

A critical evaluation and the identification of next teaching and learning steps focusing on a case study of an individual learner or a group of learners, based on an observed critical incident.

The Critical Incident of the Dog in the Angle

An incident was observed at the beginning of a mathematics lesson in a secondary school, which piqued my interest and prompted me to investigate further. Research was carried out through the context of a critical incident, which can manifest as an event that provides insight into an individual or circumstances (Cohen et al., 2007) or an occurrence that is significant to the observer and is deemed worthy of analysis (Harrison and Lee, 2011). Tripp (1993, p.8) describes a critical incident as “an interpretation of the significance of the event” and potentially “indicative of underlying trends, motives and structures” (p.25). Hickman and Stokes (2016) agree that the value of a chosen event lies in the investigation of it.

Through reflecting on the details of the event, using the Assisted Reflective Conclusions (ARC) Model, I have used case study methodology to investigate the underlying themes. Reflection is regarded as a key tool for teachers to explore and evaluate classroom practice, which, following analysis, can potentially lead to ways of developing or transforming teaching (Renard, 2019).

This assignment provides a context to the incident and makes links to the Four Core Purposes of the Successful Futures framework (Donaldson, 2015). It explores and critically discusses existing literature on the chosen themes in the form of a literature review and, using research and theory as a basis, it identifies next steps for teaching and learning, both generally and in my own practice.

School and class context

The observation took place in an English medium secondary school (11-16) in a South Wales town. According to Mylocalschool.com (2019), in 2018 the school had just over 1,000 pupils, 18.7 per cent of whom were in receipt of free school meals, which is slightly higher

than the national average for Wales at 17.1 per cent (Estyn, 2017). Indeed, information from the latest Estyn inspection (2017) reports that 15 per cent of the school's pupils "live in the 20 per cent most deprived areas of Wales". The majority of pupils are of white British backgrounds, and pupils learning English as an additional language (EAL) make up five per cent of the total. Almost half of the pupils have an additional learning need and five per cent have a statement of additional learning needs. Both figures are considerably higher than the national averages of 25.1 per cent and 2.4 per cent respectively (Estyn, 2017). The school was considered excellent by Estyn following its 2017 inspection.

I observed a Year 8, Set 2 Maths class, where the critical incident took place. The class consisted of approximately 25 pupils, for which no additional data were provided, and a teaching assistant was present, who worked with one student. This research is based on observation only as there was no scope to discuss the incident with the teacher. In accordance with BERA guidelines (2018), the name of the school and any pupils and staff have been anonymised. Pupils involved will be referred to as Pupil A and Pupil B.

Methodology

The subject of this assignment was the first of four observations recorded and reflected upon (see Appendix 1) and the critical incident records an authentic snapshot of life in the classroom. Woods (1993, p.357) classifies critical incidents as "unplanned, unanticipated and uncontrolled" and as illuminating "flash-points". However, critical incidents do not need to be dramatic to warrant scrutiny (Bell, 2014) and most will cover ordinary events that occur in a professional setting (Tripp, 1993). Cohen, on the other hand, states that they are often "unusual events" (p.404). Critical incidents are considered a relevant research method for the teaching profession (Tripp, 1993) as they are "grounded in educational events and not academic theories" (Bassey, 2007, p.146), they are context-based, real-life occurrences rather than "hypothetical" or "abstract" (Denscombe, 2007, p. 204), and encourage reflective practice (Harrison and Lee, 2011; Hickman and Stokes, 2016).

Critical incidents are narrowly focused case studies, which Cohen et al. (2007) describe as being "unique and dynamic" and "descriptive and detailed" (pp.253-254). Case studies investigate real-life contexts and the context itself plays a crucial role (Cohen, 2007; Grix, 2010; Demetriou, 2009). Advantages of this method are the profusion and depth of data, which allow for many interpretations dependent upon the readers' experiences (Wellington, 2008), the framework for studying a complex subject, and "face-value credibility" with which readers can identify (Demetriou, 2009, p.203). However, case study critics see the

significance of context as a disadvantage, which renders scientific generalisation difficult (Wellington, 2008; Bassey, 1999; Demetriou, 2009). Moreover, they focus on the issue of bias, whether through self-reporting, reliance on memory of events (Cohen, 2007), or closeness to the investigation (Demetriou, 2009).

Observation plays a significant role in case study (Wellington, 2008). In my capacity as a non-participant, I observed passively to ensure that the classroom experience was as authentic as possible and I make the assumption that my presence did not influence pupil behaviour (Grix, 2010). My observations were semi-structured; I used a guide for recording field notes; however, I had no preconceived ideas about the types of incidents I might record. Therefore, the critical incident and themes for analysis arose from the observation rather than being “brought to the research, or imposed on the data, from the start” (Bell, 2014, p.212).

Observation, as a method of data collection has many strengths. It enables the researcher to gather authentic data as it happens and in a specific context, and to examine routine behaviour that, usually, could be “taken for granted, be expected or go unnoticed (Cohen et al., 2007, p.396). Similarly, Wragg describes the benefits of observation as “immediate and fresh” (1995, p.16) with the observer able to record a complete account of events. However, whereas outside observers can be an advantage as they are unattached to the situation, Wragg highlights that there is a risk of misinterpretation as they are unfamiliar with the subjects or circumstances being observed (1995). Cohen et al. (2007) refer to the Hawthorne Effect, where events may be altered as a direct result of the observer being present, a situation also noted by Wragg (1995).

