

Overview

Friday, October 4, 2019 1:49 PM

Title: Three Pedagogical Principles applied in PTE1
Student number 1903951

Pathway: (S-PGCE)

Link to OneNote notebook: https://uowtsd-my.sharepoint.com/:o:/g/personal/1903951_student_uwtsd_ac_uk/Ekd6NDTP3zZOmBtNVvPvNM0BN0DFsqDxE2qjuCuVLLsRDw?e=PnnFdq

The Three Pedagogical Principles are:

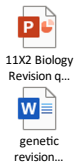
1. Good teaching and learning means employing assessment for learning principles
2. Good teaching and learning regularly reinforces cross-curriculum responsibilities, including literacy, numeracy and digital competence and provides opportunities to practice them.
3. Good teaching and learning creates authentic contexts for learning.

Assessment for Learning

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Good teaching and learning means employing assessment for learning principles

Assessment for learning, also referred to a *formative* assessment, involves the employment of various strategies which serve a dual purpose: to be used by teachers to adapt learning materials to learners' needs and to provide feedback to learners about their progress.



Powerpoint: activities for Year 11 upper band Biology GCSE revision lesson on genetics unit.

Lesson plan Year 11 upper band revision lesson genetics.
Evidence of limitations of using new AFL techniques with an unfamiliar group

Context: I was asked to prepare a revision lesson for an upper band class of year 11 pupils on their unit on genetics. I had observed the class previously but hadn't taught them before. Having observed a revision session which was very much 'chalk and talk' I decided, in conjunction with the class teacher, do arrange a carousel of activities. The rationale for this was to motivate the pupils by devising some revision games, to give them an opportunity to work collaboratively in groups and discuss issues together and to provide a variety of AFL techniques. I included two quizzes – one multi-choice and one longer-answers, a taboo-type game to be done in pairs, a Pictionary game and dominoes (taken from Paul Ginnis' Teacher's Toolkit. I had observed a similarly-styled lesson with another class which had been very well received by the students.

The class teacher was out so I had a supply teacher with me. I had planned to divide the class into groups using a technique I often used coaching kayaking: numbering pupils 1-5 then grouping all the 1s together on one station, the 2s on the next and so on. At this point, the pupils point blank refused to work in this way. They very grudgingly went to the groups allocated and barely engaged with any of the activities. I asked a senior member of staff for help: she spoke with them, but after she had left the room they continued to refuse to engage. They left me with little to go on in terms of AFL.

I discussed the events of the lesson with the class teacher and the senior member of staff. They gave me positive feedback regarding my planning and delivery of the lesson and reprimanded the class. Feedback from the class was that they did not like working with students other than those they usually sat next to. When I taught them next, I taught a more traditional revision lesson and they engaged well.

This was a big learning curve for me. It showed that what works for one class may not work for another. It also taught me that veering from traditional practice or what the class are used to may be unwise with an unfamiliar class. It also gave me an indication of pupils' reluctance to take responsibility for their own learning and how they lack key social skills that are necessary for future jobs: their fear of working with unfamiliar peers. This helped me reflect on what I had read about supporting pupils to develop problem-solving skills and communicate with each other. They may prefer a 'chalk and talk' method of teaching assessed with summative, end-of-unit, tests but is this helping them in the long term?

Key critical point for assignment: is chalk-and-talk with summative assessment preferable to a more interactive style of teaching incorporating a variety of AFL techniques?



Using randomised questioning techniques: pros and cons. Year 9 upper band chemistry lesson reactivity of metals



Evidence of effective use of traffic lights as AFL after feedback regarding use of randomised questioning. Same year 9 upper band class.

I was given positive feedback several times on my questioning including my use of randomising my questioning with pupils. I used lolly sticks with pupils' names on drawn at random. My ability to probe and get pupils to expand their answers was noted by several teachers and I was told that using randomised questioning helped keep pupils on their toes. They couldn't switch off during the lesson. However when I used lolly sticks with one particular year 9 class, the feedback from the class teacher was that randomised questioning with this group was dangerous because it inhibited pupils from engaging. It made them feel self-conscious and they didn't like being singled out. This particular teacher was also sceptical regarding the use of AFL – he felt that whilst they sound good in theory, in practice they have limited impact and are time consuming.

When I taught this class without using lolly sticks it was apparent that the class felt more relaxed, but it proved problematic because I was only involving a minority of children in question-answer sessions: those who were comfortable putting their hands up. It was very difficult for me to assess where the other pupils were up to, other than marking their written word, much of which was directly copied.

I decided to use traffic lights during the lesson as AFL. This proved helpful and pupils seemed far more comfortable with this method. However it left me with the problem that I felt that I was not developing pupils' thinking skills or verbal skills.

