

APPENDICES

Appendix 1

Reflection Template 1 – 31.01.20

Self (DF)

Pupils were well engaged throughout periods in the lesson. MA was very fluent when communicating and answering questions. The student had many good thoughts and wasn't afraid to put forward their ideas as part of discussion. Had full attention from HA for most of the lesson and they were on task. Slight distractions on occasions but didn't stop them putting ideas forward when needed. LA eventually engaged within discussions with pupils when prompted, however did hold back when prompted by myself. On the whole, the content of the lesson was fitting to the research project at hand and was clearly relatable to real life numerical contexts. Over the last few lessons, I feel this has improved their skills and engagement levels.

Students

HA – "Good but a little confusing. Detailed information about taxes."

MA – "I thought today's lesson was well planned out and well thought. I enjoyed doing salary and income tax."

LA – "I think today's lesson went well. The work was quite easy. At the start I didn't understand it, but then I got it."

Colleague (EMcA)

The lesson had high engagement. All three students were focussed mostly on the work. MA was very confident in answering and asking questions. The student had strong opinions on the context of the lesson.

The LA did not engage much in discussion, but was engaged in discussions with other students during the plenary.

HA focussed on the work for most of the lesson. They did get slightly distracted on occasion but volunteered answers to questions.

Overall the content of the lesson was applicable to real life context, and from my observation improved the student numeracy skills.

Literature

Brookfield, S. (1995). *Becoming a Critically Reflective Teacher*. San-Francisco: Jossey-Bass.

Cheqdin.com. (2020). [online] Available at: <https://cheqdin.com/leuven-scale-for-early-years/> [Accessed 12 Feb. 2020].

Giardini, E. (2016) Mathematical learning with a purpose, *Journal of Student Engagement: Education Matters*, 6(1), 13-18.

Sparrow, L. (2008). Real and relevant mathematics: Is it realistic in the classroom? *Australian Primary Mathematics Classroom*, 13 (2)

Appendix 2

Reflection Template 2 – 04.02.2

Self (EMcA)

This lesson had good engagement from the observed students. MA was the least engaged and needed more prompts to do the work (which is unlike them), but they did participate in questioning and willingly provide answers. HA was very engaged and completed the work to a high quality. They also were willing to help other students and remained on task for each stage of the lesson.

LA was mostly engaged. They interacted with other students, but this was mostly for help. They participated in questioning and asked for help from me when needed. When they were clear on how to do the task they were fully engaged.

Students

HA – “I thought it went well. I found it really fun! I learned how to calculate energy again.”

MA – “The lesson went well. I learned how to calculate energy efficiently and it will probably help in the future.”

LA – “I think the lesson was interesting and I learnt how to calculate energy efficiency.”

Colleague (DF)

The lesson's engagement levels were high. All three focus students were mostly working throughout the lesson. MA was very confident in answering and asking questions when prompted with open questions. The student had strong opinions on the context of the lesson.

The LA did not engage much in discussion with the teacher when cold-called, but was engaged in discussions with other students during all tasks throughout the lesson.

HA focussed on the work for the majority of the lesson. They did not get distracted by their environment around them and was constantly on task, helping other students when needed.

On the whole, the content of the lesson was relatable to a real life context, and from my observation, clearly improved the student skills in calculations.

Literature

Nezvalova, D. (2007) 'The Constructivist Perspective and Teaching Integrated Science: Making Science Accessible to all Students.' *International Journal of Learning*. **14**(6) pp. 133-140.

Meisels, G.G. (2010) 'Science Literacy: Hand in Glove with Numeracy.' *Numeracy: Advancing Education in Quantitative Literacy*. **3**(2) pp. 1-5.

Labouta, H.I. *et al.* 'Learning Science by Doing Science: An Authentic Science Process-Learning Model in Postsecondary Education' *International Journal of Science Education*. **40**(12) pp- 1476

Appendix 3

Interview questions

What did you think about the lesson?

- What specific parts did you enjoy?