Critical incident and links to Four Core Purposes

The chosen critical incident involved the introduction of a new topic (measuring angles) and the teacher began by activating pupils' prior knowledge, revising the relevant knowledge and ideas required for the lesson (Rosenshine, 2012). The teacher had put sentences about different types of angles on the whiteboard and asked for volunteers to answer with 90°, 180° or 360°. Pupil A answered the question that a reflex angle is between 180° and 360°. The teacher praised his answer. Pupil A then said, “I know that one because it's the dog!” The teacher and other pupils seemed confused. The teacher asked, “How is a reflex angle a dog?” Pupil A then explained that, at primary school, he had learned angles as a family. The dad is an obtuse angle, the baby is acute and the reflex angle is a dog because it looks like a dog chewing a ball. This was confirmed by Pupil B who had attended the same school.

It was intriguing that the pupil's learning was successful because it had been linked with something familiar and I was keen to investigate further. I have since found The Angles Family resources, to which Pupil A referred, online at primaryresources.co.uk (see Appendix 2).

The critical incident occurs within the Mathematics and Numeracy Area of Learning and Experience and has links to the Four Core Purposes and the Twelve Pedagogical Principles which underpin the Successful Futures framework (Donaldson, 2015). Pupil A demonstrated desirable learning behaviours set out by the framework by having "confidence in engaging with intellectual challenge" and being "ready to build on what they have learned" (p.28). In addition, the report states that pupils' "experience at school should have stimulated their imaginations in ways that engender excitement, are personally fulfilling and foster creative thinking" (p.28). The idea of a reflex angle as a dog chewing a ball has resonated with Pupil A, resulting in his clear recall of the size of the angle and ensuring a solid base on which to build further knowledge in this topic.

The critical incident provides evidence of Pupil A being an *enterprising and creative contributor* with his ability to "think creatively to reframe and solve problems" (p.29). However, this incident aligns more closely with the concept of an *ambitious, capable learner* as he has built up "a body of knowledge" and is able to "explain the ideas and concepts" that he is learning about (p.29). This is underlined by Welsh Government's commitment to higher standards, enabling learners to "evolve into enterprising, creative and critical thinkers" as well as "confident, capable and caring citizens" (Welsh Government, 2017).

The incident also shows evidence of good teaching in relation to Successful Futures' Pedagogical Principles (2015). Pupil A's primary school teacher provided powerful connections to the familiar, resulting in engagement and memorable experiences which aid learning (Principle Four). Also, by sharing The Angle Family resources, the teacher has succeeded in making learning authentic (Principle Six). Pupil A's current teacher demonstrates Principle Five by choosing activities which identify and build on pupils' prior knowledge.

Literature review

The critical incident has led to several areas which could be researched further, including pupil autonomy and use of schemas. However, the topics that I consider most relevant are metacognition, dual coding and constructivist theories of learning.

Metacognition

In its simplest form, metacognition can be described as “learning to learn” (Donaldson, 2015), “knowing about knowing” (Hewitt, 2008) or “thinking about thinking” (McGregor, 2007). In more detail, metacognition is the knowledge that a learner has about their own cognition or thinking (Hewitt, 2008) and their ability to use that thinking in a variety of learning situations (Donaldson, 2015). Metacognitive skills are further developed through reflection of the learner’s and others’ beliefs and evaluation of strategies used in problem solving (McGregor, 2007), leading to “self-regulation and self-assessment” (Fogarty, 2009, p.58).

Metacognitive strategies actively involve learners in the evaluation and improvement of their own learning through developing an awareness of cognitive processes (McGregor, 2007; Pritchard, 2014) and also a sense of ownership. Donaldson (2015, p.69) states that for children to become *capable learners* it is important that they have the ability to “stand back and observe their own process of learning and identify how it can be improved”.

Collaboration with peers is seen as key to developing these skills as learners are able to discuss and compare their thinking, questioning their ideas and those of others with the ultimate aim of refining their learning strategies (Donaldson, 2015, McGregor, 2007). Both McGregor (2007) and Pritchard (2014) emphasise the key role of the teacher in helping learners to understand how their learning occurs and by promoting metacognitive awareness through the provision of reflective tasks. For example, by investigating through discussion why pupils choose a specific method of solving a problem, valuable insights can be shared and understood.

In line with constructivist theories of learning, metacognition is most successful when learners are able to associate new information with prior learning and real-life experiences (McGregor, 2007; Muijs and Reynolds, 2011) and the role of the teacher in providing opportunities for these connections to be made is fundamental. Connections cannot be formed without providing context to an abstract concept to allow it to become concrete in the mind of the learner (McGregor, 2007). This view is corroborated by Hewitt (2008, p.47) who states that skills should be taught “in a meaningful context with transfer in mind” where the learner is conscious of the learning taking place.

The available literature on metacognition is highly positive about its merits in the classroom. However, it raises the question of why Pupil A was able to retrieve his knowledge of The Angles, whereas it seemed that Pupil B would not have made use of that knowledge without a reminder from his peer? Kelly and Donaldson (2016) suggest that conscientiousness is also a factor in successful use of metacognitive strategies and “that only if someone is

conscientious will they engage metacognitive behaviours to enhance academic performance” (p.21). Demetriou et al. (2011) also point to the influence of personality on metacognitive success, arguing that learners also need to be aware of motivation levels, personality traits and self-regulation techniques that may further or impede learning.

Dual coding

The Angles Family concept (Primary Resources) is also an example of dual coding, a theory which was first introduced by Paivio in 1971 (Kanellopoulou et al., 2019). The combination of text with visuals, offering the learner two methods of assimilating the information (Caviglioli, 2019; learningscientists.org, 2019), has been proven as an effective way to make learning more memorable (The Learning Scientists, 2019; Mayer and Sims, 1994), thus resulting in better retrieval (Kanellopoulou et al., 2019). The theory supposes that the mind processes information via two separate, yet interacting, subsystems: verbal and visual (Paivio, 1990; Cuevas and Dawson, 2018; Kanellopoulou et al., 2019). This double stimulus aids learning and facilitates recall from long-term memory (Caviglioli, 2019). Once stored in long-term memory, new information is then added to the learner’s schema (Caviglioli, 2019; Meade and Cubey, 2008), which can be described as blocks of knowledge representing the learner’s world (McLeod, 2018).

