) What Rowland et al are suggesting is the consequences of the examples given to pupils provide the outlook and opinions that build on their previous knowledge. Through this children perceive subjects and topics in certain ways based on the examples they have been given and what they can relate to everyday life. Through the detailed analysis of primary mathematics, the Knowledge Quartet created a framework which new and experienced teachers can use daily and learn from. Rowland et al findings and developments create a foundation in which to build subject knowledge and examples of how to use it in a practical classroom environment.

To conclude, this section draws attention to the literature surrounding subject knowledge and the research and findings to show the implications and the importance of positive outcomes that having a solid subject knowledge can have for teachers. Between Shulman, Rowland et al, Donaldson and Hattie, they highlight many aspects that influence subject knowledge and how to subject knowledge, content knowledge and pedagogical knowledge can influence teachers and students in the classroom.

Whilst on Professional Teaching Practice 1 (PTE 1), I taught a range of subjects including Literacy and Numeracy. Naturally there were subjects that I was more confident in than others and had a stronger subject knowledge in. One significant weakness that I have always had is mathematics. Not only did I feel my subject knowledge lacking but also my

confidence. Maths was the first subject my class teacher asked me to take over. Throughout PTE 1 my 'Foundation' (Rowland, et al., 2005, p. 97) has improved dramatically with the help of a book called 'Understanding Mathematics for Young Children' by Haylock and Cockburn. The book focussed on understanding mathematics which helped me improve my subject knowledge prior to teaching. It highlights the importance of shifting teachers perceptions of maths which is what I believe helped me most.

The class were just starting the topic of money which was the first lesson I taught them. (See appendix 5) A problem arose when taking two groups to do their written work and explaining the task. I explained to the children that they were to organise the coins from smallest to largest. What I failed to clarify was they were to order them smallest to largest amounts. This resulted in a number of children ordering the coins smallest to largest in size. On reflection I realised I could of explained the task better and should of checked that everyone understood. Murphy highlights in her research that 'it seems that a student teacher with limited understanding of mathematical topic would not be effective in developing children's understanding.' (Murphy, 2009, p. 1821) This is apparent in my ARC and reflection of my lesson. I recognised that with a poor subject knowledge in a topic such as money, I was not teaching to the best of my ability. Upon reflection I decided to use the Knowledge Quartet to help guide me and assist me in my planning and teaching. By building my subject knowledge, I then came to find that I was starting to enjoy teaching maths rather than dread it. This comes into the 'transformation' unit of the Knowledge Quartet and helped me recognise that as the children were responding to what I was teaching, that my confidence grew and my capacity as a teacher to translate the content knowledge that I had, into forms that became pedagogically powerful. When going on to the topic of addition and teaching a full week, I felt my subject knowledge and confidence was where it needed to be to successfully develop their understanding. My final lesson of the week in addition (see appendix 6) was where I felt I took my understanding and knowledge and applied it well. The final lesson was a practical lesson to put what they had learnt into practice. I incorporated the number bonds, number sentences and mental maths that we had learnt that week into different tasks and ability groups and linked this with my assessment for learning to calculate immediate feedback for myself. Throughout this week of teaching the topic of addition I strongly used my 'Connection' unit of the Knowledge Quartet by reflecting on previous lessons and linking in different strategies for the pupils to understand that when using addition there are lots of different ways to work out the sum and that is ok and encouraged.

By using and reflecting on connection and the Knowledge Quartet, this helped me ensure that my planning and teaching displayed across the series of lessons was coherent. My experience on PTE 1 supports the Knowledge Quartets research and framework they present an effective system for teaching mathematics.

Whilst on PTE 1 I taught a number of topic lessons, in particular a handful of science lessons based on the senses. While a basic knowledge of the senses was needed, I did not feel that I needed copious amounts of knowledge and experience in the topic in order to teach it successfully. Adam Riches supports my view and believes that instead of teachers being consumed with the 'depth and breadth of subject knowledge, we need to focus more on teachers knowing what is expected in a subject.' (Riches, 2018) In a report by Ofsted in 2009 they found and published the results of dozens of observations within primary schools in relation to teacher's subject knowledge. While they emphasise the importance of subject knowledge across the curriculum, within Science and Technology they found that teachers that did not have competent subject knowledge still thrived within their lessons by having the freedom to pilot activities themselves, which gave teachers a better understanding of the difficulties pupils might have. (See appendix 7) They go on to highlight that they found pupils benefited from teachers drawing on previous experiences or knowledge to progress their learning. They found 'teachers who drew upon pupils' experiences as users identified clear and agreed success criteria for their products and improve evaluation skills.' (Ofsted, 2009, p. 10) This research supports not only Piaget's cognitive progression theory but also Shulman's research that building on pupils' prior knowledge is essential to become a successful teacher.

