

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

Student Number: 1803357

Group Number: 1

Module Number: M6X02149-C

Word Count: 4,175

Introduction

Within this essay I am going to explore the literature surrounding teacher subject knowledge (SK) and its importance within a primary school setting. After critically analysing SK and the effect it has on learning and teaching in primary schools, I will reflect upon my own professional teaching experiences in order to further my understanding. I will be focusing specifically on my experiences during PTE 1 which took place at the end of last year. After researching the ethical considerations in relation to the British Education Research Association (B.E.R.A) I will ensure that the name of the school and any pupils remain anonymous throughout the essay. Therefore, I will refer to the school as 'School A' and any pupils as 'Pupil A', 'Pupil B' etc.

School A is a small urban school and consists of 141 children. The area that school A is located is an area of high deprivation and as a result has a free school meals percentage of 40.1. The teacher to student ratio is 1:22 and 40% of the pupils are recognised as having additional learning needs (ALN) which is extremely high compared to the recognised national average of 25% (Mylocalschool.wales.gov.uk, 2018). The class I taught consisted of 28 children of whom were a combination of year 1 and 2's (5-7 years old). I also had the valued help of one learning support assistant (LSA) and the occasional college student.

A consideration of the literature

Subject Knowledge

SK is a depth of understanding surrounding a topic or subject. It involves having a sound knowledge on the structure, the sequencing of concepts, an understanding of the developments and the ability to address misunderstandings (National College for Teaching and Leadership, 2018).

In 1986 Lee Shulman, a former president of the American Education Research Association, declared that SK is the foundation of which effective teaching is built upon. He recognised that the foundation could be split into 7 parts, the first 3 of which are content specific knowledge. The areas are as follows:

- Subject-matter knowledge
- Pedagogical content knowledge
- Curriculum knowledge
- General pedagogical knowledge
- Knowledge of learners and their characteristics
- Knowledge of educational contexts
- Knowledge and purposes of teaching and learning.

(Shulman, 1987, p.8)

Shulman strategically chose to place subject matter knowledge at the top of the list as he believed that a lack of SK can have a negative effective on all the other factors (Shulman, 1987).

Shulman does not argue that the teacher needs to know and understand every aspect of a subject in order to teach it successfully, but rather, that s/he needs an understanding of what identifies science; how the discipline differs from other disciplines; what are its boundaries, its limitations and the different ways in which it can be conceived.

(Khwaja, 2006, p.16)

Shulman goes further to say that there are three types of knowledge that are essential for teaching and they are as follows, subject knowledge, substantive knowledge and syntactic knowledge (Shulman cited in Khawaja, 2006, p.16).

SK is the key information about the subject and the principles that surround it.

Substantive knowledge describes the understanding of the frameworks that are used to influence inquiry and help make sense of data. Finally, syntactic knowledge defines the evidence that is used to help promote further enquiry into the topic.

A teacher may have a high content knowledge but know little of how the content of the subject has been constructed, and how to challenge it. Teachers who lack substantive knowledge and syntactic knowledge may be hampered by their ability to grasp new information in their field. Primary teachers who do not know how science facts / theories are developed will not be able to guide their pupils' investigations effectively. Thus, syntactic knowledge may impact on pedagogy.

(Khwaja, 2002, p.16)

Furthermore, Subject matter knowledge (SMK) consists of both substantive knowledge and syntactic knowledge (Garvey, 1996).

For many years now, the importance of a teachers SK when teaching in a primary school setting has become the central point for discussion in many government documents.

Reports showed concern at the lack of SK from teachers and described it as the '*most severe obstacle*' (cited in Khawaja, 2006) and that it is not as profound as it should be, particularly in mathematics. Certain policy makers have demanded an improvement in this area, and in 1993, OFSTED produced a report which stated;

Improvement of teachers subject knowledge was widely acknowledged as of central importance if primary schools were to make the looked-for progress when teaching the National Curriculum.

(OFSTED, 1993, p.16)

They then developed this statement further in 1998 suggesting that teachers should attend training sessions that target the improvement of their own SK. A set of government standards for the Initial Teacher Training (ITT), demanded that educational programmes audit their trainees 'knowledge and understanding of the mathematics contained in the National Curriculum, and where 'gaps' are identified to make arrangements to ensure that trainees gain that knowledge'. (Rowland, Huckstep and Thwaites, 2013, p. 16).

OFSTED's recommendations remain admissible today and many secondary schools work closely with local primary schools to ensure that their SK is up to date and relevant.

However, the assumption that SK is the foundation for effective teaching has since been challenged. It was undoubtedly still recognised as a highly influential factor, although, academic John Hattie argued that '*subject knowledge is only a minor consideration in student achievement*' (Hattie cited in Heggart, 2016. online). Hattie conducted a metanalysis which identified 138 different factors that influenced a child's learning potential. His studies showed that SK had a minor influence and that factors such as classroom management and teacher feedback were far more influential. However, Hattie revisited his findings in 2012 in a book called *Visible Learning* and presented the flaws in his previous theory. Hattie explained that teachers can use their SK to organise and create lessons in a way that is understandable for individuals, in particular those who are struggling with the lesson content (Hattie, cited in Heggart, 2016).