UA - Useful - need when older

MA - income but it earning up

LA - it helps in future

All feel same about previous lesson

- What specific parts would you change? How?

UA -

MA - taught more often - no one else to tell - glad its being updated

LA -

What have you learnt?

- Skills and content

UA - mortgage

MA - taxes

LA

Has providing a real-life context been useful?

- In what way?

UA - yes - couldn't do it without lesson

MA - yes not everyone has common correct misconception sense

LA - yes

Would you prefer more lessons to be based around real life problems?

UA - yes

MA - yes - would rather an exam
on mortgages - more options on
realistic maths

LA - yes - why do we learn pythagoras

Has this been useful in developing skills in maths?

UA - yes

UA - percentages

MA - overall understanding

LA - equation

Appendix 4

Starter

Child 1 LA - MF
Level of Engagement:

1

2

3

4

5

Observation:

- starts quickly but distracted easily when others talking
- looking back in book a lot
- writing through explanation (still looking back in book so still working!)

Child 12 - MA MM
Level of Engagement:

1

2

3

4

5

Observation:

- slow to start
- when work is started they are concentrating
- answer question confidently
- writing through explanation (~~correctness~~ marking)

Child 13 - HA - O
Level of Engagement:

1

2

3

4

5

Observation:

- Quickly on task
- talking to student next to them
- ~~self~~ marking writing through explanation (corrections / marking)

Main

Child 1 LA - mf
Level of Engagement:

1

2

3

4

5

Observation:

- writing during activity
- longest to write down example
- work
- concentrating on exam q - looks less confident
- help off AW
- does not get distracted at all
- 2nd q - AW moves, talks to student in front
- both students ask for help of
- continues to talk to other students

Child 2 - MA mm
Level of Engagement:

1

2

3

4

5

Observation:

- asking questions
- on calculation during explanation
- engaging in discussion - sharing thoughts about task
- strong opinions on the context
- answering questions confidently
- asks for help with exam q
- works with student next to them
- unsure of answer when questioned

Child 3 - PLA - O
Level of Engagement:

1

2

3

4

5

Observation:

- question on board - working on calculator.
- writing during activity
- Exam q - sticking in and talking
- gets started once stuck in
- completely concentrated on work
- towards the end (finished) distracted by other student
- Answers questions confidently (puts hand up)
- help off AW for 2nd q
- talking to AW during explanation

Plenary

Child 1 - LA - mt

Level of Engagement:

1

2

3

4

5

Observation:

- In discussion with other student about task (engaged)
- ~~core~~ listening (watching answers)

Child 2 - mt - MM

Level of Engagement:

1

2

3

4

5

Observation:

- ~~discussion~~
- discussion with partner
- offering answers
- fiddling towards the end.

Child 3 - UA - O

Level of Engagement:

1

2

3

4

5

Observation:

- not taking any
- listening to AW
- hands up to give answer

Appendix 5 -

Lesson Plan Phase 1

Lesson Plan – Step 1 Cynllun Gwers – Cam 1

Student-teacher	Dylan Flowers	Class:	10b2
AoLE or Subject	Mathematics	Date:	31.01.20
Lesson Focus:	Tax and Income Tax		
Meaningful links to Curriculum	Be able to calculate and identify methods for income tax.		
Meaningful links to: Cross Curricular Responsibilities	Literacy – developing an awareness of language used for the sharing of learning objectives, success criteria and assessment of pupils’ learning. Numeracy – identifying methods and requirements associated with taxes. Digital Competence – ActivInspire.		
Personal Targets (Linked to QTS and identified in weekly review)			
My mentor and I have agreed that my main target for this week is to continue improving on specific targets set during mentor recent meetings. It will be to continue with the same manner considering previous feedbacks for improvement and to develop my knowledge and understanding of the teaching process, using scaffolding to differentiate and alongside taking more responsibility within the classroom, general school life and behaviour management. I aim to increase my teaching time up to a 50% timetable. With a particular focus on the lesson as a whole and provision of general feedback and targets for improvement. This is linked to Progression in Learning under the Pedagogy-Advancing QTS standard.			