At the beginning of the lesson I talked with the pupils' to ascertain what they already knew and understood about the senses. This gave me a basic understanding of my classes abilities and who was suitable for which activity. The activities were all different and practical to engage the children in the senses and what they were trying to achieve. We talked about their 'what am I learning today?' (WALT) and 'what am I looking for?" (WILF) as a group and had that as our focus going into the activities. One downfall of the lesson was the children being able to differentiate between some of the senses and their understanding that for some things, more than one sense can be used. This is something we recapped at the end of the lesson on the carpet as an assessment for learning opportunity. I think on reflection that I took their understanding for granted and assumed that they all knew the 5 senses that they knew

the differences between them. Although their basic subject knowledge was good, I did not appreciate that differentiating the senses would be a challenge for them. This relates back to my subject knowledge and my understanding of the senses. Like the case study of Naomi in her Foundation unit, I was not aware that the questions and explanations I was giving could create tension between what I know and what the children were learning. As Rowland et al emphasise in their work, 'such knowledge and beliefs inform pedagogical choices in a fundamental way.' (Rowland, et al., 2005, p. 97) If this is true, then my lack of knowledge and more so understanding of the topic, lead to complications that ultimately were resolved, but overall could have been avoided.

Whilst on PTE 1 I believed that I a particular strength of mine was linking Digital Competency (DCF) into my lessons. I would make a conscious effort to include the iPads or laptops or interactive whiteboard within all my lessons in some capacity. Around two weeks into my placement, I realised that simply using iPads in a lesson, or playing topic related games on the laptops was not incorporating the DCF into my lessons. Donaldson highlights the six areas of the curriculum that will be the foundation for our new curriculum come April. One of these areas is Digital Competency in which he says 'All teachers should have responsibility to support the development of digital competencies, and the skills and knowledge to do this.' (Donaldson, 2015, p. 41) What Donaldson indicates here is something that myself as a teacher was not compliant to. I did not possess the correct knowledge and skills to correctly incorporate the DCF into my lessons. Donaldson states that 'children need to learn how to become more than consumers of technology' (Donaldson, 2015, p. 8) and the importance of them learning the skills to use the technology and be creative. This suggestion from Donaldson's report emphasises the importance of children and young people being able to contribute to society and become members of a competent workforce. I did not take this into account within the first few weeks of my placement, and soon came to realise the real importance of the DCF and technology across the curriculum.

Mishra and Koehler indicate in their research that 'merely introducing technology to the educational process is not enough' (Mishra & Koehler, 2006, p. 1018) and the big question we should be asking is what exactly do teachers need to know to effectively incorporate technology into their teaching? This supports the evidence that my subject knowledge was lacking and effected my teaching. In order to improve it was crucially that I studied the DCF carefully and made a conscious effort to incorporate specific aspects into future lessons.

While Literacy is seen to be one of the core subjects within education, this was a subject that I found more challenging than I expected to teach and gain an understanding of. School X had a scheme of work that they followed for most of their literacy which made it difficult for me to be creative with my lessons and limited my freedom on what I was able to teach. While my subject knowledge in English has always been a strength, I felt this hindered my content knowledge as I did not have full understanding of the scheme of work. As Shulman highlights in his work 'to teach is first to understand.' (Shulman, 1987, p. 14) In this case my understanding was low and this reflected in my teaching. Where my subject knowledge was lacking, my interaction with the children was sufficient to assist them to an extent in their learning. When it was time for me to take over the lessons, I agreed with my teacher that we could deviate slightly from the scheme of work to adapt a more creative approach to teaching capital letters and full stops. In a case study on three student teachers, Flynn found while the teachers knowledge of the subject matter was important, equally knowledge of their children was considered to be just as important. Flynn said that 'the teacher-pupil interaction of all three teachers appeared to be a key feature that led to the success of their lessons.' (Flynn, 2007, p. 145) Flynn's findings create an argument against Shulman's claims of subject knowledge and the significance in the classroom. While Flynn does agree that subject knowledge is important, she brings to light a number of other features and areas that are equally important. I feel on reflection of teaching literacy in Foundation Phase that the importance of subject knowledge can sometimes vary depending on the activity and external factors of a typical day in a classroom. Grigg highlights that 'research on effective teaching of literacy has shown that effective Key Stage 1 teachers tended to use published schemes only to consolidate points already taught.' (Grigg, 2015, p. 334) What Grigg stresses here is that if teachers are to use schemes of work, then they should be used to improve and strengthen the lesson, not to wholly rely on, which was my experience whilst on PTE. Grigg consequently supports Flynn and Hattie's findings that subject knowledge comes under an umbrella of areas that are important to create the expert teacher.