Despite Hattie's reflection there were still criticisms of his work and some educators argued that the key influence of effective teaching is neither classroom management, teacher feedback or SK alone. They believed that the only way to achieve effective teaching is to blend all these skills together in order to complete the process successfully.

Subsequently, it is through this theory that Pedagogical Content Knowledge (PCK) became more apparent.

Between subject content specialism and pedagogy lied pedagogical content knowledge which marks out the subject specialist from the specialist teacher by the ability to represent key ideas in a variety of ways by using demonstrations, examples and metaphors to convey meaning to young children. Furthermore, it requires

appreciation of pupils existing knowledge, their common errors and misunderstandings.

(Aubrey, 1997, p.17)

PCK is the blending of knowledge and pedagogy into a way that is digested and understood by learners, of all abilities and ages. As a teacher you need to consider the vast variety of ages and ability levels you may be faced with. Likewise, it is important to consider that what works for one child might not be universal across the board. Therefore, it is vital to ensure that your pedagogical choices deliver your SK in a way that is grasped, understood and inspires all learners.

For Shulman, pedagogical content knowledge (PCK) consists of the ways of representing the subject which make it comprehensible to others...it also includes an understanding of what makes the learning of specific topics easy or difficult.

(Shulman, 1987, p. 9)

In a journal written by Christine C. Khwaja (2006), she argued that as a teacher your methodological choice is vitally important to the students understanding. Therefore, despite what OFSTED may have believed, Khawaja proposed that the answer to improving teaching standards was not to send teachers on a course to improve their content knowledge. In fact, it would be more beneficial to help teachers explore and understand the different pedagogical methods that can be used.

As well as a strong understanding of the material being taught, teachers must also understand the ways students think about the content, be able to evaluate the thinking behind students' own methods and identify students' common misconceptions.

(Coe, et al., 2014, p.2)

Through understanding common misconceptions teachers can offer solutions so that learning obstacles are reduced , which in turn ensures that learning is accessible and adaptable.

There is an undeniable connection between SK and PCK. As teachers it is imperative we align a strong pedagogical understanding of effective lesson delivery with a high level of SK to create meaningful learning experiences. There are different evaluation tools that can help us to achieve this, one of which being the knowledge quartet.

The Knowledge Quartet

The knowledge quartet (KQ) is a framework created in 2003 by T. Rowland, P. Huckstep and A. Thwaites for the observation, analysis and development of mathematics teaching. The quartet focuses on a teacher's involvement of mathematical content knowledge (Shulman, 1987).

Rather than considering the generic features of the lesson (behaviour management, classroom organisation and so forth), the framework, the Knowledge Quartet, categorises events in mathematics lessons with particular reference to the subject

matter being taught, and the mathematics-related knowledge that teachers call upon.

(KnowledgeQauartet.org, 2012)

Although the KQ was created for mathematics the principles of the model have been used by teachers for lesson reflection and discussion across the curriculum. *'Our research suggests that the quartet is a comprehensives tool for thinking about the ways that subject knowledge comes into play in the classroom.'* (Rowland, Huckstep and Thwaites 2003, p.97).

The model highlights several important ideas and factors about SK and has been divided into four categories; foundation, transformation, connection and contingency.

The foundation unit represents the understanding and knowledge that one has about what they are teaching, in other words our SK. It focuses on internal understanding rather than the ways of externally sharing it with other learners. However, it is appropriately named the foundation unit because it is the basis for informing pedagogical choices.

The transformation unit reflects its title and represents a teachers ability to use their SK and model it into a form that is understood by learners. Shulman (1987), describes it as transforming knowledge in a *'pedagogically powerful'* way. It also includes the appropriate selection of resources and materials to enhance learning potential.

The next unit, connection, refers to the ability to make connections between prior learning in order to enhance future learning. It also reflects on a teachers understanding of when it is appropriate to make progressive steps to develop a persons learning. *'Teachers should be able to employ their subject knowledge so as to ensure that their teaching stretches pupils' thinking and 'not merely keeps step with it.'* (Alexander, 1992, cited in Garvey, 1996, p.269)

The final, yet equally important unit, contingency, refers to how a teacher responds to incidents within the classroom that are not planned for. It focuses on a teachers ability to deal with the situation in a cogent and informed way. For example, if a student asks a question that the teacher is not prepared for, they are able to divert from 'the planned' and use it as an opportunity to maximise learning.

In summary, both SK and PCK are vitally important skills that a teacher should possess and it was through this recognition that the KQ was created to support and guide teachers to achieve educational success.

Analysis and evaluation of your subject knowledge for primary teaching

Within this section I am going to evaluate and analyse my own SK in relation to my PTE and I will use specific lesson examples to support my findings. In addition to influential literature I will consider how I have complied with the developing curriculum in Wales with reference to Professor Graham Donaldson.

Donaldson created a comprehensive, independent review of the current Welsh curriculum and assessment arrangements, alongside his future proposal. The review is called *Successful Futures* (2015) and is centred around foundation phase and KS2. *Successful Futures* presents several arguments that promote the theory of PCK being essential within primary schools. Donaldson argues the importance of ensuring the curriculum is created in a way that excites young children and enables them to reach their full learning potential, both individually and teacher led (Donaldson, 2015).