Caviglioli (2019, p.27) describes diagrams as having “computational advantage” over text as learners are able to draw out information and absorb it perceptively. Furthermore, Thomas and Lennox (2014) summarise the power of visuals in stimulating the senses, evoking meaning and association and, therefore, helping learners to fuller understanding. A further advantage of imagery is its ability to make abstract ideas more accessible by providing context through previously constructed associations and thus enabling better retention (Hodes, 2018). Although angles themselves can be considered visual representations, learners often struggle to understand them. Biber et al. (2013) suggest that this could stem from students having only a superficial understanding obtained by rote learning. This means that angles remain an abstract concept to learners until a specific context is applied, for example investigating real instances of angles in the classroom, or linking angle sizes to a familiar context such as a family (Primary Resources).

Dual coding is closely linked to Cognitive Load Theory, which refers to the amount of working memory used to process new information. According to Cuevas and Dawson (2018, p.43), too much “linguistic stimuli can push a learner into cognitive overload”. This results in information being discarded. Hodes (1998, p.133) states that imagery enables learners “to compensate for the limitations of short term or ‘working’ memory” by reducing cognitive load.

Consequently, the information is processed adequately and received both visually and verbally, learners are able to take advantage of both visual and verbal working memory capacity (Caviglioli, 2019). As a result, retention is improved as the information is stored in the long-term memory in two different ways (Cuevas and Dawson, 2018).

However, not every combination of text and pictures can be categorised as examples of dual coding. Caviglioli (2019, p.4) warns that visuals, “if executed poorly or laid out haphazardly, will fail to realise the potential of that graphic to enhance learning”. Mayer and Sims (1994) support this view with their findings that learners are better able to recall information from a textbook when the text and visuals are placed together rather than appearing separately. In addition, The Learning Scientists (2019) emphasise that images “should be meaningful” and that learners should be granted sufficient time to assimilate the two forms of information to avoid cognitive overload.

Constructivist theories of learning

The critical incident links directly to constructivist theories of learning since activating prior knowledge is considered an example of constructivism in practice (Muijs and Reynolds, 2011). Mercer (2008) and Twomey (1996) agree that to teach effectively, the teacher must first investigate the extent of learners’ current knowledge. Constructivism is child-centred and focuses on the individual (Meade and Cubey, 2008). Constructivists believe that learners construct knowledge for themselves and that this knowledge will vary from one learner to another dependent upon previous experiences thus rendering knowledge subjective (Muijs and Reynolds, 2011; Twomey, 1996). Learning is also considered a social activity (Pritchard, 2014) in which teachers and learners build and shape knowledge through discussion (Mercer, 2008).

In the constructivist classroom, the role of the teacher is to guide learning by presenting opportunities which enable learners to construct their knowledge (Twomey, 1996). These include helping learners to find links between previous and new knowledge, encountering different views and to “build shared knowledge in social situations” (Meade and Cubey, 2008). Learning should also be placed within contexts that are meaningful to the learner and teachers should place importance upon the development of children’s thinking processes (Pritchard, 2014), all within the framework of a curriculum (Mercer, 2008). Central to constructivism is the principle of supporting others to gain knowledge. Vygotsky (1978) developed the concept of the Zone of Proximal Development (ZPD), the difference between what a learner can already achieve and what can be achieved with the assistance of a more knowledgeable other. This theory was further developed by Bruner who introduced the

notion of scaffolding, in which learners are supported as they cross the ZPD (Muijs and Reynolds, 2011) and acquire a deeper understanding than they would have accomplished alone (Mercer, 2008).

However, there are other theories of learning and differing viewpoints. Behaviourism, for example, focuses on how students learn from the environment around them, as well as on social conditioning, including programming behaviour through the provision of rewards and punishments (Meade and Cubey, 2008; Muijs and Reynolds, 2011). An advantage of behaviourism is the ability to validate research with scientific data, enabling generalisations to be made, yet the theory does not consider internal stimuli, such as emotion and motivation, arguably removing vital elements of what makes us human (McLeod, 2017). A further criticism of constructivism is that it is not results focused (Muijs and Reynolds, 2011). However, in contrast to standardised testing, constructivist classrooms encourage formative assessment, which is ongoing and built in to the learning process. Pressure is not placed upon pupils to give the correct answer, rather the process of understanding is considered more important (Muijs and Reynolds, 2011). According to Meade and Cubey (2008, p.10) the behaviourist teacher is in control of the learning with the purpose of transferring knowledge, which learners are required to commit to memory, leaving little scope for “critical thinking and creativity” in the classroom. In consequence, Mercer (2008, p.65) argues that the majority of those who criticise “progressive education” (constructivism) do not “relate it to observations of what actually goes on in classrooms”.

Evaluation

The Angles Family (Primary Resources) has proven to be an effective way of helping Pupil A remember the names and sizes of the various angles. The critical incident was recorded at the beginning of a lesson when the teacher was introducing a new topic and activating pupils' prior knowledge. This is an example of best practice as outlined by Rosenshine (2012, p.13), who stated that “The most effective teachers ensured that students efficiently acquired, rehearsed and connected knowledge” through review of previous learning. Importance is placed on progression by Donaldson (2015, p.67) whereby the use of tasks and resources “that build on previous knowledge and experience” are promoted.

Biber et al. (2013) state that there has been a considerable amount of research on the difficulties that learners face when studying geometry. They believe that much learning about angles is done by rote, therefore denying learners the opportunity to develop a deeper understanding of the subject, and they agree that the introduction of new topics needs to

forge links between learners' prior knowledge as well as uncover any misconceptions they may have.

