

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

Word Count: 4394

In consideration of the assignment title I will be analysing subject knowledge for teaching in relation to what is considered effective learning. By addressing these points, I will be discussing the debate over what knowledge a teacher requires, whether subject knowledge (SK from here in) can have a positive or negative affect on children's learning and how teacher's SK is monitored. Additionally, I will be reflecting on my own SK from recent teaching experience which I undertook in a Year 6 class within a large pioneer school. To summarise the background of the school, 34% of pupils are identified as having additional learning needs, very few have English as an additional language and a limited number of pupils speak Welsh at home (Reference removed for anonymity). The name of the school and pupils will remain anonymous in accordance with ethical guidelines set out in BERA (2018).

Shulman referred to SK as being "the missing paradigm" and a "blind spot" as previous research failed to focus on what the teacher knows and instead focussed heavily on teaching procedures (1986:6-7). Despite this, Leinhardt and Smith (1985) and Elbaz (1983) both identified the importance of subject matter knowledge in their research (cited in Grossman, 1990). However, according to Grossman (1990) studies prior to Shulman made no link between teacher SK and student achievement.

It is essential to consider Shulman's work as it is seminal, which means it informs any further literature on teacher knowledge (1987). Bennett and Carré (1993) argue that applying findings to teachers from Britain should still be treated with caution as the majority of research has been undertaken in America.

From Shulman's research of comparing trainees to expert teachers, he suggests that teacher knowledge grows through "error, success, and refinement" (1987:4).

He identifies seven categories of the teacher knowledge base which include knowledge of:

1. Content
2. Pedagogy
3. Curriculum
4. Learners and Learning

- 5. Context of Schooling
- 6. Pedagogical Content; and
- 7. Educational Philosophies

(1987:8)

Shulman received criticism from Leinhardt and Feinberg (1990, cited in Bennett and Carré 1993) for unnaturally splitting teacher knowledge into narrow categories. However, Twiselton and Elton-Chalcraft (cited in Cremin and Burnett, 2018) argue that it is the combination of the knowledge base that is essential for effective teaching.

Shulman identifies content knowledge as being a “central feature of the knowledge base of teaching” (1987:9). Shulman was the first to give credit to pedagogical content knowledge (PCK), which saw a change from looking at content knowledge and pedagogy as separate entities (Mishra and Koehler, 2006). Ball and McDiarmid (1990, cited in Mishra and Koehler, 2006) were critical of the new focus on PCK as they suggest it sacrificed content knowledge.

Shulman (1986) classifies content knowledge into three categories of subject matter, pedagogical content and curricular knowledge. Whilst considering how SK relates to effective learning it is necessary to focus on the identified content knowledge for teaching.

Subject matter is the initial knowledge a teacher may possess, namely, what they know about the subject and any beliefs surrounding the subject (Grossman, 1990). In research undertaken by Rowland et al. (2009), it was identified that the majority of primary trainee teachers had not studied mathematics since GCSE and as a result felt anxious about their own mathematical ability. Put simply by Kennedy (1991), a teacher “cannot teach something they do not know” (cited in Bennett and Carré, 1993:10).

Rowland et al. developed a framework referred to as the Knowledge Quartet which specifically reviewed content knowledge of primary school teachers (2009). The four areas which make up the knowledge quartet, titled: ‘foundation’, ‘transformation’, ‘connection’ and ‘contingency’, support the idea that SK is more than just what a teacher knows about a particular subject area (2009:225).

‘Foundation’ relates to what Shulman referred to as subject matter. According to Ball and Hill (2009), a teacher knowing how to solve a mathematical problem themselves will not be sufficient to transfer that SK to the child. As Shulman points out, “learners are unlikely to appear before them as blank slates” (1986:10). In light of this it is relevant to consider a

constructivist view that pupils learn by making connections to prior knowledge (Piaget, 2002). Thus, leading on to the importance of how the teacher presents knowledge to pupils, referred to as ‘transformation’ within the knowledge quartet (Rowland et al. 2009).

“Those who can, do. Those who understand teach” (Shulman 1986:14)

From this it is clear that it is not considered enough to simply have knowledge of the subject being taught to enable effective learning. Additionally, Shulman advocates a requirement of “knowledge for teaching” (1986:9). Teachers need to be able to offer examples, explanations and demonstrations to assist the learner’s understanding through the application of PCK (Shulman, 1986:9). PCK includes being able to identify common misconceptions and preconceptions of topics (Shulman, 1986). In support of this, Estyn the inspector of education in Wales, argues that teaching was less successful where teachers did not possess enough mathematical SK to tackle pupil misconceptions (2014:4).

Whilst agreeing that SK is important, Hollingsworth (1989) highlights the need for pedagogical knowledge as a prerequisite. In other words, knowledge on how to control the class is needed before being able to transfer SK for pupil understanding. How this is implicated on teachers today is shown by Estyn stating that “deep subject knowledge” and the ability to choose the best approach enables teachers to be effective in practice (2018:5). In contrast to Hollingsworth (1989), Koponen et al. (2019) support the idea that teacher knowledge is hierarchical and state SK is needed before PCK and curriculum knowledge. Shulman (1987:12) states that knowledge is not “fixed and final”. However, Deng (2018) criticises the lack of clarity surrounding PCK. Future studies decided to address the lack of clarity, as discussed by Deng (2018), by adding their own aspect to PCK. Grossman (1990) expands PCK specifically for teaching English (see Appendix 1a). Comparably, Ball and Hill (2009:70) created “Mathematical knowledge for teaching” (see Appendix 1b) and Mishra and Koehler (2006) demonstrate how the knowledge is interconnected (see Appendix 1c). Consequently showing that teacher knowledge should continually grow.