One incident where I felt that my understanding of PCK was not at the forefront of my planning was during a mathematics lesson on subtraction. This was the first lesson I had taught the class on subtraction, a topic which I initially felt I had a very sound understanding of. Each pupil started with seven blocks and they would then roll a 1-3 dice to determine how many blocks they would take away.

It became evident halfway through that the pupils were struggling to share my understanding. They became very distracted and after a while the blocks became more of a hindrance than a support. At the end of the session I had a small plenary with the group, and I was disheartened by their answers which reflected little understanding of the topic. Thus, it became evident that I needed to reflect upon my lesson and evaluate my practice. This reflection is further supported by a case study by Bennet and Turners (1993) that

complied evidence from post graduate certificate in education (PGCE) students which suggested that for effective teaching to take place, class management needs to be recognised and implicated. A teacher needs to not only be able to organise and present their SK, but they also need to evaluate and reflect when obstacles arise (Garvey, 1996). Subsequently, I used this lesson as an opportunity to use Shulmans KQ to help me rectify the mistakes that I had made.

Despite initially thinking I had a sound SK, it was clear from the plenary that I had in fact let myself down in the foundation unit and that my understanding was inadequate. However, the transformation unit was where I disappointed myself and my pupils the most. I failed to transform my knowledge in what Shulman (1987) described as a 'pedagogically powerful' way. My selection of resources proved ineffective and my lesson lacked creativity, which in turn had a negative effect on the learning experience.

In recent decades, educational research has provided compelling evidence that the quality of the learning opportunities created by teachers affects students' learning and motivation.

(Hattie, 2009, cited in Kleickmann, 2012. Online)

It was evident that my selection of resources had resulted in distraction rather than encouragement. Upon reflection of the transformation unit I realised I had neglected my role of giving a sound demonstration before sharing the task, therefore making it very hard for the children to form an understanding. As a result, I had lacked the ability to find ways in which my pupils could make a connection to prior learning in order to make the topic more relatable. I had failed to 'think on ones feet' (Shulman, 1987) due to a lack of preparedness which resulted in an absence of contingency.

Donaldson proposed that the new Welsh curriculum should be designed around the following 10 principles; authentic, evidence-based, responsive, inclusive, ambitious, empowering, unified, engaging, based on subsidiarity, manageable (Donaldson, 2015, p.14).

The principles have been used as a guide to help evaluate the current curriculum and to help shape the future curriculum. Thus, I took on board the analytical observations I had made about my own practice and with the support of the KQ I created a revised lesson plan that I felt complied with Donaldson's principle of making learning engaging for students.

Engaging: encouraging enjoyment from learning and satisfaction in mastering challenging subject matter.

(Donaldson, 2015, p.14)

I hoped that by doing so I would not only achieve a positive educational output, but also attain satisfaction and enjoyment from my pupils.

My revised lesson plan (see appendix A) involved teaching my pupils subtraction through the form of bowling, an activity that not only did I know the children enjoy, but one which represented meaning and moved them away from the classroom table. I'd created 'bowling record sheets' for them to record their results on through the form of a subtraction number sentence. The children started with seven bowling pins (plastic cups) and they took it in turns to bowl the ball to see how many pins they could knock over. The combination of the plenary and the answers on their record sheets provided substantial evidence that this was a far more effective learning experience.

Furthermore, the lesson supports Donaldson's argument that it will no longer be enough to just deliver your SK to a class. A teacher needs to be able to apply exciting and engaging pedagogical skills in order to entice learners and enrich their learning experience

(Donaldson, 2015). He develops this theory further by emphasising the importance of the 'how' and the 'why' of teaching (PCK) rather than just the 'what' (SK). *'The intention is to release the creativity and energy of teachers to provide rich learning for children and young people.'* (Donaldson, 2015, p.64).

The revised lesson ticked all the boxes of one that was 'pedagogically powerful' and engaging, as not only did they have educational fun, but they also attained a sound understanding of subtraction. The visual aspect of bowling also allowed the children to see how and why the answer happened.

During placement I also experienced a situation where my SK was vital in preparing me for a situation in which I had not planned for. This incident took place during a digital competence lesson, with cross curricular literacy links, which required the children to create and type their own dinosaur stories onto a word document (See appendix B). The objective of the lesson was to *'create a dinosaur story and insert the pictures to match'*.

I had differentiated the success criteria to suit the different ability groups, for example, my high ability year ones success criteria was, *'I can type simple sentences using capital letters, spaces and full stops'* and *'I can use my sounds and use my CVC words'* for the lower ability year ones. However, during the lesson, I had two pupils (pupil A and pupil B) with ALN who really struggled with the task and as a result were becoming very frustrated and reluctant to remain engaged.

Both pupils were struggling to find the correct letters on the keyboard it became apparent that they would not complete the task. I was concerned that the well-being of those two pupils was at risk, especially when it came to orally presenting their work to the class. Therefore, I reflected upon my SK of the DCF and what skills I felt would be more achievable for

these two individuals. I knew that one of the skills was to *'Record audio which has relevance to the task'* (learning.gov.wales), so I asked pupil A and B to log onto HWB and referred them to a programme called JIT5. Instead of typing their stories, I asked pupil A and B to orally recorded their stories onto a voice clip and draw pictures to accompany their story, which they could then later present to the class. Both pupils responded well to this task and maintained full engagement throughout the lesson.