Each of the areas of study opened up by the critical incident have implications for improving teaching practice, not only on the subject of angles but for effective learning in general. Firstly, metacognition is a powerful tool which puts learners at the centre of their own learning, handing them the responsibility and enabling them to understand how they learn. In line with a constructivist teaching approach, metacognition relies heavily on discussion. Hewitt (2008) asserts that when pupils are encouraged to analyse and share the ways in which they work, classmates are able to learn successful strategies from their peers. A further advantage of this technique is that any "misconceptions or other problems of understanding" will be revealed (Hewitt, 2008, p.49). However, Kelly and Donaldson (2016) and Demetriou et al. (2011) assert that metacognition can be linked to internal factors, such as conscientiousness and motivation, which leads to the assumption that the success of metacognitive techniques is reliant on the learner's engagement with them. Therefore, it would also follow that success in the use of metacognition in the classroom is dependent on the skill of the teacher in guiding metacognitive learning (Fogarty, 2009).

The evidence to support dual coding as an effective method of processing and retaining information is notable and has shown impressive results. Cuevas and Dawson (2018, p.55) report that learners recalled twice as much information when given both visual and verbal stimuli than with verbal information alone, contributing to the assumption that "dual coding may enhance retention precisely because it leads to deeper processing." Caviglioli (2019, p.27) advises teachers to take advantage of the benefits of dual coding to reduce the strain on learners' cognitive resources, which should be used on "activities that count, that directly build their knowledge".

Constructivist teaching styles promote active learning in which learners internalise new knowledge by actively engaging with it (Pritchard, 2014). Fogarty (2009, p.124) concurs, stating that active learning aids "mental processing and the creation and strengthening of the neural pathways" which store information long-term. This activity-centred style of learning makes modern classrooms a very different place to their counterparts of the past. Indeed, the Successful Futures framework (Donaldson, 2015) draws heavily on constructivist thinking in its 12 Pedagogical Principles for good teaching and learning, despite a statement that the recommendations "do not imply an emphasis on any particular teaching approaches" (p.63). Four of the pedagogical principles in particular promote constructivist teaching:

- Principle 4 encourages a mix of teaching approaches which includes techniques that develop “problem solving, creative and critical thinking” (Donaldson, 2015, p.65);
- Principle 5 suggests that teachers choose activities that draw out pupils’ prior knowledge, thus providing a base to build on;
- Principle 6 advocates linking learning to real-life contexts outside the classroom; and
- Principle 12 pupils working together.

The new framework also provides scope for pupils to develop skills within and across Areas of Learning and Experience. This will enable strong links to be formed across subjects and topics and allow pupils to engage in a variety of problem solving and critical thinking activities as well as develop their creativity within authentic contexts (Donaldson, 2015). I believe that the new framework provides clear guidelines for my personal teaching practice, which I will endeavour to follow and incorporate the other aspects of learning, such as metacognition and dual coding, which have been researched for this assignment.

Conclusion

In this assignment, I have researched the use of critical incidents as a means of reflecting on everyday classroom occurrences. Critical incident studies seem particularly appropriate for educational settings (Tripp, 1993) and it has been interesting to discover how many paths of study can be generated from one brief interaction. The observed incident led me to research literature on metacognition, dual coding and constructivist theories of learning. The link to metacognition stemmed from Pupil A’s awareness of his learning. He was able to retrieve previous knowledge about angles, he knew how he knew it, and he was keen to share that learning with his teacher and classmates. The connection with dual coding was inspired by The Angle Family resource (Primary Resources), which combined textual information about angles with an illustrative concept of a family. It fired Pupil A’s imagination and enabled him to store the knowledge in his long-term memory for easy recall. Finally, I chose to look at constructivism, as activating prior knowledge, which instigated the critical incident, is an example of constructivism in the classroom (Muijs and Reynolds, 2011). Through critical incident analysis, I have developed a deeper understanding of several areas. The observed incident appeared interesting on the surface, but a deeper scrutiny has provided a lot of rich material that has led me to discover approaches and techniques that I plan to use in my teaching.

In line with the Professional Standards for Teaching and Leadership in Wales, I aspire to become a reflective practitioner so that I may “extend my knowledge, skills and

understanding” (Welsh Government, 2018, p.16). Through professional learning, I hope to refine my teaching and advance learning as required by the Standard for Effective Pedagogy (Welsh Government, 2018). Furthermore, I have experienced how collaboration with peers can aid learning for pupils and I intend to find areas of interest in which I can collaborate with colleagues to improve practice.

4137 words

References

- Bassey, M. (1999) *Case Study research in Educational Settings*. Open University Press, Buckingham.
- Bassey, M. (2007) 'On the kinds of research in educational settings', in Hammersley M. (ed.) *Educational Research and Evidence-based Practice*, The Open University, Milton Keynes.
- Judith Bell and Stephen Waters (2014) *Doing Your Research Project: A Guide for First-time Researchers* 6th edition. Open University Press, Maidenhead.
- British Educational Research Association [BERA] (2018) *Ethical Guidelines for Educational Research*, fourth edition, London. <https://www.bera.ac.uk/researchers-resources/publications/ethicalguidelines-for-educational-research-2018>
- Biber, C., Tuna, A. and Korkmaz, S. (2013) 'The mistakes and the misconceptions of the eighth grade students on the subject of angles,' *European Journal of Science and Mathematics Education* 1(2), pp. 50-59.
- Caviglioli, O. (2019) *Dual Coding with Teachers*. John Catt Educational Ltd., Woodbridge.
- Cohen, L., Manion, L. and Morrison, K. (2007) *Research Methods in Education*, Routledge, Abingdon.
- Cuevas, J. and Dawson, B.L. (2018) 'A test of two alternative cognitive processing models: Learning styles and dual coding', *Theory and Research in Education*, 16(1) pp. 40 –64. DOI: 10.1177/1477878517731450
- Demetriou, H. (2009) 'The case study', in Wilson, E. (ed.) *School-based Research: A Guide for Education Students*. SAGE Publications Ltd., London.
- Demetriou A., Spanoudis, G. and Mouyi A. (2011) 'Educating the Developing Mind: Towards an Overarching Paradigm', *Educational Psychology Review*, 23, pp. 601–663. DOI 10.1007/s10648-011-9178-3
- Denscombe, M. (2007) 'Critical incidents and learning about risks: the case of young people and their health' in Hammersley M. (ed.) *Educational Research and Evidence-based Practice*. The Open University, Milton Keynes.
- Donaldson, G. (2015), 'Successful Futures: An Independent Review of Curriculum and Assessment Arrangements in Wales', Welsh Government, Cardiff.
- Estyn. Available at: www.estyn.gov.wales (Accessed 29th September 2019). Further details available on request.