‘Connection’ is similar to what Shulman referred to as curriculum knowledge, referring to the ability to sequence topics for effective learning. Askew et al. found that effective teachers in mathematics showed sound knowledge of the curriculum and connections between prior and future learning (1997, cited in Cremin and Burnett, 2018). This places implications on teachers’ planning as it requires acknowledgment of the curriculum from which teachers can “draw those tools of teaching” (Shulman in Pollard and Bourne, 1994:86). Shulman identifies

the need for “lateral” and “vertical” curriculum knowledge (1986:10). Lateral refers to the knowledge of what is being taught throughout the curriculum, not just in a specific subject area. This is particularly relevant to the proposed new curriculum in Wales, as it favours a move from a subject-based curriculum to a focus on skills within Areas of Learning through themes (Donaldson 2015). Although this may pose the question whether subject specific knowledge is still imperative, Donaldson states:

“subject knowledge...remains the best path to a sound and relevant education” (2015:5).

Vertical curriculum knowledge denotes knowledge of what has been taught before and what is to be taught in the future within a specific subject area (Shulman, 1986:10). As Donaldson (2015) proposes the curriculum should promote progression and continuity; having good curriculum knowledge would only assist this.

Finally, ‘contingency’ relates to the knowledge needed for unplanned situations. According to a study by Medwell et al. (1998) SK was only truly revealed when put on the spot whilst teaching. For Rowland et al. (2009), contingency requires the knowledge to respond to pupil misconceptions or queries. Brown and Wragg (1993, cited in Rowland et al. 2009) argue that a teacher’s ability to respond is hindered by anxiety. As previously stated by Rowland et al., the trainees’ lack of SK could be detrimental to their pupils, as preconceptions and anxiety surrounding mathematics can be transferred to the pupils (2009).

The relationship between effective learning and teacher knowledge is supported by findings made by Coe et al. (2014), which suggests there is significant evidence to prove teachers who lack relevant SK have a detrimental effect on the pupil’s learning. Bennett and Carré suggest that teachers having good SK assists children to develop “flexible understandings” of ideas taught (1993:10). Grossman’s (1985) case study on Colleen showed how teaching delivery depended on SK because whilst teaching a subject she was confident in she showcased good overall content knowledge. Alternatively, when teaching a topic she knew less about, Colleen was an entirely different teacher “limiting the range of possible deviations from the path she designed” (cited in Shulman, 1987:18).

The need for a review of the curriculum stemmed from Wales’ poor performance in a survey conducted by Programme for International Student Assessment (PISA) (Donaldson 2015).

The Literacy and Numeracy Framework was created to raise standards by embedding literacy and numeracy into all subjects (Welsh Government, 2014). A significant aspect is highlighted by Hattie (2003), who advocates that teachers’ knowledge becomes automatic, which enables them to integrate their knowledge base and draw upon approaches flexibly. He argues that it is in fact the flexibility that makes them effective teachers, rather than their SK (2003:6).

Turning the focus to how teacher knowledge is monitored, Hollingsworth (1989) suggests that Shulman was not clear in what specific content teachers should know. It was suggested by Ellis (2009) that as links were made between teacher knowledge and pupil attainment, it moved the focus onto teacher training with particular focus on testing SK of trainee teachers. For Grossman (1990), the lack of knowledge surrounding how teachers are trained makes it difficult to understand what knowledge is needed.

Shulman's research into tests undertaken by trainee teachers in 1875 revealed that they did not test for knowledge specific to the curriculum (1986). Instead, the tests were tailored to test general abilities as an entry requirement in to teacher education (Shulman, 1986). Current entry requirements for the teacher training courses in Wales require a minimum of GCSE Grade B in Mathematics and English and Grade C in Science (Welsh Government, 2016). The grade for Mathematics and English was originally C (which still remains for teacher training in England), but the requirements were raised to B in a bid to improve these areas in Wales (Welsh Government, 2016). Shulman (1987) would argue that standards are raised on the assumption that there is a knowledge base to examine. However, as Donaldson suggests that the new curriculum will step away from categorising 'core' subjects, it could raise the argument that testing teacher knowledge should also refrain from purely focussing on Mathematics, English and Science (2015:24). Rowland et al. were critical of such tests as they state that it is impossible to test PCK (2009).

In attempt to address questions over how trainee teachers acquire the knowledge needed to become effective teachers, Shulman created a model in attempt to understand the transition from trainee to expert in a model of pedagogical reasoning (see appendix 2a/2b)

I will be using the knowledge quartet to structure my reflections, whilst referring to aspects of Shulman's pedagogical reasoning model.

The year group consisted of 64 pupils, split into two classes of 32. All subjects bar Mathematics and English were delivered to the mixed ability classes of 32 pupils. For the purposes of Mathematics and Language lessons, both classes were mixed and set by higher or lower ability. It was decided by the class teachers (who I will refer to as Teacher A and Teacher B) that the other student and I would take it in turns to teach both higher and lower sets in order to experience teaching MAT and ALN pupils.

The theme for the term was 'Flight and World War 2'. I had limited prior knowledge about both areas of the theme. Despite taking History for GCSE I did not study World War 2 (WW2), which meant I did not feel confident in aspects of my 'foundation' knowledge (Rowland et. Al, 2009). Despite my lack of confidence, I had a positive attitude towards learning more (Grossman, 1990). I had recently returned from a visit to Auschwitz, so I was enthusiastic to have the opportunity to share the SK I had learnt.

As a pioneer school, they are testing out the proposed curriculum outlined by Donaldson (2015). Donaldson (2015) reflects Shulman's (1986) three categories of content knowledge, when outlining what a teacher requires to enable effective learning (see Appendix 3).

Donaldson identified the need for teachers to scaffold learning (2015), so pupils can build upon and add depth to prior knowledge (Piaget, 2002). I tried to make links to WW2 wherever possible in order to make the learning relatable (Donaldson, 2015). Understanding how children learn is an important aspect of foundation knowledge, which directly relates to pedagogy (Grigg, 2015).