When using the KQ to reflect upon this lesson, it was clear that my strong foundation had informed my decision to adapt the lesson plan, which in turn meant that I had succeeded in meeting the criteria for the contingency unit in the KQ. I was able to divert from 'the planned' and use it as an opportunity to maximise learning. My SK helped to prepare me for any complications and gave me the confidence to offer solutions and alternatives. Some people may argue that by personalising the lesson I deprived pupil A and B of practicing their typing skills. However, I felt that the lesson complied with the Donaldson's value of *'Every child and young person benefits from personalised learning'* (Donaldson, 2015, p.26). In other words, as teachers we cannot take a one size fits all approach. If I had not personalised the lesson to make it achievable for pupil A and B, then I would have been neglecting their individual needs and consequently their well-being.

The lesson supported Donaldson's purpose of creating *'enterprising, creative contributors'* as pupil A and B showed the ability to, *'express ideas and emotions through different media.'* (Donaldson, 2015, p.29). Furthermore, the lesson showed consensus with Donaldson that digital competence is just as important as literacy and numeracy as I chose for the children to type their stories rather than write them by hand.

Successful Futures list several progression steps to help teachers comply with the new curriculum, all of which are centred around the concept of pedagogy. Step number 4 (*'Good teaching and learning means employing a blend of approaches including those that promote problem solving, creative and critical thinking'*) (Donaldson, 2015, p.65)) supports the connection unit of the KQ and discusses the importance of pupils being able to evaluate and make connections in their learning in order for them to transfer knowledge and skills to new situations. I feel that I succeeded in meeting this concept during a science lesson I taught which involved an experiment called 'sticky ice' (See appendix C). The lesson covered units within 'Knowledge and Understanding of the World' (*communicating observations and measurements and exploring and experimenting*), which will come under 'Science and Technology' in the new curriculum suggested by Donaldson (2015). It also complied with the proposal that literacy, numeracy and digital competence become cross curricular subjects that are embedded across the curriculum (Donaldson, 2015). LNF was covered within the lesson through *'Making lists and tables based on data collected.'* (Year 1- Maths) and *'Take part in activities with others and talk about what they are doing.'* (Year 1- Literacy) and the children used iPads for digital timers to ensure a fair test. (DCF). The learning objective of the lesson was *'To understand why salt makes ice stick to string'*. Each child had a bowl, ice cube, string and a variety of ingredients in front of them alongside their results sheet to record their findings on. The children, accompanied with my guidance, tested which ingredients reacted with the ice and caused the string to stick. When it came to experimenting with the salt I moved away from my 'planned' criteria as I saw it as an opportunity to make a connection to prior learning (Shulman, 1987).

During the previous week I carried out a dinosaur ice excavation with the children to teach them about the different substances that can be used to melt ice (see appendix D). I froze plastic dinosaurs in ice and presented the children with various substances, one of which was salt, and asked them to experiment and see which one melted the ice the fastest. By the end of the experiment all the children agreed that salt was the most effective substance to melt ice.

Therefore, during the sticky ice experiment I asked the children to think about why it was that the ice stuck to the string when we used salt. I prompted them to think back to our ice excavation and what we had learnt during that lesson. Immediately, one child explained that *'salt melts the ice and makes the string stick!'*. I then used this understanding as an opportunity to maximise learning by explaining to the children the scientific explanation behind the chemical reaction.

During the plenary I asked each child to explain the chemical reaction to me as they left the classroom. Their answers showed that they had a sound understanding and I believe this came down to their prior knowledge of ice and their ability to make a connection. It is therefore vital to use PCK to make learning relatable for pupils in order to promote problem solving and critical thinking. It was important that I used my understanding of the connection unit to build upon previous experiences and to create an experience which engaged my learners and allowed them to make progressive steps towards developing their learning. The outcome of the lesson also provided evidence for Donaldson's purpose of developing young people as *'ambitious, capable learners, ready to learn throughout their lives'* as they were *'building up a body of knowledge and have the skills to connect and apply that knowledge in different contexts'* (Donaldson, 2015, p.29).

Conclusion

In summary, despite a clear theoretical distinction, it is evident that both SK and PCK have a positive correlation and when combined the outcome demonstrates that of effective teaching. Through personal practice I can confidently say that SK is only worthwhile if it is presented through the most effective and pedagogically powerful form.

Within my future practice it is imperative that my SK is up to date and complies with Donaldson's proposals in order to achieve the highest standards of teaching. Furthermore, I will continue to refer to the KQ, as it is a highly effective framework which helps to evaluate and improve both SK and PCK, which in turn leads to higher educational gains for pupils.