For the future, I will continue to try to find ways of involving the whole class. I am focusing on this for my lesson study (looking at differentiating the randomised questions to help the less confident pupils engage with them. I will also try concept cartoons which I have read positive things about regarding AFL and developing thinking and oracy skills.



Evidence of good use of questioning: year 7 upper band science lesson (solids, liquids and gases)

I have included this lesson as an example of a class in which my questioning skills and use of lolly sticks/who wants to be a millionaire were assessed as effective. The class are a lively and confident year 7 upper band class. They seem to enjoy class discussion and have all been involved in discussions and are growing in confidence at expressing their opinions. A traditional chalk-talk style would be likely to disengage this group. This is also the class who greatly enjoyed the carousel revision lesson that the year 11 class so struggled with.

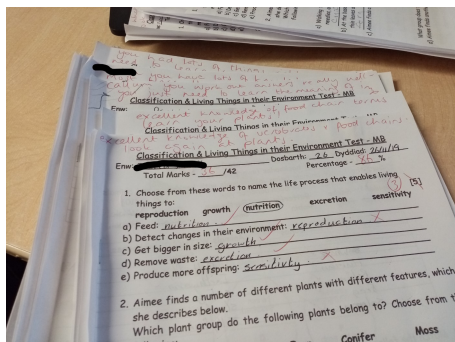


Evidence of peer assessed task Year 7 nurture group (lowest class of 8)

Peer assessment doesn't seem to be embedded into school culture as yet, with pupils viewing it rather negatively – their attitude was 'we've done the task, why do we need to assess it?' More work seems to be needed to embed within the school the ideas behind peer and self-assessment so that pupils can take on more responsibility for their own learning and develop metacognitive capacity.



Reflection: proponents of more traditional 'chalk and talk' teaching might argue that there isn't time for all these different activities within AFL. Science is necessarily a content-heavy syllabus and there simply isn't time to incorporate these additional exercises. I agree to some extent: getting through the scheme of work seems a mammoth task for me. When I spend time on AFL I simply do not finish the lesson material I am expected to. This leaves me with a dilemma: do I replace content with AFL? I hope that, with experience, I develop in my ability to make the right decisions regarding these priorities. Perhaps my delivery of the content will become slicker?



Evidence of using comments as well as a percentage grade for a summative assessment task (end of unit test, year 7 nurture class, science unit on adaptation).

My experience in school thus far is aligned with my reading on AFL: students disregard feedback comments and are interested solely on their grade. Pupils speak fervently with their teachers and with each other about their end-of-term PGs (progress grades). The negative impact of this is evident for my year 7 nurture class who all have a long history of low achievement. This is evident within their attitude to learning and their demeanour in the class.

However when the test conditions are altered and the test tasks are supported and scaffolded, all of these pupils found that they were more able than they had thought. They were able to challenge their initial negative mindset "I can't do it, I'm stupid" and see themselves succeed.

I ensured, when marking these tests, to provide feedback comments in addition to their grade and to use this summative assessment information to help plan for future learning. I also talked at length with individual pupils about their strengths and how they can make progress and develop useful skills and knowledge irrespective of their grades.

Cross-curriculum Responsibilities

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Good teaching and learning regularly reinforces Cross-curriculum Responsibilities, including literacy, numeracy and digital competence, and provides opportunities to practise them

Donaldson states that the challenge for teaching posed by the Cross-curriculum Responsibilities will be to maintain the focus on these responsibilities within teaching and learning so that their application becomes natural and authentic rather than an add-on (Donaldson, 2015:69)

Numeracy: science is a subject that naturally lends itself to the development of cross-curricular skills. Literacy skills are developed through extended writing QER questions, numeracy skills are already embedded with calculations and graph work. For me, ICT skills are less well embedded although there are plenty of opportunities to do so. Scientific data can be recorded and presented using computer programmes and packages, there is the scope to do internet research and create power points and presentations.



QER extended writing task Year 9 upper band Extraction of Metals lesson: choosing an appropriate metal based on properties and place in reactivity series with which to build a fence

The scheme of work already has literacy and numeracy embedded in it. The example here is a year 9 class's first attempt at an extended answer question. Pupils are required to transfer their prior learning of literacy skills to construct an argument. I adapted the scheme of work to scaffold this activity for them. This included sentence starters, group and pair discussion tasks and lesson activities in which they compared different properties of metals. The subject of the extended writing task was to decide on the best metal to build a fence with and provide arguments for their choice.

Reflection: I was surprised how difficult the class seemed to find this task, especially given the scaffolding provided. It seems that pupils may not be used to transferring skills across the curriculum. This shows me the need to support pupils to do this as these are skills that will help them in life. They are used to learning and applying subject-specific knowledge and seem to lack the necessary thinking skills and creativity.