In conclusion, while subject knowledge is seen as important, many practitioners and professionals do not see it as the main aspect to become a successful teacher. Other factors such as teacher-pupil relationship and classroom environment play an equally big part in the development of children and young people. Links with pedagogy are vital for teachers to fully understand what it means to have a good subject knowledge and how these can be used

in conjunction with each other. Links with Piaget support claims that pedagogical content knowledge and subject knowledge do indeed go hand in hand with one another.

While on PTE 1 I gained a significant about of experience in the classroom but also a substantial amount of subject knowledge. I learnt that subject knowledge does not always come from reading a book or studying a subject in depth; but from your peers and even pupils that you interact with on a daily basis. Everyone learns from each other and while the teacher will overall have more knowledge than the pupils, I found that did not mean that my subject knowledge and pedagogical content knowledge could not be improved and enhanced by the pupils I taught. While many would argue that subject knowledge is the all important element in teaching, Donaldson's Successful Futures shows that there is more to learning and more to the curriculum than this. His modern and contemporary views show that with a combination of subject knowledge and the key skills presented in his findings, we can produce the confident, well-balanced individuals who can contribute positively to society.

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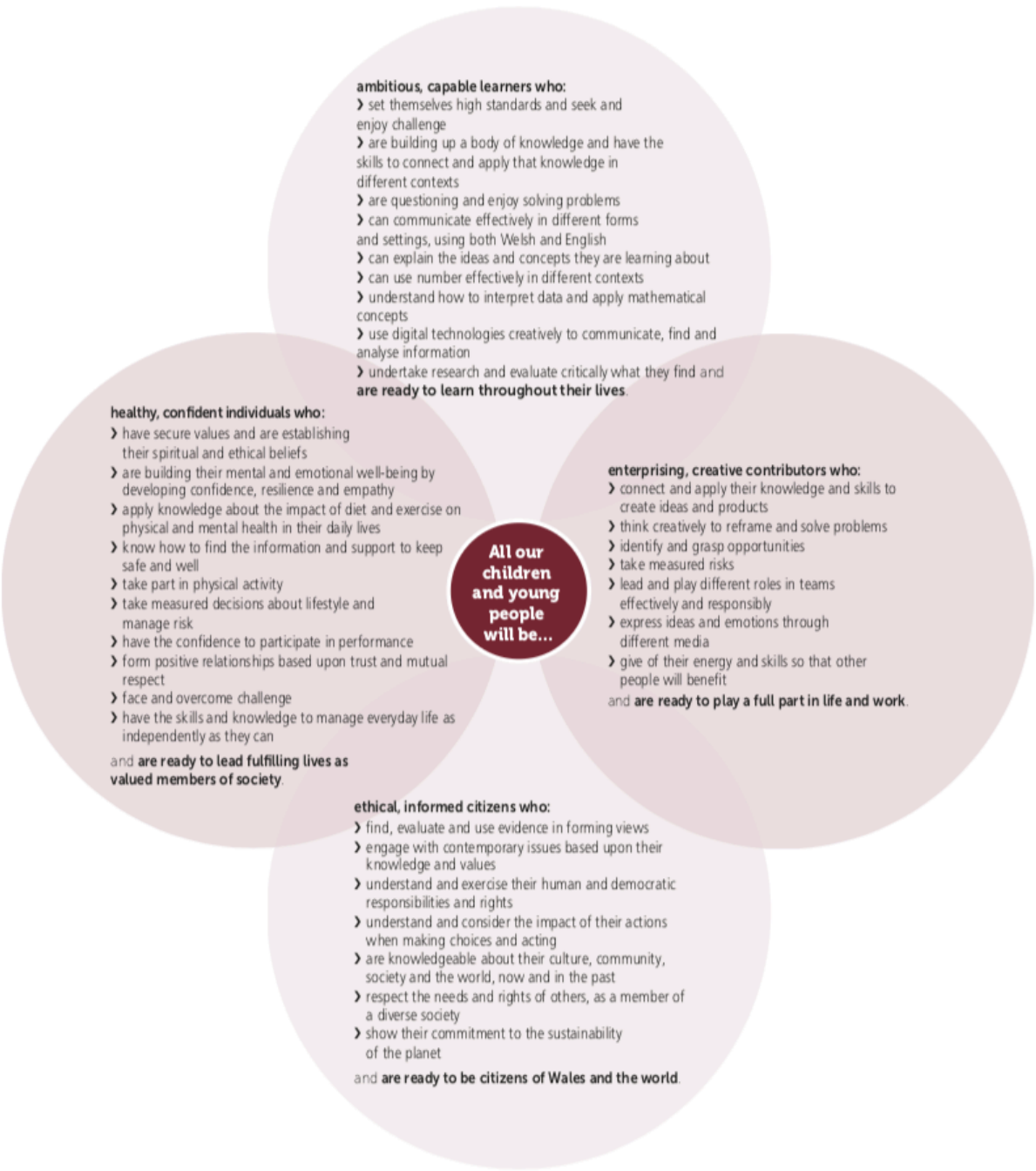
Appendices