Fogarty, R. (2009) *Brain Compatible Classrooms*, 3rd Edition. Corwin, Thousand Oaks.

Grix, J. (2010) *The Foundations of Research*. Palgrave Macmillan, Basingstoke.

Harrison, J.K. and Lee, R. (2011) 'Exploring the use of critical incident analysis and the professional learning conversation in an initial teacher education programme', *Journal of Education for Teaching*, 37:2, pp. 199-217. DOI: 10.1080/02607476.2011.558285

Hewitt, D. (2008) *Understanding Effective Learning: Strategies for the Classroom*. Open University Press, Maidenhead.

Hickman, M. and Stokes, P. (2016) 'Beyond learning by doing: an exploration of critical incidents in outdoor leadership education', *Journal of Adventure Education and Outdoor Learning*, 16:1, pp. 63-77. DOI: 10.1080/14729679.2015.1051564

Hodes, C. (1998) 'Understanding Visual Literacy Through Visual Information Processing', *Journal of Visual Literacy*, 18(2), pp. 131-136.

Kanellopoulou, C., Kermanidis, K.L. and Giannakouloupoulos, A. (2019) 'The Dual-Coding and Multimedia Learning Theories: Film Subtitles as a Vocabulary Teaching Tool', *Education Sciences*, 9(210). DOI:10.3390/educsci9030210

Kelly, D. and Donaldson, D.I. (2016) 'Investigating the complexities of academic success: Personality constrains the effects of metacognition', *The Psychology of Education Review*, 40(2) pp. 18-23.

The Learning Scientists, (2019) 'Dual Coding and Learning Styles'. Available at: <https://www.learningscientists.org/blog/2019/6/6-1> (Accessed 19th October 2019).

Mayer, R.E. and Sims, V.K. (1994) 'For Whom Is a Picture Worth a Thousand Words? Extensions of a Dual-Coding Theory of Multimedia Learning', *Journal of Educational Psychology*, 86(3), pp. 389-401.

McGregor, D. (2007) *Developing Thinking: Developing Learning: A Guide to Thinking Skills in Education*. Open University Press, Maidenhead.

McLeod, S. A. (2017, Feb 05). *Behaviorist approach*. Simply Psychology. Available at: <https://www.simplypsychology.org/behaviorism.html> (Accessed 26 October, 2019).

McLeod, S. A. (2018, June 06). *Jean Piaget's theory of cognitive development*. Simply Psychology. Available at: <https://www.simplypsychology.org/piaget.html> (Accessed 26 October, 2019).

Meade, A. and Cubey, P. (2008) *Thinking Children: Learning about Schemas*. Open University Press, Maidenhead.

Mercer, N. (2008) *The Guided Construction of Knowledge*. Multilingual Matters, Bristol.

Muijs, D. and Reynolds, D (2011) *Effective Teaching: Evidence and Practice*. SAGE Publications Ltd., London.

My Local School. Available at: <http://mylocalschool.wales.gov.uk/> (Accessed 29th September 2019). Further information available on request.

Paivio, A. (1991) 'Dual Coding Theory: Retrospect and Current Status', *Canadian Journal of Psychology*, 45(3), pp. 255-287.

Primary Resources, 'The Angles Family'. Available at: <http://www.primaryresources.co.uk/maths/mathsE7.htm> (Accessed 28th September 2019).

Pritchard, A. (2014) *Ways of Learning: Learning Theories and Learning Styles in the Classroom*, 3rd edition. Routledge, Abingdon.

Renard, L. (2019) 'How to become a reflective teacher – The complete guide for reflection in teaching', Book Widgets. Available at: <https://www.bookwidgets.com/blog/2019/02/how-to-become-a-reflective-teacher-the-complete-guide-for-reflection-in-teaching> (Accessed: 28 October, 2019).

Rosenshine, B., (2012) 'Principles of Instruction: Research-based Strategies That All Teachers Should Know', *American Educator*, Spring 2012, pp. 12-39.

Thomas, A.F. and Lennox, J. (2014) 'Two Codes Are Greater than One: Developing Students' Vocabularies with Images and Visualization', *Illinois Reading Council Journal*, 43(1), pp. 15-29.

Tripp, D. (1993) *Critical Incidents in Teaching: Developing Professional Judgement*. Routledge, London.

Twomey Fosnot, C. (Ed) (1996) *Constructivism: Theory, Perspectives and Practice*. Teachers College Press, New York.

Vygotsky, L.S. (1978) *Mind in Society: The Development of Higher Psychological Processes* The President and Fellows of Harvard College, Massachusetts.

Wellington, J. (2008) *Educational Research: Contemporary Issues and Practical Approaches*. Continuum, London.