Until I had delivered and reflected on this lesson and read around the subject I hadn't fully appreciated the need for cross curricular links. Some staff I had spoken with were sceptical about the idea. It seemed, again, time consuming and difficult to implement when they already have a subject-specific syllabus to get through. However having considered the four purposes of the curriculum and the holistic development of skills required to produce healthy, creative and enterprising citizens I can see the benefit of developing these links. My next steps would be to consider how best to support the pupils with this. Pupils do not always seem to understand the rationale behind cross-curricular links and their motivation to conduct literacy tasks within science lessons isn't always great.



graph reactivity...
Metals, year 9 higher ability

Year 9 upper band reactivity of metals unit example of graph work and numeracy and Year 10 lower ability scaffolded PowerPoint for graph work on solubility

Again there are already examples of numeracy skills within the science scheme of work. The example here is the presentation of data in a graph. It was interesting to compare how different classes took to this activity. In general the upper band year 9 class seemed to be relatively comfortable with this and could use prior knowledge to complete aspects of the task, although the lesson required several mini plenaries after assessing their progress in class. It seems some cross-curricular links are perhaps more obviously relevant to pupils (we have to do graphs in science but why do we need to write essays?)



lesson 6 measuring...
Year 10 lower ability

When doing graph work with a lower ability year 10 applied science class, pupils' initial reaction was very negative "no, not graphs, I hate graphs, I can't do them". However, having prepared for this in my planning, I had adapted the scheme of work so that each step was scaffolded and pupils in general seemed pleased, even proud, of their work. Their difficulty was one of self-esteem (this links to another teaching point about the need to address pupils' mindsets and self-esteem as Carol Dweck refers to) rather than failing to see the point of the activity.

My reflections are that pupils have an implicit understanding of the relevance of certain links between subject disciplines (we do graphs in science because they are how we present the results of the experiment). However there does not seem to be an implicit understanding of the wider need to develop links between subjects in order to develop skills and knowledge for lifelong learning. Again, Donaldson points to how teachers need to see how to equip children and young people with key skills that are transferable to the adult world and for lifelong learning. My observations of pupils within lessons seems to show how pupils (and staff) may create barriers between subject disciplines and at the school gates so that pupils 'shut down' because they have not developed the metacognitive skills necessary to think creatively and to problem solve. They are simply phased when they see something that they think shouldn't be there.



7B lesson 7 mixtures...

Year 7 upper band science lesson (mixtures) using internet research compared with textbook research

A target for me to work on is to develop my own ICT skills and to think more creatively about using ICT within the classroom. It is a given that being digitally literate is increasingly important in an increasingly technological world and that pupils need to be digitally literate. However, as with other cross-curricular links, there is debate about the extent to which ICT skills should be taught in ICT rather than within other subject areas. I admit to being sceptical initially. Teaching a science syllabus seemed like a difficult-enough task in itself – why would it be important to teach aspects of other subject disciplines as well? Particularly as I am by no means an expert in these areas? When I was first introduced to this pedagogical principle and hadn't read widely about it, I held a view (that it seems is shared at least in part within school) that it was simply another 'bolt-on'. Completing this assignment would mean filing through my lesson plans in search of examples that I could include in order to tick the box.

I have chosen this example because it was adapted from a very content-heavy scheme of work. This particular lesson required pupils to complete many tasks, one of which was to conduct internet research into the composition of air, a mixture of gases. When planning this lesson I considered the debate from both sides. What were the priorities; the most important objectives to achieve within this lesson? On the one hand, I had a syllabus to teach and it was important that the pupils had the key facts written in their booklets; facts that I could quickly directly teach. Surely this was more important within science than a time-consuming internet research activity? I discussed this with my mentor who suggested they use textbooks to find out the answers to the questions. This would save time and be a useful-science related academic activity. It could be argued that pupils are already internet-savvy and would benefit from learning how to use books!! On the other hand, researching topic matter online is a key skill relevant for lifelong learning and it would be useful for pupils to be guided through this process; what search terms to use and how to assess the reliability of different sources.

In the lesson there were enough iPad for half the class to research online and the other half to use textbooks. I scaffolded pupils' research methods briefly, covering the key points of both methods of research. Interestingly, the online research seemed to capture the pupils' interest and they were able to investigate the topic in more depth. They came up with their own examples and ideas. One pupil used the search term 'solids liquids and gases' as this was the title of the unit of work and found out that the Eiffel tower expands by up to 15cm on hot days because the metal expands. Pupils using the textbooks were limited in their investigations to the information provided within that one textbook which was, in fact, too basic to answer all the questions.

On reflection there are several factors to consider. Firstly, the content of the syllabus must be taught, and direct teaching is necessary because of the time constraints. It took a long time for pupils to lead their own research and they were drawn down other avenues. However pupil-led research using the internet seemed to be important in developing key life skills and making their learning relevant. The Eiffel tower example is one that I will remember and use within my future teaching and I'm sure was memorable for that pupils and his classmates.