Appendix 1 – Donaldson's four key purposes for Successful Futures



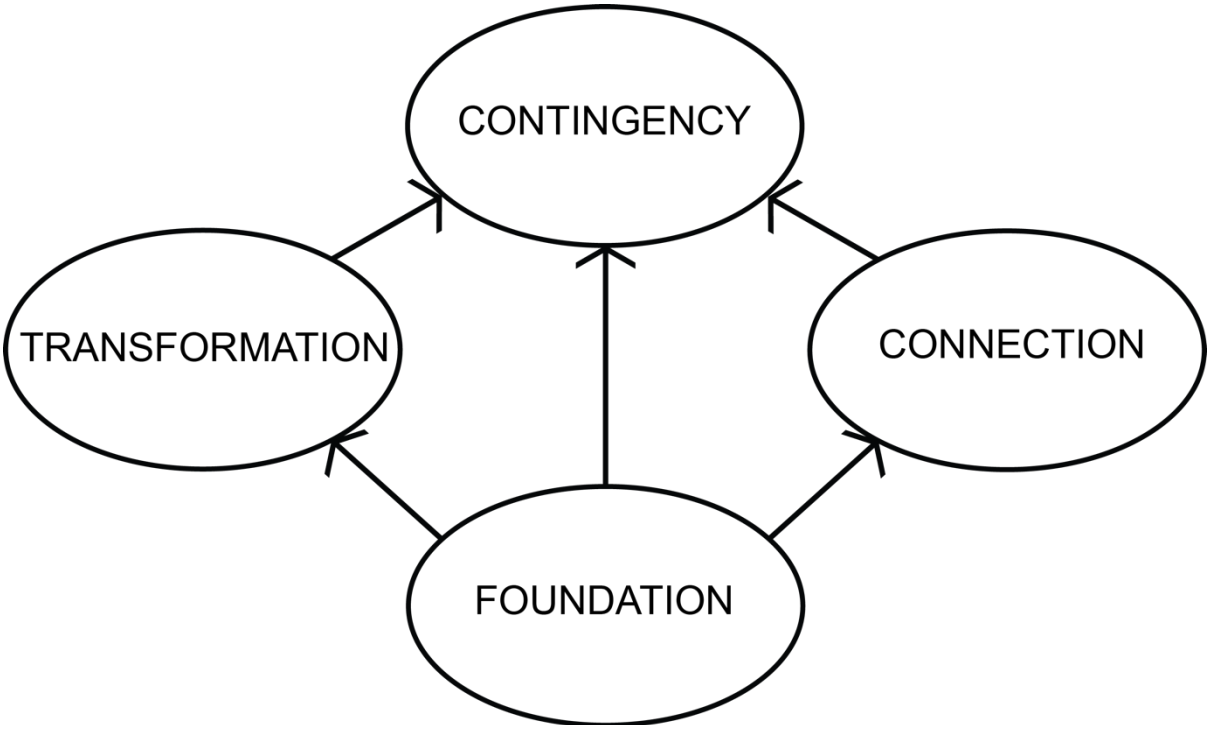
Appendix 2 – Hattie's five dimensions for an 'expert' teacher