The four purposes of the curriculum (see Appendix 4) outline what the curriculum is trying to achieve for children. Donaldson (2015) suggests that a wide range of pedagogical approaches need to be adopted to guarantee effective learning across the six Areas of Learning and Experience. Furthermore, the Cross-Curriculum Responsibilities of Literacy, Numeracy and Digital Competency will ensure pupils have frequent opportunities to develop their skills identified as essential for learning across the curriculum (Donaldson, 2015:40). Using the university planning template, I had to identify whether my lesson was hitting any skills for each of the cross-curriculum responsibilities (see Appendix 5). In light of the importance given to the cross-curriculum responsibilities, I have chosen to focus on analysing a Mathematics, Language and ICT lesson.

'Direct teaching' is what Donaldson referred to as the best approach to encompass the four purposes (2015:65). Hattie (2009) adds definition to direct teaching in his five dimensions: sharing learning objectives, success criteria, modelling, providing regular feedback and summarising learning in plenaries. Taking this on board I had to create a learning objective and success criteria for each lesson taught. I initially found this difficult as I did not know where the class tutor got the learning objectives from. After asking my class tutor for guidance on how they come up with learning objectives, it became apparent that as Hattie (2003) suggested, after teaching for many years such knowledge had become automatic and

they just drew upon their automatic knowledge bank. According to Grigg (2015) this happens because the expert becomes familiar with what is being taught.

Donaldson points out that direct teaching should not be mistaken as whole class instruction (2015). Despite this, all of my teaching was undertaken as whole class delivery. I felt as though this tested my PCK as I had to find techniques that worked for a variety of situations, particularly when commanding the class' attention as suggested by Hollingsworth (1989).

In analysis of my own SK it is relevant to consider my foundation knowledge as a starting point (Koponen et al, 2019). In the key skills tests I had 86% in Literacy and an average of 85% in Mathematics. However, in agreement with Shulman (1986), the tests did not prepare me for the knowledge needed to teach the Year 6 curriculum. Nevertheless, they are still a requirement set by the Government (Department for Education, 2019). It has been established in review of the literature that it is essential to look further than a superficial understanding of content knowledge being what is known about a subject (Grossman, 1990).

## Mathematics

### Foundation

Before starting PTE 1, I felt particularly confident in my mathematical knowledge. However, after teaching my first Maths lesson on negative numbers I found it more difficult than I anticipated to explain my understandings to the pupils. In analysis of my content knowledge I am going to focus on my first observed lesson where I taught co-ordinates (see Appendix 6). I began by looking at the Numeracy framework (Welsh Government, 2014) to see which skills relate to co-ordinates and then designed a worksheet to achieve the skills using the WW2 theme. I was happy with my planning and I felt prepared going in to the lesson.

### Transformation

By looking at the school mentor feedback made by Teacher A (Appendix 7) it is clear to see that I used SK to plan efficiently. Creating the worksheet myself not only ensured the learning objective was met but also meant I fully understood the task.

I explained a way of remembering that the x-axis goes across as: 'x' is sometimes called a cross, therefore the x-axis goes aCROSS. I felt as though this was an effective way for pupils to remember. According to Donaldson, lessons should be exciting in order to ensure effective learning (2015) so playing a game of battleships made achieving the learning objective fun. It was the first time I taught Mathematics to the lower set, so I did not feel confident in adaptation. I was not made aware of the additional learning needs of pupils prior to the

lesson, subsequently the differentiation was not “tailored to fit” the specific needs of the pupils (Shulman 1987:17). As a result, I believe that my PCK was weak from not knowing the capabilities of the individual pupils. However, I made sure that the TA supported the ALN pupils as she was aware of their capabilities after working with the same class for the last 3 years. Ball and Hill (2009:70) would argue that my knowledge of content and students was missing from my PCK.

### Connection

By relating the lesson to WW2, I showed lateral curricular knowledge (Shulman, 1986). I particularly struggled with vertical curricular knowledge due to being unaware of the individual needs of the pupils (Shulman, 1986). To improve my curriculum knowledge, I would have to make myself more familiar with the documents and also improve PCK to know the needs of the individuals. In agreement with Koponen et al. (2019), I believe my SK was more important in this lesson as the majority grasped co-ordinates well.

### Contingency

I was aware that I was running out of time after having to spend longer on the introduction to clear up misconceptions about the rules of co-ordinates. The whiteboard activity at the start revealed that many pupils went up the y-axis first and then across the x-axis, when the common rule is: along the corridor and up the stairs. I adapted the lesson by removing Activity 1 as seen in my lesson plan (Appendix 6). I believe that I used contingency, referred to by Rowland et al. (2009), to respond to misconceptions and to adapt the lesson on the spot. I felt nervous as it was my first observed lesson and I was worried about running out of time. I also noticed that I moved on to Battleships before modelling how to play effectively and addressing any misconceptions from the previous activity. According to Brown and Wragg (1993), nerves could have impacted my knowledge (Rowland et al., 2009).

Using the ARC template (Appendix 8) I reflected on a lesson each day, to say what went well and what I can do to improve what did not go so well next time. Reflections helped me learn from errors and successes (Shulman, 1986). In contrast to this observed lesson, unlike Colleen (Grossman, 1985 cited in Shulman, 1987) I was less confident teaching the rules to adding and subtracting negative numbers to the higher set, my content knowledge was weak as I did not have relatable examples to make the learning experience authentic (Donaldson, 2015:67).

### Language

### Foundation

I was generally more anxious about teaching language as there are so many rules and complexities to the subject. I taught a lesson on describing a setting, but I had my own doubts on how to focus on purely describing a setting and not going into a story. I, like Colleen (Grossman, 1985 cited in Shulman, 1986:18) did not want to stray from the planning I had prepared as I was worried that I would not be able to answer any queries. As a result, the majority of the class got carried away by writing a story with minimal descriptions of the setting. This is a direct example of how my lack of SK impacted the learning (Rowland et al., 2009). To rectify this, I asked Teacher B for advice and in the next lesson I asked the class to redraft.