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Welsh Government, Education in Wales: Our National Mission, Cardiff, 2017

Welsh Government, Professional Standards for Teaching and Leadership, OGL, Cardiff, 2019

Wragg, E.C. (1995) *An Introduction to Classroom Observation*. Routledge, London.

Appendix 1

OBSERVATION / FIELD NOTES

(Questions adapted from Fletcher Wood (2016))

Date:	26/9/19
Lesson details:	8.45-9.45. Maths lesson Year 8 set 2 LSA in class (1-2-1)
Classroom culture (Are the students focused on learning?)	pupils just got on with it. pupils entered, teacher placed starter sheet on table 60 x tables given (x2 → x12). worked quietly. Pupils Teacher took register during this time. went through answers. children mostly worked quietly. 2 girls in corner talked through explanations. Teacher noted "noise"
Objectives (Is there a clear purpose to the lesson? How do the lesson activities promote that purpose?)	New topic - measuring angles Objectives - activate prior knowledge - revision of types of angles use equipment effectively (key vocab). key vocabulary.
Direction (Are the students clear about what they are doing and how to do it well?)	clear instructions, sheets, equipment given. Q1's 6 and 4 more difficult - students put up hands. Teacher drew class together and went through these on board.
Access and challenge (Are all students able to engage in the lesson? Are all students challenged?)	TA. working 1-2-1 First task estimation and type of angle. Task 2 - measuring angles / checking estimate in set 10 aimed at level of class - similar ability 2 harder Q1's



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Yr Athrofa
Addysg a'r Dyniaethau
Education and Humanities

Assessment

How does the teacher assess student understanding before, during and after the lesson? How is this used in their teaching?

APK exercise - do pupils remember angle sizes / names, focused on 90° , 180° , 360°

2

Specifics / Critical Incidents

Are there particular telling moments and examples which it would be helpful to discuss?

teacher has highlighters and protractors to lend - left at front of room on way out.

Discussing reflex angles - pupil said that they learnt angles as families in primary school. Reflex angle was a dog with a ball (dog's nose chewing ball). Barked up his classmates who went to same primary school. Teacher praised use of strategy to remember the names / sizes of the angles. (baby = acute, dad = obtuse)
(could look at links to recognisable things that help pupils to learn facts.
Can I find this link online?





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

Dyddiad/Date: 26/9/19 - Maths

Digwyddiad critigol (Ffocws)/Critical incident (focus):

Profiad/ Experience	
Teimladau/ Feelings Beth yw eich teimladau ynghylch y profiad? "What are your feelings regarding the experience?"	surprised intrigued I was part of the collective puzzlement in the class at the pupil's method of remembering a reflex angle.
Cofio a Deall/ Remember and Understand "Allwch chi restru elfennau'r achos yng nghyd-destun y dysgu?" "Can you list the aspects of the incident in the context of learning?"	The teacher was activating prior knowledge and asking pupils to fill in the blanks on the board, which identified the names and sizes of different angles. The pupil put his hand up and was chosen to answer a question about reflex angles. He said he remembered reflex angles "because ~~that~~ it's a dog."
Gwerthuso a dadansoddi/ Evaluate and analyse "Beth y gellid ei gadw yr un fath i sicrhau addysgu a dysgu effeithiol yn y dyfodol?" "What could be kept the same to ensure effective teaching and learning in the future?"	The child's recall of reflex angles was effective because of the link made to the dog (memorable). The visual was backed up by another pupil who had attended the same primary school. The teacher was surprised and hadn't heard of this link before.
Casgliadau a chymau gweithredu/ Conclusions and actions "Beth yw eich atebion posibl i'r mater a nodwyd?" "Beth y gellid ei wneud nesaf?" "What are your possible solutions to the issue identified?" "What could be done next?"	The memory was effective / method of remembering. I could look at links - how new / tricky information can be memorized / internalised by making links to familiar things (eg. dog with a ball). visuals to aid learning dual coding meta cognition } look at schemas theories of learning - ~~can~~ ^{can} ~~much~~ ^{much} ~~more~~ ^{more} ~~to~~ ^{to} ~~it~~ ^{it}
Y profiad newydd / Transformed experience	

music? transference to long term memory
 not necessarily a visual needed to make it memorable
 memory v understanding



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OBSERVATION / FIELD NOTES

(Questions adapted from Fletcher Wood (2016))

Date: 26/9/19

Lesson details:

Lesson 2 9.45 - 10.45
French - banded (lower ability?)
26 pupils, one TA working 1-2-1 with pupil

Year 8

Classroom culture

(Are the students focused on learning?)

Some chatter
5, 4, 3, 2, 1 (in French) for quiet
points chart on board - points given to individuals for correct answers / first 5 to finish written activity
girl next to me missed out a whole activity, instead drawing a v. elaborate compass (as on board) rather than that class were asked to draw. *

Objectives

(Is there a clear purpose to the lesson? How do the lesson activities promote that purpose?)

All activities linked to geography of France and Francophone countries across the world. Learning compass points and positions relative to other countries. Revising continents and Francophone countries from previous lessons.

Direction

(Are the students clear about what they are doing and how to do it well?)

Instructions given first in French then repeated in English. If anyone appeared to not have understood, teacher spoke to them individually and more extensively in English.

Access and challenge

(Are all students able to engage in the lesson? Are all students challenged?)

Teacher corrections - pupil says sud (sudel) for south.
Teacher asks sud (sudel) or sud (soud)? Pupil chooses correct pronunciation.
Pair work - one pupil expressed dislike at working in pairs.



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Assessment

How does the teacher assess student understanding before, during and after the lesson? How is this used in their teaching?

starter translation revising vocabulary and knowledge gained in previous session.

Exercises - ~~go~~ teacher went over together on board to check answers.

Specifics / Critical Incidents

Are there particular telling moments and examples which it would be helpful to discuss?