For Hattie, expert teachers demonstrate the following five dimensions of teaching:

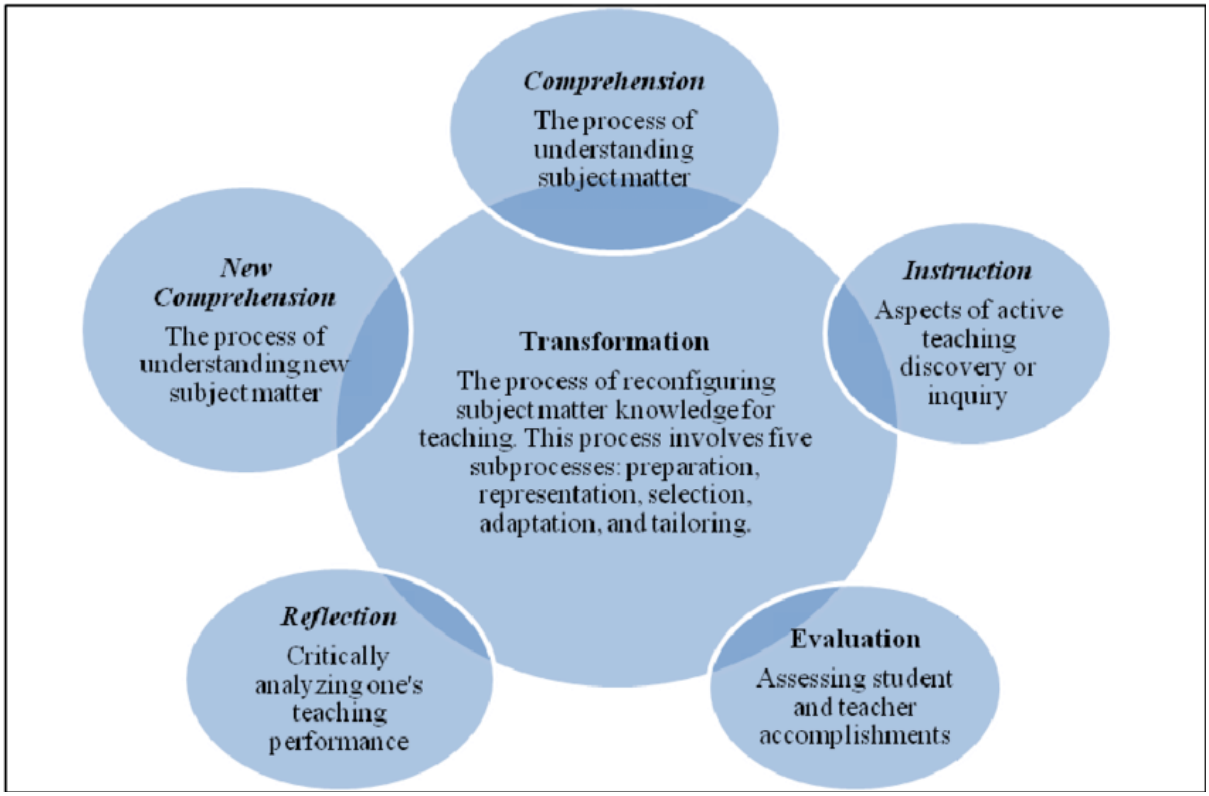
1. Can identify the most important ways in which to represent the subject that they teach
2. Are proficient at creating an optimal classroom climate for teaching
3. Monitor learning and provide feedback
4. Believe that all students can reach the success criteria
5. Influence surface and deep student outcomes.