APPENDICIES

Appendix A- Bowling Subtraction Lesson Plan

Introduction/plenary tasks	Main activities	Resources/ Key Vocabulary	Assessment for Learning (strategies and opportunities)
Introduction N/A	<u>Trainee focused task</u> (purpose, outline of trainee's role and children's learning): <u>Bowling Subtraction</u> - Children work in <u>pairs</u>, each pair has 10 bowling pins (plastic cups) and a bowling ball (tennis ball). - Make sure you ask the children what shape the bowling pins are set out as and do we know the name of this shape in welsh? (assessment of shape knowledge) - The class collectively count to three in Welsh and say 'Bowlio'. - One child bowls the ball trying to knock over as many pins as they can. - The other child records their results on their bowling record sheet which allows them to create number sentences. These will then be stuck in their topic books. - For Example, they will be able to see that they had 10 pins to start with, they knocked over 4 and now they have 6 left ($10-4=6$). - Once they have completed the subtraction sentence they swap over. - Each time ask the bowler to take a photo of their bowling alley so that later we can print the photos for our learning boards and to make laminated cut outs for independent learning stations. <u>Group Glas:</u>	<u>Resources</u> - Paper cups (Bowling pins) - Tennis balls (Bowling balls) - Ipads - Bowling record sheets - Topic books (to stick bowling records in) - Laminated copy of 'Bowlio' <u>Key Vocabulary</u> - Take away - Total - Sum of - How many are left? - How many fewer is... - Words for numbers in Welsh and English - Welsh word for 'bowl' - bowlio - Welsh word for 'Triangle' - Triangl	<u>Questioning Techniques</u> - Using open ended questions to help develop their understanding. For example 'so now you have knocked over two of our pins, how many in total are still standing?' <u>Self Assessment</u> - Ask the children to do thumbs up, thumbs down to help assess understanding and ask them to tell me one thing theyve learnt from todays task. <u>Areas for development and understanding</u> - I will use the photos that the children took during the task and make laminated bowling cards with different amounts of standing pins. This enhanced provision will mean that during independent learning time the children can use these cards to create number sentences in their independent writing books. - Sticking their bowling record sheets in their topic books will allow for assesment of understanding in focused task. - Photographing activities for use during plenary- recall of events.

Appendix B- Digital Competence Lesson Plan

Name of Trainee: <u>Naomi</u> Session ref: <u>Literacy Morning</u> Date: <u>23/11/18</u> Class: <u>2</u>		Cynllun Ffocws y Cyfnod Sylfaen 2d					
SS.1 - Teaching, Planning, Expectations and targets (to make activities more practical based) Targed(au) Hyfforddi Personol: <u>based</u> Number of learners: <u>26</u> Age: <u>5-7</u>							
Learning objectives/intentions:	To create a dinosaur story and insert the pictures to match	Success Criteria	- I can type simple sentences using capital letters, spaces and full stops. (Group <u>Coch</u>) - I can use my sounds and use my CVC words to help me type a story. (Group Melyn)	Meeting learners' needs:	This activity can be adapted for children working towards ARE by: Giving them sound sheets and working with them to spell out and type the sounds. This activity can be adapted for children working towards Greater Depth by: Leaving them to work more independently and ask them to insert pictures to support their story.		
#Introduction/plenary tasks		Main activities		Resources/ Key Vocabulary		Assessment for Learning (strategies and opportunities)	
<u>Introduction</u> (Mr Denham)		<u>Trainee focused task (purpose, outline of trainee's role and children's learning):</u> <u>Group Melyn</u> - The group will be given a variety of picture cards all of which relate to the class topic (dinosaurs). - The pictures will all relate to simple CVC words. - I will ask the children to pick the pictures they like and type their own picture story. - They will then need to type their own simple sentences using the picture cards provided. - Making sure to check for capital letters, spaces and full stops. <u>Group Glas and Group Coch</u> - Group Coch and Glas will be provided with the more detailed picture cards. - They will be asked to write two sentences about each picture.		<u>Resources</u> - Sound sheets - CVC picture cards - Detailed picture cards - Topic books - Pencils - Rubbers - Whiteboards - Whiteboard pens <u>Key vocabulary</u> - Detail - Type - Click - Insert - Research - Font - Expand - Describe - Imagine - Neat - Tidy - Equall		<u>Questioning</u> - I will use open ended questions to encourage the children develop their stories. For example, 'what colour is the dinosaur' and 'what do his teeth look like' <u>Peer Marking</u> - Group Coch and Glas will peer mark eachothers works which will help me to assess their level of understanding.	

	- Through questioning they will be encouraged to use adjectives and verbs to develop their sentences. - Strong focus will be placed on using capital letters, full stops and spaces. - They will be asked to insert pictures to support their story - This group will also peer mark each <u>others</u> work looking for 3 key things (spaces, capital letters and full stops) - Encourage to experiment with different fonts <u>Additional adult tasks</u> (purpose, outline of additional adults' role and children's learning): - Continuing with yesterdays RWT	- Adjective - verb - Sentence - Create	
Plenary At the end of the literacy morning the whole class will come together on the carpet and I will <u>chase</u> one person from each group to read and share their work with the class. This will allow me to assess their understanding.	<u>Independent learning opportunities:</u> - Match the lower case bottle cap to the capital letters on the word chart. - Stick the correct letters underneath the picture to create the word. - Practice writing letters in the salt and glitter tray. - Peg the peg to the correct letter to match the picture (e.g 'C' on the picture of a cat). - Reading books in the literacy lodge.		
Curriculum coverage (range and skills) - Select appropriate software to complete given tasks (Year 1) - Build sentences. Insert and delete text (Year 1) - Use images in a digital piece of work (Year 1)			