The 3D printer and data loggers which I plan to implement in Future lessons

Examples of how I could develop the use of ICT within science. The department has a 3D printer and data loggers. However this technology is 'hidden away' and is not generally used. The lab technician told me that the data loggers were not always suitable for much of the practical work within science and weren't used. The 3D printer was languishing at the back of one of the labs.

Since starting this course the learning curve regarding use of ICT skills has been steep. Donaldson is keen to emphasise how important the development of ICT skills within an ever-changing technological and global world. Digital skills are essential in order to be able to take an active part in adult life and it is essential I develop my own skills in order to be able to help pupils develop theirs.

Next steps for me is to continue to embrace new technologies and be creative with their use. In terms of lesson planning I will re-look at data-loggers and see how I can use them within science experiments rather than, as other staff have done, left them languishing in a drawer. Perhaps I could have used 3D printers in my year 7 biology project work on bird boxes and biodiversity. They created imaginary animals for a lesson on adaptation. Perhaps these could have been printed out? Perhaps the prototype birdbox could have been also?

These are good examples of how cross-curricular links (and developing links with the wider community) can help children see how the development of key skills is important for their future and to make their learning relevant and inspiring. It also shows me how teaching can be creative and inspiring. I would enjoy planning lessons more creatively rather than sticking to the scheme of work.



lesson 10
biodiversity
Year 7 nature class

Year 7 science and technology project work: science part biodiversity; tech part building bird box

I have included a lesson plan which is the science part of a science-technology project. I attended a school trip with year 7 to a local wildlife centre. They were building bird boxes in their DT lessons and doing some related computer work in ICT. This experience showed me that making these links between subjects meaningful could inspire children and help them to think beyond the confines of one particular subject and to think creatively and problem-solve. The project was planned and implemented in a meaningful way and did not necessitate teachers having to teach much outside their subject or do a lot of extra planning. I enjoyed teaching these lessons and supporting children to talk about their ideas and experiences. The cross-curricular links helped to develop these skills.

Authentic Contexts for Learning

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Good teaching and learning creates authentic contexts for learning

Donaldson explains the rationale for making learning meaningful and authentic. Children and young people need to see how their learning is relevant to the real world. Learning can be made relevant using local examples and developing links with the wider community



map of
bedwas...

Year 9 upper band reactivity of metals series: adapting scheme of work to include authentic contexts: making a sparkler and the chemical composition of fireworks; the mining and extraction of welsh gold and welsh copper; adapting the scheme of work to include a local example of an aluminium smelting works (I adapted the exam question drawing my own map)



lesson 6y
and...

In comparison with developing cross-curricular links, making the context of a lesson authentic for the pupils was a concept I could more easily buy in to. It seems obvious to me that making learning relevant by bringing it to life by linking it to real-life examples that pupils can relate to and identify with is always going to be a useful exercise. Complaints that the school curriculum is not relevant to the real world is often heard within everyday life. I have said myself that I didn't really learn anything relevant to the real world until I studied for a masters in social anthropology within which we learned about real people in the real world and the issues that affect them. Even psychology, as an academic subject, was more about counting and measuring people and taking them out of the real world, studying their behaviour in a laboratory and presenting results in statistical terms. When I read Donaldson I embraced the idea that teachers could have more flexibility in what they taught to make learning relevant to pupils. Surely this is how we keep children in school and keep them inspired in school?



metal
extraction...

When I started teaching, however, I soon met with a challenge to this idealistic viewpoint. If teachers have flexibility in what they teach, and different pupils in different schools learn about different things using different 'authentic' examples, how should their learning be measured? How could GCSEs or an equivalent be made fair? I soon came to see high stakes tests and accountability were so powerfully influential. Teachers are rated on their results. Schemes of work within science are built upon year by year geared to exam board syllabus content. Moreover, pupils appreciated the need to achieve certain grades in key subjects as their ticket out into the real world. At this stage in my teaching it feels difficult to branch away from schemes of work. When I incorporated real life examples into my lessons I found that I wasn't getting through the material quick enough. I was skimming over some activities and subject content.



yr 9 lesson 1
reacting...

Despite this, I enjoyed incorporating 'Cwricwlwm Cymreig' and local examples into my science lessons. The lesson series on reactivity of metals lent itself well to this because of the history of welsh mining. However feedback from the observing class teacher was to work on prioritising material from the scheme of work so that the key points were covered and key activities completed within pupils' booklets. I was spending too long in the early parts of the lesson which was when I introduced my slides. The sparkler-making activity was reviewed well, however – the teacher hadn't expected it to work. It worked well and this seemed to inspire the pupils and really capture their attention.



9X lesson 8
electrolysis...