From *Visible Learning for Teachers: Maximizing Impact on Learning* (Hattie 2012)

Appendix 3 – The Knowledge Quartet four units



Appendix 4 – Shulman's model of Pedagogical Reasoning and Action



Appendix 5 – Lesson Plan & ARC – Money – 5th November 2018

Name of Trainee: Lois White	**Session ref:** Maths - money	**Date:** 5.11.18	**Class:** Year 2		**Cynllun Ffocws y Cyfnod Sylfaen**
Targed(au) Hyfforddi Personol		**Number of learners:** 24	**Age:** 6-7 years		**2d**
Learning objectives/intentions:	Can I recognize the value of coins?	**Success Criteria**	Name and find all the coins Use the coins to make amounts to 20p / £1 Use correct signs £ / p	**Meeting learners' needs:**	Differentiation in worksheets

Introduction/plenary tasks	**Main activities**	**Resources/ Key Vocabulary**	**Assessment for Learning (strategies and opportunities)**
Introduction Lesson planned by Mrs Dillon. I took the two lower groups to work on ordering coins.	Trainee focused task (purpose, outline of trainee's role and children's learning): Cut out coins and order them from the smallest amount to the largest amount. Ext – write under coins with the correct symbol and amount	Coins Money Order Pence (p) Pounds (£) Coins Scissors Glue worksheets	Peer assess – work in pairs to compare answers
Plenary Create your own four-beat metre sheet – everyone completes it and shows they understand the beat and rhythm of music and songs.			

Curriculum coverage (range and skills) - Use different combinations of money to pay for items up to £1			
Literacy (LNF) - N/A		Numeracy (LNF) - Use different combinations of money to pay for items up to £1	
DCF N/A	Thinking Think about the value of the different coins	ESDGC N/A	YCC N/A

Model Beirniad Wedi Adfyfyrio (BWA)
Assisted Reflective Conclusions (ARC) Model

Dyddiad/*Date:* 5.11.18

Digwyddiad critigol (Ffocws)/*Critical incident (focus):* Maths - Money

Profiad/ *Experience*	
Feelings *"What are your feelings regarding the experience?"*	- Children were confident in explaining the coins, therefore made me feel at ease with the activity - Money is easy to link to real life experiences so I was confident in delivering the topic and linking it to things the children would understand, like a transaction in a shop
Remember and Understand *"Can you list the aspects of the learning experience that went well?"* *"What were the elements of the learning experience that were disappointing?"*	- The practical side of cutting and sticking engaged the children which focused them on the activity - I could have explained the activity a bit clearer as 2 of the 10 pupils ordered the coins in smallest to largest size, not in value.
Evaluate and analyse *"What will you keep the same to ensure effective teaching and learning in the future?"* *"What was the cause of the most important disappointing element?"*	- The organization of the activity worked as they started off practical and moved into the theory - Next time I would ensure that all pupils understand the task and explain better. Maybe break down the task more for a basic understanding
Conclusions and actions *"What are your possible solutions to the disappointing issues identified?"* *"What will you do next?"*	- Explain the task more clearly and get reassurance from the children that they understand - Move on from this and continue to structure the lesson layout but explain tasks better
Y profiad newydd / *Transformed experience*	

Appendix 6 – Lesson Plan – Addition – Friday 30th November 2018

Name of Trainee: Lois White	**Session ref:** Maths – addition	**Date:** 30.11.18	**Class:** Year 2		**Cynllun Ffocws y Cyfnod Sylfaen**
Targed(au) Hyfforddi Personol S1.6 – Support staff		**Number of learners:** 24	**Age:** 6-7 years		**2d**

Learning objectives/intentions:	To understand and add together 2-digit numbers	**Success Criteria**	1. I can add number bonds to 10 & 20 2. I can add up 2-3 2-digit numbers	**Meeting learners' needs:**	Varied tasks for different abilities