- Could look at use of target language in classroom.
- Could look at gentle correction techniques (as used by teacher) to correct a pupil without putting them off answering in future.
- Groupwork: pupil expressed dislike for working in pairs. Teacher repeated that she would like everyone to work in pairs for the activity. Pupil: "The only people I want to work with ~~are~~ L or G (girls). Or him if I have to." (points to boy in row behind her). Sulking. After activity teacher explains to class that working with others is a "social skill and you learn to adapt and work with different people."

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

Dyddiad/Date: 26/9/19 - French

Digwyddiad critigol (Ffocws)/Critical incident (focus):

Profiad/ Experience	
Teimladau/ Feelings Beth yw eich teimladau ynghylch y profiad? "What are your feelings regarding the experience?"	interested that a pupil should dislike groupwork enough to express her dislike Assumption - I'd imagined shy people would feel that way rather than someone confident/outspoken perhaps aimed at her neighbour rather than partner work itself?
Cofio a Deall/ Remember and Understand "Allwch chi restru elfennau'r achos yng nghyd-destun y dysgu?" "Can you list the aspects of the incident in the context of learning?"	Teacher asked the class to work in pairs for task. Pupil said she didn't like working in pairs. Teacher repeated that she would like her to work in a pair for this task. Pupil gave a list of other pupils that she wanted to work with - 2 girls and one boy (at a push). Sulked. Teacher explained importance of partner work after completion of task.
Gwerthuso a dadansoddi/ Evaluate and analyse "Beth y gellid ei gadw yr un fath i sicrhau addysgu a dysgu effeithiol yn y dyfodol?" "What could be kept the same to ensure effective teaching and learning in the future?"	Teacher was consistent in her instructions and expectations. Didn't give in to pupil's demands and pupil appeared to be doing the task, albeit with the person behind her, rather than next to her. Teacher explained the reasoning behind partner work (for future reference?)
Casgliadau a chamau gweithredu/ Conclusions and actions "Beth yw eich atebion posibl i'r mater a nodwyd?" "Beth y gellid ei wneud nesaf?" "What are your possible solutions to the issue identified?" "What could be done next?"	Not all pupils like group / partnerwork. What are the benefits of group work (teacher gave examples)? What are the drawbacks? Why might people not like group work? Ways of building enthusiasm for partnerwork amongst pupils who are not keen?
Y profiad newydd / Transformed experience	



OBSERVATION / FIELD NOTES

(Questions adapted from Fletcher Wood (2016))

Date:	2/10/19
Lesson details:	Year 8 History - Lesson 4 (12-1) ≈ 26 in class + TA (1-2-2) mixed ability (form class)
Classroom culture (Are the students focused on learning?)	Lesson 4 - some off task Pupil C - rapping
Objectives (Is there a clear purpose to the lesson? How do the lesson activities promote that purpose?)	Why did Henry VIII vandalise Tintern Abbey Yes ① 66 word challenge ② jigsaw (linked to Henry VIII / Tintern Abbey) in pairs/3s ③ Research task ④ Have I got news for you
Direction (Are the students clear about what they are doing and how to do it well?)	Lesson objectives given Instructions / choices on board (example bullet points, table and bubble diagram) or data sheet on offer for recording.
Access and challenge (Are all students able to engage in the lesson? Are all students challenged?)	yes - differentiated texts Usually - a pupil (B) noted that both the white and yellow texts were identical, and brought to teacher's attention. → pupils asked if they wanted a white or yellow sheet.



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Assessment

How does the teacher assess student understanding before, during and after the lesson? How is this used in their teaching?

Recapped topic

60 word challenge - summarise why religious and monasteries were important in Tudor England. Pupils given 6x11 grid - 1 word/idea of punctuation in each box and finish in final box. = starter while register taken (5 mins as timer) +5

Came together near end of the lesson to gather ideas about each section - power/money/divorce.

Plenary - Have I got news for you - missing words round-style question. One is class eg — wanted to be as — as he possibly could. (Henry, powerful).

Specifics / Critical Incidents

Are there particular telling moments and examples which it would be helpful to discuss?

T: Which chair sheet - white or yellow?

Pupil A - white

Pupil B (handed a white sheet)

T: Let's challenge ourselves today, shall we?

choice

Also choice of recording style - bullet points, table or bubble diagram.

Spoke to ~~the~~ class teacher re choices - said "they like a bit of choice". Said that sth had gone wrong and both texts were the same today. Sometimes different texts (levels of challenge), sometimes same text but differentiated questions (sentence starters given)

Pupil C - off task (has TA for behavioural and emotional support). Started rapping, using vocabulary from the walls.

Teacher asked him to stop. He then started deriving a rap from the timeline around the top of the room. Very talented but inappropriate timing. How could this be encouraged in an appropriate environment?

although
language
not always
appropriate

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

Dyddiad/Date: 2/10/19

Digwyddiad critigol (Ffocws)/Critical incident (focus): Pupil choice

Profiad/ Experience	
Teimladau/ Feelings Beth yw eich teimladau ynghylch y profiad? "What are your feelings regarding the experience?"	I was impressed with the amount of choice offered to the pupils - they could choose whether or not to use the differentiated text and how to format their research results. It was a positive experience and seemed to be appreciated by pupils.
Cofio a Deall/ Remember and Understand "Allwch chi restru elfennau'r achos yng nghyd-destun y dysgu?" "Can you list the aspects of the incident in the context of learning?"	Pupils were offered a choice of yellow or white sheets or text (yellow being the easier texts). Pupils were given a choice of 3 ways to record their data and a data recording sheet was also available if wanted. table or bubble diagram bullet points
Gwerthuso a dadansoddi/ Evaluate and analyse "Beth y gellid ei gadw yr un fath i sicrhau addysgu a dysgu effeithiol yn y dyfodol?" "What could be kept the same to ensure effective teaching and learning in the future?"	Differentiation of texts or questions The expectation that pupils should challenge themselves. One pupil was handed a white sheet and the teacher said "let's challenge ourselves today." The pupils appreciated the range of choice in presenting their facts.
Casgliadau a chymhellu/ Conclusions and actions "Beth yw eich atebion posibl i'r mater a nodwyd?" "Beth y gellid ei wneud nesaf?" "What are your possible solutions to the issue identified?" "What could be done next?"	Pupil choice - benefits Impact on engagement? Any situations where too much choice? How does introducing this choice affect the lesson? Differentiation of texts/questions/expectations or amount of work? Pupil autonomy Or responsibilities come with the choices?
Y profiad newydd / Transformed experience	