Literacy (LNF) - Express opinions, giving reasons and provide appropriate answers to questions (<u>oracy</u> Year2) - Orally blend and segment words (Year 1 Listening) and polysyllabic words (Year 2) - Talk about what they are going to write (Year 1 writing) - Use talk to plan (Year 2 writing) - Write words phrases and simple sentences and read back own attempts (Writing Year 1) - Re read and improve their writing to ensure that <u>its</u> makes sense (Year 2 writing) - Follow a form modeled by the teacher (Writing Year 1) - Understand and use language appropriate to writing <u>e.g</u> noun, verb, adjective (writing Year2) - Use specific words which relate to the topic of their writing (writing Year2)		Numeracy (LNF) N/A	
DCF Phonics Play on the iPad	Thinking Basic Understanding: - Organising gathered information - Forming concepts - Linking ideas together	ESDGC All of our pictures will link to the environment, so we will discuss why it is important to protect our environment in order to keep enjoying these things such as trees and animals.	YCC For all the simple words I will have a copy of the Welsh words and at the end we will have a challenge to see which pair can match the most correct Welsh words to the English words.

Appendix C- Sticky Ice Lesson Plan

Name of Trainee: Naomi Pattinson Session ref: Topic: sticky ice Date: 11/12/18 Class: 2 Targed(au) Hyfforddi Personol S3.3- Teaching and class management- confident and well developed approach to class behaviour/management Number of learners: 28 Age: 5-7		Cynllun Ffocws y Cyfnod Sylfaen 2d	
Learning objectives/intentions:	• To carry out a scientific experiment and understand what happens to ice when salt is added.	Success Criteria	• I understand why salt makes ice stick to string
Meeting learners' needs:		This lesson can be adapted for children working towards ARE by: only using salt and not changing the variables. This lesson can be adapted for children working at greater depth by: asking them to write out the ingredients that they are trying and create their own results sheet.	
Introduction/plenary tasks		Main activities	
Introduction - Ask them to turn to their partner and discuss if they think ice will stick to string and why. - Share some answers - Explain that we are going to carry out a scientific experiment today to explore this topic. - Introduce the learning objectives of the lesson to the class. - Tell the children all the new independent areas. - Split the children into groups.		Trainee focused task (purpose, outline of trainee's role and children's learning): Coch and Glas - 20 minnte rotation - Sticky ice experiment with small groups - Ask the children to fill a bowl with 500 ml of water and an ice cube. - Ask the children if they can make the ice cube stick to the string. - What happens if we add salt to the water? - We all need to count to 60 together to make the magic work - Some of you can time it on your ipads - Now lets lift the string up and see. Has it worked? - Now lets do the same but with sugar. Each time recording results on the board and ask the children to use a thermometer to measure the temperature of the water. - Why do you think is the salt work but the sugar doesn't? - Turn to your partner and discuss. - Ask them to think back to our dinosaur ice excavation. What were we using to melt the ice? Salt. - Have a quick group discussion about how Salt lowers the freezing point of water to below 0 degrees Celsius. When you added salt to the ice cube, the salt lowered the melting point of the ice. The salt is in a thin layer, so it melts a thin layer on top of the ice cube. The water cooled down further and re-froze around the string.	
Resources/ Key Vocabulary		Assessment for Learning (strategies and opportunities)	
Resources: Ice cubes Bowls String Salt Results cards Whiteboard pens Food colouring Sugar Flour Fossils Spades Paintbrushes Flour Mixing bowls Spoons Cookie cutters Rolling pins Key Vocabulary Experiemnt Investigate Scientists Results Reliable		Assessment for learning Half way through the lesson I will review the learning objective with the group and ask whether they think they are meeting it. The childrens response to 'what do we know that salt does to ice?' will allow me to assess whethr they remember the results from their ice excavation experiment two weeks ago. I will also use continous open ended questions to probe their investigation. For example, 'now why do you think it is that the ice cube has stuck to the string? What other method do we think might have the same effect?'	
Plenary At the end of the lesson when we come back to the carpet I will ask certain individuals to share their results with the class and explain what they have learnt.		Additional adult tasks (purpose, outline of additional adults' role and children's learning): Melyn and Gwyrdd - Making salt dough christmas tree decortions that they can paint during independent learning in the week. - Children need to help make the dough and measure the ingredients as independently as possible. - Children working towards greater depth need to try reading and following the recipe themselves.	
Curriculum coverage (range and skills) Knowledge and understanding of the world- exploring and experimenting • thinking about questions and then asking them and listening to the answers • thinking creatively and imaginatively • communicating observations and measurements • recognising simple patterns in their findings • describing what they have found out and offering simple explanations Creative Development- Promotion of creativity involves stimulating children's curiosity and imagination, raising self-esteem and encouraging confidence to try new things. Problem solving, investigating and exploring. Sensory experience.		Literacy (LNF) - Take part in activities with others and talk about what they are doing (Year 1) - Share activities and information to complete a task (Year 2) - Prepare and ask a variety of questions. E.g. 'who', 'what', 'why', 'when', 'how', for a variety of purposes and to clarify identity and understanding (Year 2) - Read aloud with attention to full stops and question marks (Year 1)	
Numeracy (LNF) - Measuring - Using descriptive words for a range of temperatures, e.g. cooler/warmer (Year 1) - Use descriptive words for a range of temperatures, e.g. cooler/warmer (Year 1) - Compare temperatures using a thermometer (Year 2)		ESDGC N/A	
DCF using their ipads to time the experiment		Thinking - Problem solving - Information Gathering: Sensing – seeing, hearing, touching - Basic Ideas- Linking ideas together	
YCC Using incidental Welsh			