### Transformation

Lack of subject knowledge clearly impacted my ability to present the information to the pupils, which could be seen to break the cycle (See Appendix 2b). Before redrafting, I asked the class to draw a setting from a description being read to them. I used PCK to take a different approach, from which they could then appreciate the need for detail. In comparison to Mathematics, I generally found it easier to explain concepts in Language lessons. I think this was because I usually carried out more research due to being anxious about whether my knowledge was sufficient to teach Year 6.

### Connection

I found it easier to make connections to the wider curriculum as I gained more experience on PTE and became more familiar with the curriculum documents (Grigg, 2015). Feedback from an observed lesson (see Appendix 9) shows that I improved from good to excellent. My target became to continually improve PCK, which arguably supports Koponen et al. (2019) notion of hierarchical knowledge.

### Contingency

I used assessment for learning techniques to check understanding throughout each lesson and encouraged self-assessment and peer assessment. This encouraged pupils to check whether they had met the success criteria which Hattie believed contributed to effective learning (2009). In accordance with Medwell et al. (1998) I only realised my lack of SK whilst teaching the lesson, hence needing another session to rectify misconceptions.

### ICT

#### Foundation

When asked to teach a lesson on Excel databases I initially felt anxious about my lack of knowledge (Rowland et al, 2009). I have always felt that I was not as competent using Excel

as I am with other software. Despite having a negative attitude towards using Excel I made sure that this was not evident in my teaching.

In preparation for the lesson I followed a tutorial to recap how to use formulas and used the DCF (Welsh Government, 2018) to see which skills the lesson would be covering.

#### Transformation

I felt as though I used good PCK to explain key words such as 'rows'. To make it relatable I asked: "how are seats arranged in the cinema?". By making it relatable to something they knew meant the pupils made connections to their prior knowledge (Piaget, 2002).

#### Connection

This particular lesson (see Appendix 10) was not related to the lateral curriculum which meant my vertical curricular knowledge had to be sufficient to plan an effective lesson (Shulman, 1986). In comparison to my Mathematics lesson plan, it is clear to see that my planning is more thorough. This was because I was trying to make up for my lack of technological content knowledge by researching in detail (Mishra and Koehler, 2006).

#### Contingency

Since becoming a Cross-Curricular Responsibility, incorporating ICT into lessons has become an expectation (Donaldson, 2015). I faced a few technological hitches whilst attempting to incorporate technology into my lessons, which I feel tested my ability to think on the spot (Rowland et al., 2009). During this particular lesson, I had not researched how to upload the database onto the school's shared area, which caused disruption at the end of the lesson. As a result, I did not have time to summarise the learning, which is something that Hattie (2009) refers to as necessary for effective learning. From reflecting on this failure, I made sure that I tested out the technology before future lessons to ensure the resources were working. This enabled me to foresee any problems that may arise and therefore plan for them suitably. Teacher B advised that I should always have a back-up plan in case an unforeseen problem arises in a lesson dependent on ICT.

I have chosen to reflect on these lessons specifically to show how research from the literature review can be used to analyse my personal SK. However, in consideration of my teaching experience on the whole, I can relate to Shulman's analogy that knowledge grows from "error, success, and refinement" (1987:4). Daily reflections I undertook by means of the ARC inform refinement. In support of this Rowland et al. (2009:26) state: "critical reflection helps develop teaching".

Overall, I found planning very time consuming as I had to do a lot of research beforehand to explore the curriculum for Year 6. I also had to create achievable learning objectives, plan appropriate tasks for age and stage (Donaldson, 2015) and anticipate any confusion that may arise from my explanations. As I gain more experience I should take less time planning as the knowledge will become automatic (Hattie, 2003).

Generally, I found it difficult to acquire knowledge from the ‘expert’ teachers (Shulman, 1986:8), namely Teacher A and Teacher B. I believe this was because their knowledge was automatic (Hattie, 2003) and therefore difficult to transmit to a trainee.

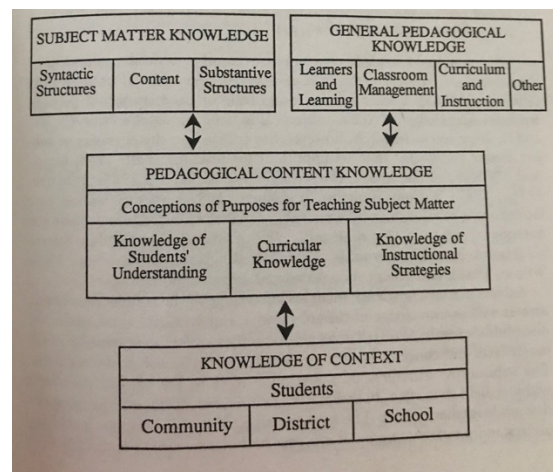
Grossman (1990) argues that learning through teaching experience can result in relying on what is known to work instead of focusing on effective teaching and learning. I would need to ensure that I am continually looking to improve all aspects of the knowledge base and not just settling for ideas that have been successful in one particular lesson.

I believe that difficulty lies with knowledge being an abstract matter. Although it is evident that current testing of teacher knowledge is not sufficient to give a true reflection of teacher knowledge, as research in this field develops the relationship between teacher knowledge and effective learning will become explicit.

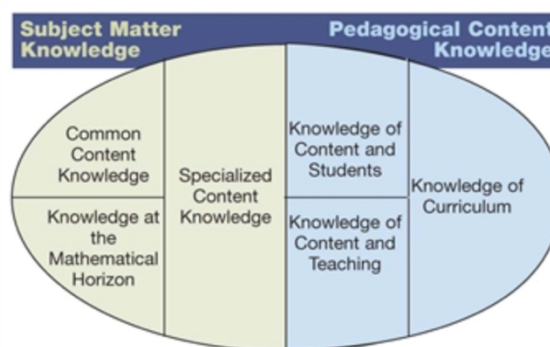
Donaldson proposes that the curriculum will give teachers freedom to plan creative learning opportunities, which I believe will put increased pressure on developing PCK (2015). In order to continually grow my teacher knowledge to keep up with a developing education system, I will begin by meeting my targets set by my tutor. It has been clearly established that pedagogy plays an important role in enabling effective learning. In explanation of how children learn effectively, Bruner (1986:76) suggests that the learners “borrow the knowledge” of the adult when they have gaps in their knowledge. Henceforth, I would argue that effective learning and teaching is underpinned by subject knowledge, as the learner cannot borrow knowledge, nor learn effectively from someone who does not possess such vital knowledge.