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④

OBSERVATION / FIELD NOTES

(Questions adapted from Fletcher Wood (2016))

Date: 2/10/19

Lesson details:

Maths - year 8, set 2
approx. 25 pupils

Classroom culture

(Are the students focused on learning?)

Seating plan (boy/girl)
Most were - some off task (identified either verbally or non-verbally)

Objectives

(Is there a clear purpose to the lesson? How do the lesson activities promote that purpose?)

Division with remainders
• Activate prior knowledge
• Use times tables
• Show structured working out

Direction

(Are the students clear about what they are doing and how to do it well?)

Starter activity - fill in the gaps of fractions and decimals and percentages
• Measures while register taken and books given out
Activity - division using bus stop method
Detailed and clear explanation.
Repeated part way through activity time.

Access and challenge

(Are all students able to engage in the lesson? Are all students challenged?)

Pupils encouraged to work at own pace and beat own score
in terms of questions answered (starter)

Questions on board - low numbers to start, gradually getting harder and last few challenging

2 into 7, that's 7 divided by 2 - vocabulary used covers whichever pupils understand best



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Assessment

How does the teacher assess student understanding before, during and after the lesson? How is this used in their teaching?

Demonstrating and asking questions - how many times does 5 go into 48? how do we know there'll be a remainder? (48 ÷ 5)
(Answer: only 5s and 0s in 5x table)

Questions on board for practice. Teacher walked around checking progress and answering queries.

Bring class back together for further examples - some pupils had expressed confusion.

56 ÷ 10 - reminded class they have another method for working out ÷ 10 but using bus stop method today.

End of lesson, went over questions on board, explaining and putting in answers but not questioning. Time constraint?

Specifics / Critical Incidents

Are there particular telling moments and examples which it would be helpful to discuss?

Non-verbal signals from teacher: looks and mouths at pupil making noises with his mouth. Later gestures for him to hush and finger a lip to talking pupil.

Pupils working, some off task - humming around and making noises. Identifies 3 by name and their undesired behaviours.

I noticed pupil A doing something under his desk and I thought he was texting. However, he was using his fingers for his times tables. I noticed this on subsequent occasions too. Covert - stigma about using fingers? On the other hand, Pupil B openly counted her fingers either flat on the table or up in front of her face while also whispering the numbers (less self-conscious).

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

Dyddiad/Date: 2/10/19

Digwyddiad critigol (Ffocws)/Critical incident (focus): Maths - finger counting

Profiad/ Experience	
Teimladau/ Feelings Beth yw eich teimladau ynghylch y profiad? "What are your feelings regarding the experience?"	I felt sorry for the pupil using his fingers (to count through his times tables) under the table. It was as if he didn't want the teacher to know that he didn't know them off by heart.
Cofio a Deall/ Remember and Understand "Allwch chi restru elfennau'r achos yng nghyd-destun y dysgu?" "Can you list the aspects of the incident in the context of learning?"	Division activity. I noticed Pupil A's hand under the desk and thought he was texting at first. Using his fingers to help work out his times tables. However, another pupil (B) openly used her fingers to count. Covert v blatant use
Gwerthuso a dadansoddi/ Evaluate and analyse "Beth y gellid ei gadw yr un fath i sicrhau addysgu a dysgu effeithiol yn y dyfodol?" "What could be kept the same to ensure effective teaching and learning in the future?"	Encourage use of fingers as a concrete resource Acceptance that pupils need that support. Teacher making clear that pupils would use their times tables to divide.
Casgliadau a chamau gweithredu/ Conclusions and actions "Beth yw eich atebion posibl i'r mater a nodwyd?" "Beth y gellid ei wneud nesaf?" "What are your possible solutions to the issue identified?" "What could be done next?"	Is there a stigma to using fingers? In secondary school? In general? Use of concrete - pictorial - abstract heavy for maths learning Encourage finger use and show how fingers can help in different areas of maths. Knowledge of times tables - no longer by rote? Advantages / disadvantages.
Y profiad newydd / Transformed experience	

Appendix 2

The Angle Family

(From www.primaryresources.co.uk)

The Angles

Come and meet the Angle family...

“Hi! We’re the Angles, we’re one family, but all very different, so let us tell you a bit about ourselves!”



Mr. Obtuse Angle

This is Obtuse.
He's the husband
of the family. He's
*bigger than Right
and Acute*. He's
always inside, and
he always
measures between
 90° and 180°
(depending on
how much dinner
he's eaten!)



Mrs. Right Angle

This is me. I'm Mrs.
Right Angle. I
always measure 90° ,
my favourite shape
is a square, and
whatsmore, no
matter what my
husband tells you,
I'm *always right*!



Baby Acute Angle



This is baby Acute angle. Isn't he cute?! He loves a hug, and always has his arms out for cuddles! He's the smallest of the family, measuring less than 90° .



Reflex Angle

This is our pet dog, Reflex. He's always outside. He's only a pup at the moment so he measures 180° , but he can grow up to 360° ! So he's definitely the biggest angle. You'll never see him without that ball in his mouth either, horrid thing!