Learning Objectives (focus on Learning- use accessible vocabulary):

The pupils will learn to:

1. Identify key aspects of income tax.
2. Apply methods learnt find out the total income tax cost. With use of visual model examples to opening phase questions, exposition exam examples and exercises and plenary match up activity.

Success Criteria (clearly linked to each Learning Objective and related to the process and/or product of learning)	Assessment of Pupils' Learning Evidence (What have the learners to say/write/do/produce – to demonstrate learning)
1. Pupils will be able to recall and explain the key process finding tax amounts and income tax 2. Using theory and practice introduced, pupils will be able to demonstrate how to find the value of income tax.	1. Answering open and closed questions in verbal form to demonstrate knowledge and understanding of key aspects. 2. Illustrative interpretation of the processes. Give them an exercise to complete so that they can all access it, with extensions available if needed.

Time	Activities/Methodology/Key Concepts (Teacher's Role – including key teaching points, differentiation strategies and key questions)	Pupil Tasks (Pupils' role –including differentiation, engagement in formative assessment and homework)	Resources (Including Health and Safety requirement)
Opening phase (with links to prior learning)	5-10 minute: Continuation of new topic. I will ask pupils to continue with an electricity bill question. Intent to jog pupils memories to allow them to calculate % of an amount to find VAT. Circulating the room while the starter is on the board, to help and answer any individual queiries pupils may have. Having a red/green pen to tick and mark when circulating. -	Encourage and try to activate the use knowledge they might already individually know, to apply to the starter questions. Quick recap of grid to fill out essential vs non-essential bills. Pupils to listen to the teacher's introduction and make notes to support their learning, including self marking of answers.	Planned ActivInspire flipchart (interactive whiteboard). APLP Phase 1 Lesson Planning Template Pupils have access to any specifc equipment for the lesson, e.g. classbooks. H&S, ensuring bags are safely under tables, and nothing minor is likely to cause a trip hazzard.
Teaching & Core Learning			

	I will adopt a direct teaching approach in order to guide pupils through the key components of finances. These key components are: ➤ The lesson focus and success criteria for taxes ➤ Continuous discussion on how to find income tax. ➤ Methods to calculate them ➤ Assessment of pupils' learning I will ask the following key questions as pitstops and hinge questions during this phase of the lesson to monitor and assess learning. Intenet to adopt a variety of questioning strategies (e.g. thinking time, peer discussion, cold calling, 'pose, pause, pounce, bounce'): ➤ Does anybody know what we mean by income tax? ➤ How does it link with taxes and income? ➤ Can we calculate them? ➤ Can we recall this definition? Provide feedback on responses to these questions, and to provide further information/guidance if necessary.	To listen to the guidance given to them and make notes of key rules and examples to support their learning. Pupils to be encouraged to make their own notes but with a need for the method to be correctly copied for future reference. Pupils to respond to key questions individuals. Pupils to work individually to complete the tasks set, and use the examples modelled as a scaffold for their own work. Provide feedback in the form of self assessment and marking.	Planned ActivInspire flipchart (interactive whiteboard). Pupils have access to any specifc equipment for the lesson, e.g. classbooks. H&S, ensuring bags are safely under tables, and nothing minor is likely to cause a trip hazzard.
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	To provide appropriate examples as a starting point and guidance for pupils. To introduce chunked individual tasks to complete throughout. To monitor and circulate as they work on the exercise questions, provide feedback and targets when applicable and to identify and respond to any misconceptions and/or misunderstandings	Pupils to respond to any feedback and targets given. Pupils to ask further questions should they not understand what is required of them.	
Plenary	An activity where students have to link up and match the terms with a definition. Intent to ask the following questions so a summary of learning is provided by pupils: ➤ What were the least challenging aspects of the examples/exercises ? ➤ What were the most challenging aspects of the examples/exercises ? ➤ Are there any key aspects/rules from the lesson you will take away with you today?	They will also need to explain their reasoning for specific answers. Think and share: Pupils to respond to the teacher's questions as individuals.	ActivInspire flipchart H&S: Ensure bags are away under tables, and computer cables are not likely to cause a trip hazard.