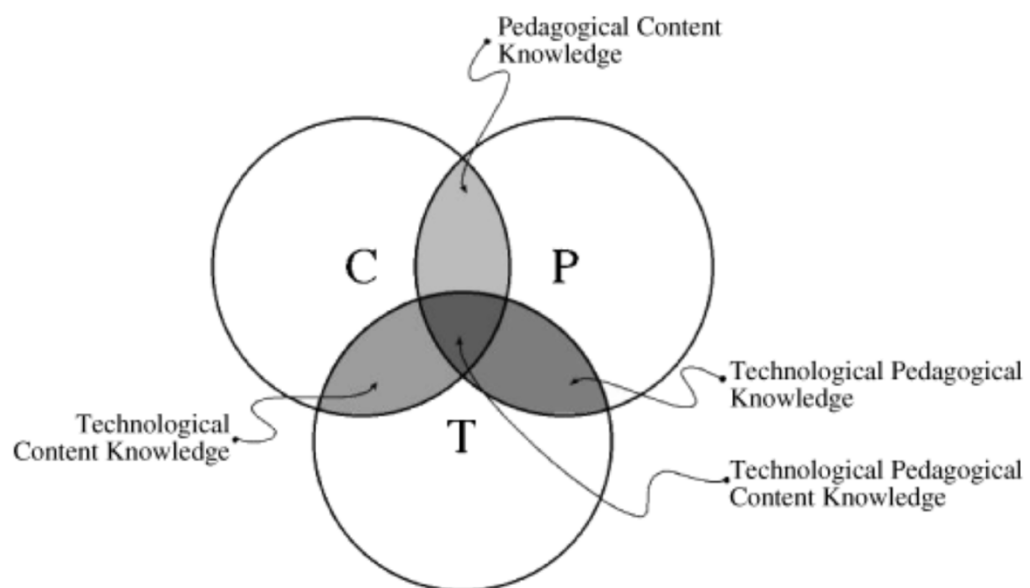
## Appendix 1a – Developed model of teacher knowledge by Grossman (1990:5)



## Appendix 1b – Ball and Hill (2009: 70) “Mathematical knowledge for teaching”



## Appendix 1c – Mishra and Koehler (2006:1025) showing how knowledge is interconnected.



## Appendix 2a: Shulman's pedagogical reasoning model.

TABLE 1  
A Model of Pedagogical Reasoning and Action

**Comprehension**

Of purposes, subject matter structures, ideas within and outside the discipline

**Transformation**

Preparation: critical interpretation and analysis of texts, structuring and segmenting, development of a curricular repertoire, and clarification of purposes

Representation: use of a representational repertoire which includes analogies, metaphors, examples, demonstrations, explanations, and so forth

Selection: choice from among an instructional repertoire which includes modes of teaching, organizing, managing, and arranging

Adaptation and Tailoring to Student Characteristics: consideration of conceptions, preconceptions, misconceptions, and difficulties, language, culture, and motivations, social class, gender, age, ability, aptitude, interests, self concepts, and attention

**Instruction**

Management, presentations, interactions, group work, discipline, humor, questioning, and other aspects of active teaching, discovery or inquiry instruction, and the observable forms of classroom teaching

**Evaluation**

Checking for student understanding during interactive teaching

Testing student understanding at the end of lessons or units

Evaluating one's own performance, and adjusting for experiences

**Reflection**

Reviewing, reconstructing, reenacting and critically analyzing one's own and the class's performance, and grounding explanations in evidence

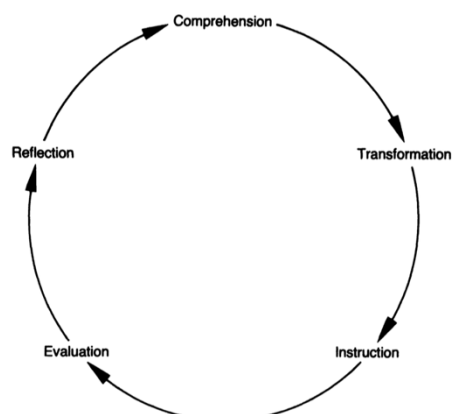
**New Comprehensions**

Of purposes, subject matter, students, teaching, and self

Consolidation of new understandings, and learnings from experience

Reference: Shulman  
(1987:15)

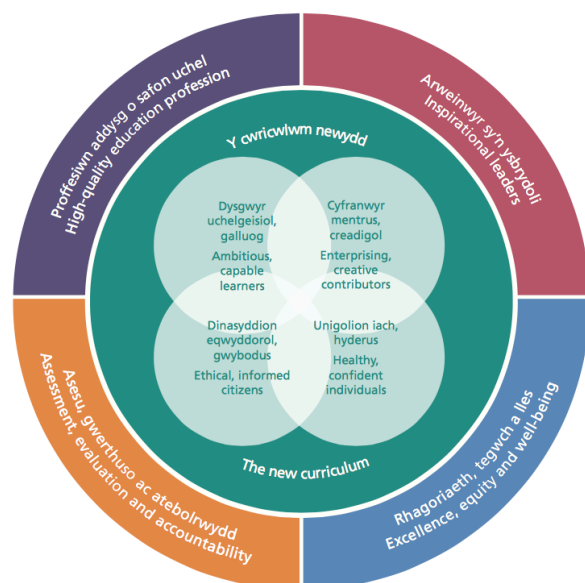
Appendix 2b: Drawing from the definitions given above, the cycle emphasises the process of how a trainee teacher acquires teacher knowledge.