Appendix D- Ice Melting Lesson Plan (Dinosaur Excavation)

Name of Trainee: Naomi Pattinson		Session ref: Science- dinosaur excavation	Date: 20/11/18	Class: _____	Cynllun Ffocws y Cyfnod Sylfaen 2d
Targed(au) Hyfforddi Personol		S3.1 – Teaching, Planning, Expectations and targets (to make activities more practical based)	Number of learners: _____	Age: _____	
Learning objectives/intentions:	observing ice closely, using simple equipment and carrying out experiments.	Success Criteria	I can confidently talk about ice and the elements that make it melt.	Meeting learners' needs:	This activity can be adapted for children who are working towards ARE by: giving them a results sheet which just involves them ticking the methods they tried and using basic CVC words. This activity can be adapted for children working towards ARE by: asking them to write a simple sentence about each method they tried.
Introduction/plenary tasks		Main activities		Resources/ Key Vocabulary	Assessment for Learning (strategies and opportunities)
Introduction - Show the class an ice cube and ask 'What do we know about ice?' - Give each child an ice cube and ask the following questions. - Can we think of words to describe ice? 'Where is ice found?' 'How can we melt ice?' (write down the ideas on the board) (hold it in our hands, wrap it on a towel) - Explain to the children that overnight it was very cold and our dinosaurs in our shelters outside have frozen! So we are going to have to conduct an experiment to set them free trying some of the methods we have written on the board. - But first they need to make a prediction of which method they think will work best and why.		Trainee focused task (purpose, outline of trainee's role and children's learning): Group Theropods, Carnivores, Herbivores and Sauropods (20 minute rotation blocks) - Ice Excavation - Inside the dinosaur shelters that the children have built there will be a tray of grass with frozen ice eggs with miniature dinosaurs inside. - The children need to experiment in partners different ways for melting the ice and setting the dinosaur free. - They will be provided with a variety of different materials and utensils to aid their dinosaurs escape (spray bottles, salt, spoons, rocks) - They need to take a photo of each method they try - At the end of the task the children need to fill out their '5 of the best ways to melt ice' sheet to stick in their evidence books.		Resources - Balloons - Miniature dinosaurs - Trays of grass - Spray bottles - Spoons - Rocks - Salt - Ice cubes - Fossils - Dpades - Paint brushes Key Vocabulary - Experiment - Estimate - Melting - Temperatures - Predict - Reaction - Welsh word for ice cube - Investigate - Scientists - Results - Reliable	Assessment for learning The pupils results sheets will help me to assess their understanding of recording results accurately as salt will be the only thing to make the ice stick to the string. I will also use continuous open ended questions to probe their investigation. For example, 'now why do you think it is that the ice cube has stuck to the string? What other method do we think might have the same effect?'
Plenary At the end of the lesson we will all come back to the carpet and have a 'show and tell' feedback session where the children will share what methods of ice melting they tried and what worked best.		Additional adult tasks (purpose, outline of additional adults' role and children's learning): Dino Dig – become a paleontologist roll over from yesterday (Herbivores and Sauropods 30 minute rotation block) Independent learning opportunities: - Writing in the dino swamp tray - Dinosaur junk modelling - Dino detective word hunt - Dinosaur modelling with plasticine - Dino trumps - Practicing writing dinosaur names in independent learning books from the prompt cards - Dinosaur pasta bones		- Fair test - Cooler - Warmer - Chemical reaction	
Curriculum coverage (range and skills) Knowledge and understanding of the world- exploring and experimenting • thinking about questions and then asking them and listening to the answers • thinking creatively and imaginatively • communicating observations and measurements • recognising simple patterns in their findings • describing what they have found out and offering simple explanations Creative Development- Promotion of creativity involves stimulating children's curiosity and imagination, raising self-esteem and encouraging confidence to try new things. Problem solving, investigating and exploring. Sensory experience.					
Literacy (LNF) - Take part in activities with others and talk about what they are doing (Year 1) - Share activities and information to complete a task (Year 2) - Prepare and ask a variety of questions. E.g. 'who', 'what', 'why', 'when', 'how', for a variety of purposes and to clarify identity and understanding. (Year 2) - Read aloud with attention to full stops and question marks (Year 1)		Numeracy (LNF) - Using descriptive words for a range of temperatures, e.g. cooler/warmer (Year 1) - Making lists and tables based on data collected (Year 1)			
DCF Photographing their ice melting methods for their topic books.		Thinking - Problem solving - Information Gathering: Sensing – seeing, hearing, touching - Basic Ideas- Tinkling ideas together		ESDGC N/A	YCC Using incidental Welsh

Bibliography

Alexander. R, Rose. J and Woodhead. C. (1992) *Curriculum Organisation and Classroom Practice in Primary Schools: a discussion document*, London: Department of Education and Science

Aubrey, C. (1997) *Mathematics teaching in the early years: an investigation into teachers subject knowledge*. London: Falmer Press. P.17

Brown, et all., (1999) *Primary student teachers' understanding of mathematics and its teaching*. British Education Research Journal, 25(3)

Coe, et all., (2014) *What makes great teaching? Review of the underpinning research*.