This class teacher is representative of the viewpoint of several practitioners I have spoken with who feel that the pedagogical principles within the new curriculum are all very well in theory but are impractical. At the end of the day, pupils need to be taught the key facts and rehearse exam technique. Unfortunately, until the high stakes testing can be altered in a way that aligns itself with Donaldson's aims and objectives, it is difficult to see how. At this stage in my career I feel bound to the departmental schemes of work and booklet activities. It would take more experience as a teacher to feel confident to veer away from these and add my own. Perhaps in a different school I would have more flexibility to create my own activities and materials.



lesson 10
biodiversity

Year 7 (nurture class) lesson on biodiversity: science linked with a trip to a local wildlife centre and authentic contexts for learning. I have talked about this project already in the tab entitled cross-curriculum responsibilities. It is included here as an example of how this year 7 project uses the authentic contexts of two local wildlife centres. I attended the year 7 trip to one of these centres. Some lesson content about biodiversity was taught here, and then the children were taken on a fieldtrip around the centre to learn about local wildlife. I spoke with one of the rangers who said he enjoys working with young people, especially those who have, or are at risk of, disengaging with mainstream education. He told me the story of a boy from the school who was at risk of permanent exclusion and had really taken to his work placement at the centre and eventually began to settle back in school too.

I work with a year 7 nurture class, none of whom are likely to gain good grades in their high stakes exams. However despite this, through making their learning interesting and relevant, they can be encouraged to work hard and develop a solid skill set they can apply in the wider world. If school life is reduced to coaching for high stakes exams, there seems to be little place for them. I have seen that, through inspiring teaching and supporting them to be more resilient, they too can develop a pride in their learning. Ironically, their results in their end of unit tests were very good (mentioned in the AfL section of this assignment)



water
sources...

Year 10 (lower ability) lesson on water sources: adapted scheme of work showing kayaking and caving in and the local river 'Afon Melltte'.

I am an outdoor sports enthusiast and have a love of Wales and its natural beauty. My love of science is connected to this and I enjoyed planning and delivering my lessons on water sources to this low ability year 10 class. When I showed them the photo of kayaking on the Afon Melltte they were visibly enthused by this too. It was not difficult to incorporate these pictures into my power points and talk about them briefly, linking them to the key scientific concepts and principles.

Year 10 Afon Melltte powerpoint.
On reflection and next steps: I will continue to adapt the schemes of work to make them as interesting and relevant for pupils as I can. The literature describes a key feature of good teaching as having a passion for your subject and presenting lesson material that captures the interest of pupils and enthuses them. It is always possible to do this, although at present I am curtailed by the prescriptions of the pupil booklets: the activities in these must be completed. I can adapt material to some extent but I am constrained by the time it takes to complete these, often dull gap-fill exercises.

Critical Reflection

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Introduction

This assignment aims to critically reflect on the implementation of three pedagogical principles within the first part of Professional Teaching Experience 1 (PTE1). The three principles under review are

- Good teaching and learning means employing assessment for learning (AfL) principles
- Good teaching and learning regularly reinforces cross-curriculum responsibilities, including literacy, numeracy and digital competence, and provides opportunities to practise them
- Good teaching and learning creates authentic contexts for learning

These principles are taken from Professor Donaldson's Successful Futures report 2015. Donaldson was commissioned to write his report because there was an increasing body of evidence to suggest that the national curriculum in Wales was based on outdated principles which did not adequately prepare pupils to be healthy, active and ethical citizens in an increasingly global and technological world (e.g. Black et al 2003, Hattie, 2012). For example, barriers between subject disciplines and a curriculum that was prescriptive and content-heavy stifled the development of metacognitive skills such as creativity and problem-solving (Lemov, 2010, Coe 2014). Teaching styles were hampered by the pressure for pupils to perform well in high-stakes tests, with the preferred teaching style being 'chalk and talk' with an emphasis on coaching for performance in exams (Byrne & Brodie, 2012).

The focus of the assignment is to consider how successfully these principles were implemented in the context of the literature from which they were derived, assessing their impact on pupils' learning and identifying areas for development. It will consider different literary viewpoints which may have influenced their implementation. In addition, it will consider how they inter-relate and identify common themes which will influence how effective teaching can be further improved. A common theme revolves around the move from direct teaching ('chalk and talk') and assessment of learning (summative assessment) to a focus on AfL (formative assessment) and the development of thinking skills through effective use of questioning and interactive, constructivist learning strategies (Hattie, 2012, Coe et al 2014). These thinking skills can be developed and transferred throughout the curriculum and beyond the school gates, so that learning is a process that permeates through all stages of development and into the wider community (Ko & Sammons, 2013).

The PTE1 was conducted within the science department of an English-medium secondary school in South West Wales with percentages of pupils on the special needs and free school meals register significantly higher than the national average. There is also a significant number of pupils for whom English is their second language.