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D

Interview questions

What did you think about the lesson?

- What specific parts did you enjoy?

calculating - (3)

- What specific parts would you change? How?

(W) One section eq^{ns}

(3) one " (worded)

Easier ones first

What have you learnt?

- Skills and content

understand how to do it now

"good skill for later life"

Has providing a real-life context been useful?

- In what way?

"Yes" (3)

encounter future problems

Would you prefer more lessons to be based around real life problems?

"Yes" (3)

Better for future life.

Has this been useful in developing skills in maths?

Yes

Starter

Child 1 HA (w) ✓
Level of Engagement:

1 2

3

4

5

Observation:

- Not very engaged, took a while to get on task.
- Had to re-direct back on task because he waved at me
- Once on task, was fine and engaged in work.
- Confident with answers

Child 2 MA (co) ✓
Level of Engagement:

1 2

3

4

5

Observation:

Looked slightly confused at points, but on task.

Child 3 LA (B) ✓
Level of Engagement:

1 2

3

4

5

Observation:

- On task. No breaks in off-task work.
- Communicating with people around her for help.
- Confusion.

Main

Child 1 HA (w)

Level of Engagement:

1 2

3

4

5

Observation:

- Chatting while first question on board. going through
- Not very engaged when ~~listen~~ answers. ~~with~~ were
- Back table. very chatty.
- "Should have said no!" - unsure about what it was for, (corrected)
- Back on task when prompted.
- Messing about, on & off task constantly. Very vocal in teacher discussion.

Child 2 MACO

Level of Engagement:

1 2

3

4

5

Observation:

- engaged. Very good attempts at questions
- Tending to peer at Libby's work quite often.
- Constantly comparing answers.
- Quiet when completed answers.

Child 3 LA (B)

Level of Engagement:

1 2

3

4

5

Observation:

- On task - with little verbal discussion when cold-called, but more verbal with close peers.
- Constantly comparing answers
- Concentration tailed off towards the end slightly.

$$\frac{10}{60} = 0.16\bar{6} \times 7 = 1.1\bar{6}$$

Penary

Child 1 HACW)

Level of Engagement:

1 2

4

5

Observation:

- Didn't start when instructed.
- 4 mins in, still nothing
- Quick to apologise when prompted.
- Worked when prompted.

← (3)

Child 2 HACW)

Level of Engagement:

1 2

3

4

(5)

Observation:

- Attempted as much as possible.
- Working solidly for the final question.

Child 3 LACB)

Level of Engagement:

1 2

3

4

5

Observation:

- Working solidly for the final questions.
- Lost attention slightly. ~~for the final ques~~ towards end.

(4) →

Lesson Plan Phase 1

Lesson Plan – Step 1 Cynllun Gwers – Cam 1

Student-teacher	Ellie McAdams	Class:	10a Red
AoLE or Subject	Science	Date:	
Lesson Focus:	Efficiency and Cost of Electricity		
Meaningful links to Curriculum	Chemistry		
Meaningful links to: Cross Curricular Responsibilities			
Personal Targets (Linked to QTS and identified in weekly review)			

Learning Objectives (focus on Learning- use accessible vocabulary):
The pupils will learn to: Revision of calculating efficiency of various appliances, including identifying useful or waste energy. Calculating the cost of electricity using the correct units and equations. Compare appliances based on their efficiency and cost to run.

Success Criteria (clearly linked to each Learning Objective and related to the process and/or product of learning)	Assessment of Pupils' Learning Evidence (What have the learners to say/write/do/produce – to demonstrate learning)
The students will be able to identify waste and useful energy from a sankey diagram and from example questions and then use this in the calculation for efficiency. Students will complete a worksheet where they calculate efficiency of appliances.	Teacher observation, circulation and questioning.