Available at:

[file:///C:/Users/Naomi/AppData/Local/Packages/Microsoft.MicrosoftEdge_8wekyb3d8bbwe/TempState/Downloads/What%20Makes%20Great%20Teaching%20\(1\).pdf](file:///C:/Users/Naomi/AppData/Local/Packages/Microsoft.MicrosoftEdge_8wekyb3d8bbwe/TempState/Downloads/What%20Makes%20Great%20Teaching%20(1).pdf) (Accessed: 2nd Jan 2019) p.2

Graham, D. (2015). *Successful Futures Independent Review of Curriculum and Assessment Arrangements in Wales*. Gov.wales. Available at:

<https://gov.wales/docs/dcells/publications/150225-successful-futures-en.pdf> (Accessed 2nd Jan 2019).

French, D. (2005). *Subject Knowledge and Pedagogical Knowledge*. Available at:

<http://www.maths.manchester.ac.uk/~avb/pdf/DougFrenchSubjectKnowledge.pdf> (Accessed 8th Jan 2019).

Garvey, J. (1996) *Subject knowledge content in primary initial teacher education courses in design and technology - a discussion*. Available at:

[papefile:///C:/Users/Naomi/AppData/Local/Packages/Microsoft.MicrosoftEdge_8wekyb3d8bbwe/TempState/Downloads/275-1-1285-1-10-20090721%20\(1\).pdf](papefile:///C:/Users/Naomi/AppData/Local/Packages/Microsoft.MicrosoftEdge_8wekyb3d8bbwe/TempState/Downloads/275-1-1285-1-10-20090721%20(1).pdf) (Accessed: 2nd Dec 2018)

Grigg, R. (2010) *Becoming an outstanding primary school teacher*. Essex: Pearson Education Limited

Guerriero, s. (2017). *Teachers' pedagogical knowledge: What it is and how it functions* /

READ online. OECD iLibrary. Available at: https://read.oecd-ilibrary.org/education/pedagogical-knowledge-and-the-changing-nature-of-the-teaching-profession/teachers-pedagogical-knowledge-what-it-is-and-how-it-functions_9789264270695-6-en#page1 (Accessed 7th Dec 2018).

Hattie, J. (2012). *Visible learning for teachers : maximising impact on learning*. London: Routledge

Heggart, K. (2016) *How Important is Subject Matter Knowledge for a Teacher?* Available at: <https://www.edutopia.org/discussion/how-important-subject-matter-knowledge-teacher> (Accessed: 13th Dec 2018)

Khwaja, C. (2006). *The Role of Subject Knowledge in the Effective Teaching of Primary Science..* Available at: <http://www.educatejournal.org/index.php/educate/article/view/43/40> Educatejournal.org (Accessed 28th Dec 2018)

Kleickmann, et al., (2012). *Teachers' Content Knowledge and Pedagogical Content Knowledge. Journal of Teacher Education.* Available at: <https://journals.sagepub.com/doi/abs/10.1177/0022487112460398> . 64(1), pp.1-17. (Accessed 3rd Jan 2018)

National College For Teaching and Leadership (2019) *Subject Knowledge: Leading Teaching,* Available at: http://www.inspiringleaderstoday.com/ILTMaterials/LEVEL3_LIT-v4.0-2014_08_08-11_54_0/leading-and-improving-teaching/lit-s4/lit-s4-t05.html (Accessed: 5th Jan 2019)

Rowland, T. Huckstep. P. and Thwaites, A. (2003) *The Knowledge Quartet,* Available at: [file:///C:/Users/Naomi/AppData/Local/Packages/Microsoft.MicrosoftEdge_8wekyb3d8bbwe/TempState/Downloads/Introducing%20Knowledge%20Quartet%20,\(3\).pdf](file:///C:/Users/Naomi/AppData/Local/Packages/Microsoft.MicrosoftEdge_8wekyb3d8bbwe/TempState/Downloads/Introducing%20Knowledge%20Quartet%20,(3).pdf) (Accessed: 2nd Dec 2018)

Rowland, T. (2013). *Analysing secondary mathematics teaching with the Knowledge Quartet. Research in Mathematics Education,* [online] 1(3), pp.15-31. Available at: [http://file:///C:/Users/Naomi/AppData/Local/Packages/Microsoft.MicrosoftEdge_8wekyb3d8bbwe/TempState/Downloads/The_Knowledge_Quartet_The_Genesis_and_Ap%20\(1\).pdf](http://file:///C:/Users/Naomi/AppData/Local/Packages/Microsoft.MicrosoftEdge_8wekyb3d8bbwe/TempState/Downloads/The_Knowledge_Quartet_The_Genesis_and_Ap%20(1).pdf) (Accessed 14th Dec 2018).

Shulman, L. (1987) *Knowledge and teaching: Foundations of the new reform.* Harvard Educational Review, 57(1), pp. 1-22.