The 'experienced practitioner' viewpoint of mentor teachers will also be considered. The influence of these 'grassroots' viewpoints in shaping a trainee teacher's development are at least as significant as the literature. The view that "what sounds good in theory is difficult to implement effectively in practice" is frequently heard. Adding AfL strategies, cross curricular links and authentic contexts is time-consuming. It is difficult to envisage completing complicated schemes of work (SoW) with all these bolt-ons. Hayes (2010) writes eloquently about, in his opinion, the detrimental impact of the unnecessary importation of cross-curricular links.

Discussion/Literature Review

Before focusing on each principle individually, it should be noted that Donaldson is clear to state that the report does not dictate how teachers should teach. It does not advocate the use of any particular teaching style. On the contrary, Donaldson recommends the use of a blend of approaches, including direct teaching (Donaldson, 2015:65). Importantly, the report recognises that what works for individual teachers in the specific context of their school, classes and individual pupils will vary. This has become apparent to me in PTE1 during the process of planning, teaching and gaining feedback from experienced teachers. What works with one class may not work for another (Thompson, 2015).

Pedagogical Principle 1.

Good teaching and learning means employing AfL principles

Successful Futures uses the work of experts in the field of assessment such as Dylan Wiliam and John Hattie who have conducted widespread reviews of literature. AfL, also referred to as *formative* assessment, involves the employment of various strategies which serve a dual purpose: to be used by teachers to adapt learning materials to learners' needs and to provide feedback to learners about their progress. Wiliam and Hattie argue that learning can be particularly powerful when learners are given feedback that helps them think through the issues and provides them with guidance on next steps. Similarly, peer collaboration and feedback can provide a safe environment to articulate and test ideas (Hattie, 2012; Black et al, 2003)

Dylan Wiliam has suggested that effective teacher assessment can 'double' the rate of learning – that is, if implemented appropriately it could result in learners making what had previously been one year's progress within six months. According to Wiliam, implementation of AfL strategies is relatively straightforward; the challenge is to change practitioner behaviour to embed AfL practices consistently into classroom practice (Black et al, 2003).

AfL is *formative* assessment because it is used to adapt teaching activities to meet the needs of learners during the course of their learning rather than a summative grade or assessment provided at the end of the learning process (Black et al, 2003). Knight & Benson (2014) show how formative assessment requires teaching to be collaborative and more pupil-led. Pupils will express their thoughts and ideas and alongside their peers will take responsibility for assessing and improving their own work to develop their own learning through metacognitive skills (Lemov, 2010).

It also involves a consideration of theoretical perspectives of learning. Learner-led styles of teaching are constructivist and promote use of AfL (Ko & Sammons, 2013). They have been shown to improve critical thinking and creative skills, problem-solving skills, increase motivation and help students transfer knowledge to new situations. (Barrows, 1996). An example is problem-based learning (PBL) which was introduced in medical schools. Barlow declares "the end of chalk and talk" quoting results from his study that after replacing his direct teaching style with a podcast and pupil-led activities students got better marks and considered him to be a better teacher (Barlow, 2012:54). The results of another study suggest things are not so simple: Maycock (2019) found that direct teaching produced better results in exams whereas a more student-led style of teaching improved the coursework components. Proponents of direct teaching, for example Biesta (2010) protest "let teachers teach". PBL was found to be ineffective as medical students simply could not complete the work without some direct teaching input (Barrows, 1996). Ko & Sammons (2013) were commissioned to review international literature and concluded that the problem arises when constructivist learning activities replace direct teaching and where students do not have adequate prior knowledge and experience to engage in student-led activities.

In another extensive, longitudinal study Siraj-Blatchford et al (2011) put forward an ecological systems model based on the child development work of Urie Bronfenbrenner (e.g. 1979), emphasising the impact of interconnected community systems on pupil attainment. Interestingly, this study suggests that the home and wider community systems have a far greater impact on pupil progress than teaching in schools, especially pupils in secondary schools. If so, teaching style is less important than the development of links with families to help parents provide the kinds of pre-school/home environments which promote learning. There are reasons beyond teaching styles and strategies which may explain Wales' mediocre PISA results. This aside, the bulk of the evidence suggests that learning and teaching will be improved through the use of AfL strategies that support children to develop their cognitive and communication skills. Skilful use of these strategies, particularly questioning, should make visible the learning of all children rather than just those with their hands up (Hattie, 2012; Lemov, 2010) and support children to develop a confident 'growth' mindset (Dweck, 2006; Siraj-Blatchford et al, 2011)

Reflecting on next teaching steps, therefore, is not whether assessment should be formative or summative or whether teaching style be 'chalk and talk' or pupil-led but how to balance both viewpoints. AfL can be used as well as direct teaching, and constructivism and direct instruction do not have to be in conflict (Ko & Sammons, 2013).