Reference:  
Bennett, N and  
Carré, C (1993:8)

Appendix 3: Donaldson outlining what a teacher requires to enable effective learning: “subject and methodological expertise; sound classroom craft skills; an understanding of the social and psychological factors that influence learning; and the ability to excite and inspire children to want to learn and to be able to learn independently.” (Donaldson, 2015:63)

Appendix 4: The four purposes of the new curriculum.



Reference:  
Welsh Government (2018b)  
*Timelines made visible:  
Curriculum and Education  
Reform.*

Appendix 5 – Lesson plan template to show cross-curricular skills in digital competency (DCF), thinking skills, literacy and numeracy (LNF), y curriculum cymreig (YCC) and sustainable development and global citizenship (ESDGC).

|                                        |                  |                   |     |
|----------------------------------------|------------------|-------------------|-----|
| Personal target(s) in relation to QTS: |                  |                   |     |
| Year group:                            | No. of learners: | ALN:              |     |
| Additional Adults:                     |                  |                   |     |
| Learning objective(s):                 |                  | Success criteria: |     |
| Links to previous learning:            |                  |                   |     |
| Curriculum coverage (range, skills)    |                  |                   |     |
| Literacy(LNF)                          |                  | Numeracy (LNF)    |     |
| DCF                                    | Thinking         | ESDGC             | YCC |

## Appendix 6 – Lesson plan for co-ordinates – Lesson observed by Teacher A.

| Canolfan Addysg Athrawon<br>De-Orllewin Cymru                                                                                                                              |                                                                                                                                                                                        |                  |                            | The South West Wales<br>Centre of Teacher Education                                                                                                                                                                  |                                                                                                                                                                                      | 1B |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Session Plan – Key Stage 2</b>                                                                                                                                          |                                                                                                                                                                                        |                  |                            |                                                                                                                                                                                                                      |                                                                                                                                                                                      |    |
| Name of trainee: [redacted]                                                                                                                                                |                                                                                                                                                                                        |                  | Session ref: 231118 Maths3 |                                                                                                                                                                                                                      |                                                                                                                                                                                      |    |
| Personal target(s) in relation to QTS: To use incidental Welsh and timings of the lesson.                                                                                  |                                                                                                                                                                                        |                  |                            |                                                                                                                                                                                                                      |                                                                                                                                                                                      |    |
| Year group:                                                                                                                                                                | 6                                                                                                                                                                                      | No. of learners: | 28                         | ALN:                                                                                                                                                                                                                 | 4 (HK), (NO), (RW), (MT)<br>Differentiated – 2 quadrants instead of 4. (Coordinate bingo if they are having difficulty identifying coordinates. Work in small group supported by KR) |    |
| Additional Adults:                                                                                                                                                         |                                                                                                                                                                                        | 1 (KR)           |                            |                                                                                                                                                                                                                      |                                                                                                                                                                                      |    |
| Learning objective(s): To identify and plot coordinates. To identify and plot coordinates on all four quadrants.                                                           |                                                                                                                                                                                        |                  |                            | Success criteria:<br>I can identify and plot coordinates in the first and second quadrants<br>I can identify and plot coordinates in all four quadrants<br>Some can identify missing coordinates of a regular shape. |                                                                                                                                                                                      |    |
| Interactive quadrants<br><a href="https://mathsframe.co.uk/en/resources/resource/79/itp-coordinates">https://mathsframe.co.uk/en/resources/resource/79/itp-coordinates</a> |                                                                                                                                                                                        |                  |                            |                                                                                                                                                                                                                      |                                                                                                                                                                                      |    |
| Maths Pack 1                                                                                                                                                               |                                                                                                                                                                                        |                  |                            |                                                                                                                                                                                                                      |                                                                                                                                                                                      |    |
| Links to previous learning: Negative number line.                                                                                                                          |                                                                                                                                                                                        |                  |                            |                                                                                                                                                                                                                      |                                                                                                                                                                                      |    |
| Curriculum coverage (range, skills)<br>Mathematics:                                                                                                                        |                                                                                                                                                                                        |                  |                            |                                                                                                                                                                                                                      |                                                                                                                                                                                      |    |
| <ul style="list-style-type: none"> <li>identify the coordinates of a missing point from a regular shape ♦</li> <li>refer to the x axis and the y axis</li> </ul>           |                                                                                                                                                                                        |                  |                            |                                                                                                                                                                                                                      |                                                                                                                                                                                      |    |
| Literacy (LNF)                                                                                                                                                             |                                                                                                                                                                                        |                  |                            | Numeracy (LNF)<br>Use grid references to specify location<br>To identify positions in the 1st and 4th quadrants on co-ordinate grid                                                                                  |                                                                                                                                                                                      |    |
| DCF<br>Plotting coordinates on the WB.                                                                                                                                     | Thinking                                                                                                                                                                               |                  | ESDGC                      |                                                                                                                                                                                                                      | YCC<br>Incidental Welsh.                                                                                                                                                             |    |
| Key vocabulary (English/Welsh): Axis, Axes, X axis, Y axis, origin, coordinate, quadrant.                                                                                  |                                                                                                                                                                                        |                  |                            |                                                                                                                                                                                                                      |                                                                                                                                                                                      |    |
| Time                                                                                                                                                                       | Session activities, organisation and management                                                                                                                                        |                  |                            |                                                                                                                                                                                                                      | Key questions & Assessment for Learning opportunities                                                                                                                                |    |
| 5 min starter<br><br>10mins intro                                                                                                                                          | Introduction<br>Maths Pack 1 – coordinates grid. Quick warm up on the whiteboards. Write down the coordinate for.... Choose some children to come up to the whiteboard to plot points. |                  |                            |                                                                                                                                                                                                                      | Choosing individuals to plot coordinates.                                                                                                                                            |    |
|                                                                                                                                                                            | Introduce the terminology of quadrant. X and Y axis. We remember the X axis because it goes aCROSS.                                                                                    |                  |                            |                                                                                                                                                                                                                      |                                                                                                                                                                                      |    |
|                                                                                                                                                                            | Along the corridor and up the stairs. Along the corridor and down the basement if moving on to 4 quartiles.                                                                            |                  |                            |                                                                                                                                                                                                                      | Who can remember how we move on the coordinate graph?                                                                                                                                |    |