Introduction/plenary tasks	**Main activities**	**Resources/ Key Vocabulary**	**Assessment for Learning (strategies and opportunities)**
Introduction Whole Class Counting – 2's, 5's, 10's – odds and evens Counting in Welsh to 20 Addition – Adding 3 1-digit numbers – struggled a bit yesterday so lots of examples together on the carpet Interactive game – add 3 1-digit numbers together – explain how you did it Different ways we can say 'addition' Who can remember? Explain different activities Plenary Come back to the carpet and recap on what everyone did. Someone from each group to explain the areas and what they learnt. AFL.	Trainee focused task (purpose, outline of trainee's role and children's learning): Glas & Gwyrdd (alternate Glas – Pick a number from each feely bag and add them together showing their workings out. If too simple, add a third number to add together Additional adult tasks (purpose, outline of additional adults' role and children's learning): Pinc & Melyn alternate Pinc – on laptops and ipads – playing games with number bonds to 20 and adding together 3 1-digit numbers Melyn – Addition game with numicon – in teams run to the box and grab a numicon. The next person must run to the number box and find the number that makes the bond to 10 or 20 Independent task: Busy bees: Sand – find the tens & units and add them together Water – fish out 3 1-digit numbers and add them together Cutting table – cut out the welsh words and match them to the numbers Tuff tray – shop – add 2 items together and give the total in pence or pounds	Interactive whiteboard Worksheets Counters Numicon Scissors Glue sticks Whiteboards Pens Feely bags/boxes Numicon & number laminates Addition Sum of Plus Together Number bonds Total Numicon	Checking strategies – repeat addition in a different order – do you get the same answer? Self assess

Curriculum coverage (range and skills)
Using Number Skills
Calculate using mental and written methods:

- Understand and use mathematical symbols
- Understand and use different mathematical terms for addition
- Mentally add 10 or 20 to a given number up to 100
- Solve one and two setep problems involving addition including missing number problems

Estimate and check:

- Use checking strategies – repeat addition in a different order

Literacy (LNF) - Listening skills, collaboration and discussion		Numeracy (LNF) - As above	
DCF Laptops & Ipads to play addition games	Thinking Think about the number bonds to 10 & 20 Think about how they can show their workings out	ESDGC Working cooperatively on tasks can solve problems	YCC Counting in Welsh

Appendix 7 – Lesson plan – Science – The Senses

Name of Trainee: Lois White	**Session ref:** The Senses	**Date:** 9.11.18	**Class:** Year 2		**Cynllun Ffocws y Cyfnod Sylfaen**
Targed(au) Hyfforddi Personol Time Management		**Number of learners:** 31	**Age:** 6-7 years		**2d**
Learning objectives/intentions:	To differentiate and identify the 5 different senses	**Success Criteria**	1. I can identify the senses 2. I can work as part of a team	**Meeting learners' needs:**	Range of learning activities for all learners

Introduction/plenary tasks	**Main activities**	**Resources/ Key Vocabulary**	**Assessment for Learning (strategies and opportunities)**
Introduction Whole Class Talk and discuss the 5 senses. What is their prior knowledge? PowerPoint to test the children on which senses are used for what.	Trainee focused task (purpose, outline of trainee's role and children's learning): Smelling pots & touch boxes - Guess the smell/ texture and use 'wow' words to describe the items Additional adult tasks: 1. Senses walk – go on a walk outside and think abiut what we can see, smell etc – complete the worksheet and work in pairs 2. Senses games – try to guess what picture matches what sense.	Sight Smell Taste Touch Sound Pairs Team work Nature 'wow' words Smelling pots Touch boxes Worksheets game	Open ended Q's in introduction 'What do you know about the senses?' 'What do the sesnes mean and why do you think they are important?' Review What did they learn? WALT & WILF

Curriculum coverage (range and skills) - Learn about the senses that humans and other animals have and use to enable them to be aware of the world around them - Describing what they have found out and offering simple explanations			
Literacy (LNF) - Use written language for different purposes, audiences or functions within play or for structured activities		Numeracy (LNF) N/A	
DCF 3.2 Creating select appropriate software from a limited range to create multimedia components; create and explore the use of text, image, sound, animation and video.	Thinking The differences between the 5 senses	ESDGC Using recyclable resources & materials	YCC N/A

Appendix 8 – Ofsted report on improving teacher subject knowledge across the curriculum

Planning, making and evaluating in design and technology

12. In design and technology, 65 lessons were observed. Nearly all the teaching was good or outstanding; in seven lessons it was satisfactory. Where design and technology teaching was good or outstanding, it was characterised by:
    - teachers who piloted making activities themselves as part of their preparation for lessons, so that they understood better the practical and cognitive difficulties that pupils might have to overcome
    - teachers who drew upon pupils' experiences as users to identify clear and agreed success criteria for their products; and using the criteria at key points to inform design decisions and improve evaluation skills