Feedback received within PTE1 from mentors generally commended my use of probing, randomised

questioning. However one class teacher advised against asking randomised questions with year 9 because they are at an age where they feel self-conscious. When I omitted such questioning it was more difficult to assess and monitor pupils' progress and any learning that may have been occurring became invisible. It became too easy for the majority of pupils to switch off. The current difficulty in PTE1 is finding time within an already prescribed SoW to squeeze it in. Extended question-answer sessions have been praised and pupils may have enjoyed researching topics themselves, but this is at the expense of content within their pre-prepared booklets. PTE2 will be a chance to compare my experience within this school to another. I look forward to having more scope as a fully-fledged teacher to develop my own material or have more freedom to adapt current SoW. A common theme running through the literature (Hattie, 2012, Black et al 2003, Lemov, 2010, Rosenshine 2010) is to support students to verbalise their thoughts and be comfortable in making mistakes. Future work with this class will be to develop their confidence to express their thoughts irrespective of whether they are right or wrong. I also plan to use concept cartoons both as a means to generate discussion and also as a means of AfL (Naylor & Keogh, 2012).

Good teaching and learning regularly reinforces cross-curriculum responsibilities, including literacy, numeracy and digital competence, and provides opportunities to practise them

Knight & Benson (2014) describe a 21st century paradigm shift whereby schools and individuals are no longer seen as operating as autonomous units. They are now seen more holistically as inter-connected systems. Holism means teaching and learning is neither top-down (teacher-led) nor bottom up (pupil-led) but emergent from a complex interplay of many factors. The Donaldson curriculum embraces this philosophy in emphasising links between the development of skills and knowledge within learning from the foundation stage all the way through to adulthood. Pupils and teachers can see how learning, irrespective of subject discipline, is relevant and meaningful in the preparation of young people as healthy, creative, enterprising and ethical adult citizens. Cross-curricular links, Literacy, numeracy skills and digital competence in particular, are to be embedded in the Areas of Learning and Experience.

According to Byrne & Brodie (2011) the challenge for teaching posed by the cross-curriculum responsibilities will be to maintain the focus on these responsibilities within teaching and learning so that their application becomes natural and authentic rather than an add-on. Forcing subjects together for the sake of it will have little classroom benefit. Critics of cross-curricular teaching are heard at the practitioner/grassroots level echoing Biesta's call to "let teachers teach". Proponents of 'chalk and talk' view argue that barriers between subjects are necessary as teachers cannot be 'experts' in a wide range of subjects and there is little time to cover the necessary subject-specific content. Hayes (2010:384) argues learning needs the clearly delineated boundaries provided by single subject teaching and that cross-curricular learning lacks the rigour to support the development of fundamental subject knowledge.

In answer to Biesta's plea, researchers who have comprehensively reviewed the literature provide evidence that shows that effective teaching makes links between curriculum disciplines explicit in terms of transferable skills and the development of metacognitive skills which are necessary for children to grow and develop with their learning into the healthy and productive citizens of the future. They warn against the direct teaching of a content-heavy syllabus because learning is passive and assessed by recall of facts crammed into short term working memory and soon forgotten (Thompson, 2015).

In terms of reflections on the implementation of cross-curricular links with science teaching in PTE1 it was found that certain links are inherent in science and therefore easier to teach, specifically graph work and calculations. Pupils can view them as 'difficult' and their mindset can make them reluctant to 'have a go' but appreciate their relevance and are proud of their success when activities are appropriately scaffolded. However, when the cross-curricular links relate to wider skills and the four purposes of the curriculum and the development of metacognition and oracy, hesitation and reluctance was noticed. It seems that links between learning and the purposes of learning will need to be made more apparent, particularly for pupils to appreciate their relevance. Again, pupil attitudes and mindsets are often negative and they need support to take more responsibility for their own learning rather than being passive learners (Hattie, 2012; Dweck, 2006). My own teaching would benefit from having more flexibility in adapting schemes of work in order to weave in the cross curricular links, particularly oracy and ICT. Painter & Bamfield (2015) explain how digital competence is key in linking schools with wider

community groups and the workplace. I need to develop digital creativity and innovation.

In line with the idea of holistic learning, Masters & Nott (2002) argue that effective science teaching should not just focus on the teaching of scientific 'facts' but how scientific advances exist within the social, moral, spiritual and cultural contexts in which they were developed. They believe that meaningful science teaching should include activities which promote class discussion, drama and role play bringing science to life through the structured reading of the stories of science. Osborne & Millar 1998 in Thompson, 2015:112) talk of the value of narrative in communicating ideas and making subject content memorable and coherent. Research into teenagers' brains show that this is a key time to develop views and opinions. Teenagers experience strong emotions, passions and a desire for risk taking that has been shown to be connected with changes within the brain and neural pruning which can be channelled constructively with the right support (Hedaya, 2020). Critical thinking skills, problem solving and the ability to construct a logical argument can be developed in science using current topical issues such as climate change and genetic engineering.