|         |                                                                                                                                                                                                                                                                           |  |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|         |                                                                                                                                                                                                                                                                           |  |
| 10 mins | Main activities<br>Activity 1: To plot coordinates of shapes using given coordinates. Self-mark Activity 1.                                                                                                                                                               |  |
| 10 mins | Activity 2: To identify coordinates on the coordinate grids. (2 quadrants for LA, 4 quadrants for the rest of the class). Peer mark activity 2.                                                                                                                           |  |
| 15 mins | Plenary<br>Allies vs Axis battleships. Rock paper scissors to decide who is going to choose first. 1 quadrant plot 5 ships. 4 quadrants plot 2 ships in each quadrant.<br>After the game is over do a tally chart on the board for Allies or Axis to see who won overall. |  |
| 5 mins  | T or F quiz to recap on the rules of coordinates.                                                                                                                                                                                                                         |  |

## Appendix 7 – Feedback from Teacher A regarding knowledge

## S2: Knowledge and Understanding

Good

- **Comments and Evidence**
- **Targets for improvement and suggested ways forward**

personal research supports her planning and teaching effectively. She demonstrates an understanding of different learning and teaching approaches that offer breadth within provision. She did differentiate the task for the ALN children, but needed to be aware her introduction into the 'four quadrants' wasn't relevant for their task and they lacked focus as a result. Her Power point was well planned and guided the children through the activity. She displayed knowledge of the subject to be covered - 'Coordinates', explained the rule for interpreting and plotting points and she set out her expectations clearly. She had planned well, the activities engaged the children's interest and they linked to topic. The children particularly responded to the warm-up activities and 'Battleships' game that she had planned. She did continuously check understanding throughout with 'thumbs up/down' and 'hands'. Expectations of behaviour were made clear and 'busy' children chatting was addressed. Her target is to make clear that undivided attention and focus is needed when required and that the children were 'on-task' and focused throughout.

## Appendix 8 – ARC reflection model.

**Digwyddiad critigol (Ffocws)/Critical incident (focus):** Coordinates observed lesson ALN

| Profud / Experience                                                                                                                                                                                                                    |                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Teimladu/ Feelings</b><br/> Beth ydych chi teimladu wrthych chi osoddi?<br/> <i>"What are your feelings regarding the experience?"</i></p>                                                                                       | <p>Overall I thought that the lesson was OK. I had to think on my feet because I knew that I was running out of time to complete the two activities planned.</p>                                                                     |
| <p><b>Cofio a Deall/ Remember and Understand</b><br/> Dilych chi restru'r aweddau a'ych chi osoddi dymuniadau gwrthedd?<br/> <i>"Can you list the aspects of the learning experience that went well?"</i></p>                          | <p>Most were on tasks throughout. They enjoyed coming up to the white board to plot the coordinates. They enjoyed the battleships game.</p>                                                                                          |
| <p><i>Pe effeithiol a'ch osoddi dymuniadau gwrthedd?</i><br/> <i>"What were the elements of the learning experience that were disappointing?"</i></p>                                                                                  | <p>I was aware that the ALN group were off task during the introduction. This was part of my oral feedback from my mentor too.</p>                                                                                                   |
| <p><b>Gwerthuso a dadansoddi/ Evaluate and analyse</b><br/> Beth ydych chi restru'r nodau a'ych chi osoddi dymuniadau gwrthedd?<br/> <i>"What will you keep the same to ensure effective teaching and learning in the future?"</i></p> | <p>I would use the battleships game again because it brought a fun element to their learning. I linked it to the theme which engaged them throughout.</p>                                                                            |
| <p><i>Beth oedd achlysuas yr effeithiol a'ch osoddi dymuniadau gwrthedd?</i><br/> <i>"What was the cause of the most important disappointing element?"</i></p>                                                                         | <p>It was my first time teaching the lower ability math set. So I was unaware of the ALN needs and I didn't have time to go through the work with the TA beforehand because she was covering a duty.</p>                             |
| <p><b>Casglu a chymhellu/ Conclusions and actions</b><br/> Beth ydych chi restru'r nodau a'ych chi osoddi dymuniadau gwrthedd?<br/> <i>"What are your possible solutions to the disappointing issues identified?"</i></p>              | <p>Had I been able to speak to the TA beforehand, I would have had a better understanding as to when was the right time to send them out to work with the TA.</p>                                                                    |
| <p><i>Beth ydych chi restru'r nodau a'ych chi osoddi dymuniadau gwrthedd?</i><br/> <i>"What will you do next?"</i></p>                                                                                                                 | <p>Next time, I would ensure that I had gone through the work with the TA beforehand and I will get the ALN information that I need.</p> <p>Teaching them again I would have a better understanding of their ability as a class.</p> |
| Y profiad newydd / Transformed experience                                                                                                                                                                                              |                                                                                                                                                                                                                                      |

## Appendix 9 – University tutor feedback from Language lesson teaching 2nd voice poetry.

**S2: Knowledge and Understanding**

Excellent

- **Comments and Evidence**
- **Targets for improvement and suggested ways forward**

Excellent You use own subject knowledge in an appropriate way to motivate learners. You had carried out a great deal of personal research to support planning, teaching, and assessment for today's lesson. You have taken on board routines established within the class and have also added your own twist to lessons. You demonstrate an understanding of effective learning and teaching approaches that offer breadth and diversity of provision, again in line with the class teacher's expectations. TARGET 1. To continue to develop your understanding of effective teaching strategies that will maintain pupils' enthusiasm and engagement in the lesson being taught

## Appendix 10 – ICT lesson plan.

| <small>Ceredigion Adding Allergies<br/>The Children's Centre</small>  <small>The South Wales Valleys<br/>Centre of Teacher Education</small>                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                           | 1B                                                                                                                      |                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| <b>Session Plan – Key Stage 2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                           |                                                                                                                         |                                                               |
| Name of trainee: <b>Jordan James</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                           | Session ref: <b>28/11/18 ICT</b>                                                                                        |                                                               |
| Personal target(s) in relation to QTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                           |                                                                                                                         |                                                               |
| Year group: <b>6</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | No. of learners: <b>64</b>                                                                                                                                                                                                                | ALN: <b>HK, RW, NO, MT – support in mixed ability pairs.</b>                                                            |                                                               |
| Additional Adults: <b>0</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                           |                                                                                                                         |                                                               |
| Learning objective(s): To collect and enter data for interpretation in spreadsheets.                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                           | Success criteria:<br>I can enter data into a spreadsheet.<br>I can add, edit and calculate data.<br>I can use formulas. |                                                               |
| Links to previous learning:                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                           |                                                                                                                         |                                                               |
| Curriculum coverage (range, skills)<br>Find and analyse information                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                           |                                                                                                                         |                                                               |
| <ul style="list-style-type: none"> <li>Produce and use models and/or simulations to ask and answer questions,</li> <li>Use ICT sources of information and non-ICT sources of information</li> <li>Store and retrieve information they have found or created use ICT to explore and to solve problems in the context of work across a variety of subjects</li> <li>Share and exchange information safely through electronic means e.g. use of e-mail, virtual learning environment.</li> </ul> |                                                                                                                                                                                                                                           |                                                                                                                         |                                                               |
| <u>Literacy(LNF)</u><br><i>Communication – working in pairs.</i> oracy, reading, writing and wider communication.                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                           | <i>Numeracy (LNF)</i><br>using mathematical information, calculating, and interpreting and presenting findings.         |                                                               |
| <i>DCF</i><br>They should be able to follow instructions to minimise risk to themselves and others.                                                                                                                                                                                                                                                                                                                                                                                           | <i>Thinking</i><br>Following step by step instructions to explore and solve problem<br><br>Working in pairs                                                                                                                               | <i>ESDGC</i>                                                                                                            | <i>YCC</i>                                                    |
| Key vocabulary (English/Welsh): cell, column, row, range, cell reference, formula, bold, underline, title,                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                           |                                                                                                                         |                                                               |
| Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Session activities, organisation and management                                                                                                                                                                                           |                                                                                                                         | Key questions & Assessment for Learning opportunities         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Introduction</b><br>Introduce the lesson by explaining we are going to be working in pairs and recapping how we use excel. Go through key words such as cell, column, row, range, cell reference, formula, bold, underline, title etc. |                                                                                                                         | Why do we use excel? What is it used for?<br><br><br><br><br> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
|  | <b>Main activities</b><br>To begin with I will model what I want the children to do. Firstly, I will ask the children if they know how I can underline, make the writing bold, change the font and change the size of the font. I will ask one of the children to come up and demonstrate how they would do this.<br><br>Next, the children will need to include the title 'Shopping list' in cell A1. After they have completed this they will need to include in the next row the following headings: Items, Cost, Quantity and Total cost. | Everybody understand – thumbs up or down?<br><br>What does quantity mean?<br><br>What cell reference is orange in? |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|

(Continued on the next page)

|                                                                                                                                                                                                                                                                                                                                                                                       |                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| <p>The children will then have to fill in the rows under the heading 'items' the following: Oranges, Apples, Bread and milk. After the children have filled this in I will ask if they can give me the cell reference for orange <del>ca</del> Orange is in cell A3.</p>                                                                                                              | <p>What cell reference is milk in?<br/>How do you know this?</p> |
| <p>I will then show the children that they need to change the column to 'currency' as we are dealing with money. To do this I will explain we must highlight the column with the heading 'cost' and change to currency using the <del>drop-down</del> box at the top of the screen—after modelling how this is done I will get the children to repeat this in their spreadsheets.</p> | <p>What unit is money measured in?</p>                           |
| <p>The children will also need to fill in the quantities of the items in the column. After filling these sections in the children will have to close the laptops and pay attention to me as I will be explaining about the formulas and how we can use a formula to multiply and add the columns/rows together to get a total.</p>                                                    | <p>What do we start a formula with?</p>                          |
| <p>I will explain that the * means multiplication. I will then demonstrate how to multiply the cost and quantity columns together for the total cost e.g. b3*c3. I will then drag down the one cell that I have typed the formula into so that the formula calculates each cells total.</p>                                                                                           |                                                                  |
| <p>The next step will be to explain that we now need to add the quantity of items and also the total cost of the shop. To do these I will introduce the new formula of addition. I will explain again that we need to use an = before the formula, I will then write out the formula of =Sum(A2+B2) which will calculate the quantity of items.</p>                                   | <p>How do we start a formula?</p>                                |
| <p>The next addition formula will be for the total cost of items bought – I will explain that to do this I will need to include '=sumc' and then I will explain we can click and highlight the columns of the items that we want to add together. An example of this will be =sum(c3:c6)</p>                                                                                          |                                                                  |
| <p>The children will then have a completed spread sheet using addition and multiplication formulas to get totals and costs of the shopping list.</p>                                                                                                                                                                                                                                  |                                                                  |
| <p>They will need to save their work and then upload to <del>kyda</del> and share on one drive and also share with their partner they were</p>                                                                                                                                                                                                                                        |                                                                  |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                             |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
|  | <p>working with.</p> <p><b>Extension:</b></p> <p>If the children complete the work I will ask them how we can add data into the spreadsheet? I will then demonstrate how to insert new columns/rows</p> <p>I will also explain <del>that</del> if someone's scores were wrong that they can be <del>edited</del> and the spreadsheet formulas will automatically recalculate the correct totals and averages.</p> |                                                             |
|  | <p><b>Plenary</b></p> <p>Ask the children what comes before the formula?</p> <p>What was the addition and multiplication formula?</p> <p>Praise and show the work of the children's completed work.</p>                                                                                                                                                                                                           | <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> |

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