In conclusion, effective cross curricular teaching should be carefully planned and delivered in a way that clearly promote the development of skills that support children and young people to play a confident role in the adult world. If not, pupils as well as teachers, can see them as a bolt-on exercise and pay lip-service to them.

Good teaching and learning creates authentic contexts for learning

Creating authentic contexts for learning further develops the idea of holistic learning and the development of links in learning which permeate from foundation stage through to the workplace. It involves seeing the school as part of this network rather than education in terms of ivory towers and autonomous factories (Knight & Benson 2014). It involves seeing the learner as an active agent within this system who can be supported to take responsibility for their own learning. In terms of critical reflection, similar arguments exist as already stated above. This section will take it as a given that the development of these links is a necessary part of lifelong learning and success within the wider community beyond the school gates.

The curriculum purposes and Progression Steps will reinforce the need to make learning meaningful and authentic. Waters (in Donaldson 2015) describes good teaching as bringing 'the world into range' and Nott (in Wellington 1994) argued that effective science teaching should bring the stories of science to light. It is important that children and young people see the relevance in their learning to the world beyond the school gates and that opportunities are taken to forge links to that world. Many schools already recognise the need to go beyond their own expertise and have forged strong links with outside bodies and individuals. The Welsh Government has encouraged outside agencies to work with schools. Visits and visitors can help to bring abstract learning to life. Similarly, the internet opens up immense possibilities to access resources, explore sources and engage with real-life issues (Donaldson, 2015:67).

Byrne & Brodie (2012) feel that using authentic contexts can help students who have a negative attitude to science as being too difficult with ideas and concepts abstracted from the real world. This is what I aimed to do through using local rivers and outdoor sporting activities as well as local aluminium smelting plants and Clogau gold. This certainly seemed to engage some pupils although, again, there was little time within these lessons to develop much dialogue because the SoW I was bound to was so content heavy. Estyn (2001) advocate Y Cwricwlwm Cymreig as a means of developing a sense of belonging and making pupils united, confident and creative. This means that teachers should have good local knowledge and be in touch with issues affecting the community

Common themes for next teaching steps are emerging. Authentic contexts, cross-curricular links and AfL techniques which promote dialogue all help make subject content meaningful and relevant. Learning promotes the development of key life skills such as communicating and sharing ideas and using new technology so that children become young adults who feel empowered, not floundering, as they leave the school gates. The world of work will have already been made familiar to them during their time in school. All three pedagogical principles are relevant here and it is clear how they link in to the four purposes.

Conclusions/Recommendations

There is a strong evidence base supporting the use of dialogic AfL questioning techniques, cross-curricular links and authentic contexts. However, the practicalities of incorporating these into a content-heavy science syllabus as well as acknowledging the necessity for high-stakes assessment the question remains about how to balance teaching styles. Ko & Sammons (2013:78) recommend that basic knowledge and skills are taught initially by direct instruction before engagement in 'rich' constructivist learning activities.

Within PTE1, it seems pupils fail to see the point of the inclusion of AfL and cross curricular links as relevant to their learning. They may lack motivation and seem not to take peer assessment tasks seriously, needing prompting. They do not see the relevance of writing essays in science, and again, needed a lot of prompting and encouragement to engage with it. In PTE1, pupils certainly need help to develop metacognitive strategies and growth mindsets. Passive learning and learned helplessness prevail!

In terms of how to do this I will continue to develop my own AfL strategies especially the use of stretching questions and find ways of involving all pupils in this. In terms of cross curricular links science lends itself to the development of numeracy and literacy skills. In terms of digital competence Stockford (2013) gives many examples of ways of incorporating digital technologies into secondary science lessons, for example using computer simulations and modelling experiments. Painter & Bamfield (2015) warn that adapting to technological change from childhood all the way through life has been shown to be connected to social mobility and that teachers need to be ICT savvy and unafraid of embracing new technological developments in order to support pupils.

Holt (1990) argues that children fail because they are bored, afraid or confused. There is certainly evidence of this in PTE1 perhaps because of disadvantages of social economic status and home lives which do not promote academic learning. Siraj-Blatchford et al (2011) conclude that teachers can best support children by promoting dialogic learning and fostering a positive attitude to learning. I would be failing these pupils if I gave in to the learned helplessness present in my year 9 class and resigned myself to chalk-and-talk. I will actively find ways to help them to talk and to help them not to worry about making mistakes.

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Saturday, November 23, 2019 5:18 PM

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