The students will be able to decide which appliance to buy based off calculations.	
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Time	Activities/Methodology/Key Concepts (Teacher's Role – including key teaching points, differentiation strategies and key questions)	Pupil Tasks (Pupils' role –including differentiation, engagement in formative assessment and homework)	Resources (Including Health and Safety requirement)
Opening phase (with links to prior learning)	Sankey Diagram on the boards. Students asked to point out the useful energy, the waste energy and calculate efficiency.	Students asked to point out the useful energy, the waste energy and calculate efficiency.	IWB
Teaching & Core Learning	Worksheet with more examples of Sankey Diagrams to calculate efficiency of household appliances. Cost of Electricity. Go through a worked example on the board. Worksheet for further practice.	Students will complete a worksheet for efficiency. Two worked example on the board. The students will have to listen to the first whilst also being questioned, the second will be part done and they will have to finish it. They will then complete a worksheet.	IWB Worksheets

Plenary	Example question on the board for students to complete. Compare the efficiency and cost of electricity of two home appliances to decide which would be best to buy.	Questions are on the board. Students will need to calculate efficiency of each hairdryer then the cost to run each hairdryer.	IWB
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Consent Form (Parents)

Project Title:

Please tick box

1. I confirm that I have read and understand the information sheet provided for the above study. ☐
2. I understand that my child's participation is voluntary and that I am free to withdraw my child from the study at any time, without giving any reason. ☐
3. I understand that my child can choose to withdraw at any time, without giving a reason. ☐
4. I understand that the information given by my child will be used in a university assignment. ☐
5. I understand that my child's name will not appear at any time. ☐
6. I agree for my child to take part in the above study. ☐

Child's name

Parent signature

Date

Child's signature

Date

When completed, please return to Mr D. Flowers or the Maths Department by the 31st of January 2020. (31/01/20)

Thank you.

Information Sheet

Project Title: "How can providing a real life context for numerical problems affect engagement?"

Dear Parent / Guardian,

My name is Mr D. Flowers and I am studying for a PGCE qualification at Yr Athrofa, University of Wales Trinity Saint David. I am currently a student teacher within Penyrheol Comprehensive School and am teaching in your child's mathematics class.

I would like to invite your child to participate in my research project. The title of the project is "How can providing a real life context for numerical problems affect engagement?" and I aim to use this information as research to change the attitudes towards numerical learning with accessibility and engagement at the forefront of this project. Through your child's participation, I hope to ascertain whether providing a real life context for mathematical problems and scenarios aids learning and engagement during lessons.

The process I will undertake will include the teaching of a full lesson providing real life experiences, such as calculating VAT/ electricity bills and or rounding with money. During this process, I will be partnered with a fellow PGCE student in the science department in the school who will observe the lesson. We intend to observe the lesson and conduct a group interview with 3 pupils to gather participant's thoughts and opinions at the conclusion of the lesson. Other than my colleague observing, the lesson will be a normal Mathematics lesson. We intend to record our findings on paper as a hard copy and through the medium of recorded audio which will not be shared in any way and stored securely.

All names will be kept strictly confidential and will only be known by myself and my research partner. Your child's participation in this study is completely voluntary so you or your child can withdraw from the study at any stage. Your child will also be asked to give their assent before the beginning of the study.

After careful and precise analysis of the data obtained from the lesson observation and group interview, I would be happy to provide you with a copy of the findings at your request. The results of the research will be discussed in a university assignment that will contribute to my PGCE course. The results of this study will be stored on the secure school network and all raw data will be destroyed once the assessment has been marked.

I thank you in advance for your time. If any questions do arise, feel free to contact me at your convenience.

Yours sincerely,

Mr D. Flowers

Gwaith Dosbarth Dydd mawrth
o'r chwefrwr.

Efficiency and Electricity
cost.

- ① The sound energy is the waste
- ② fast working.
- ③ a Th.6
- ④ The benefit of having a high efficiency Kettle is uses less electricity and boiling quicker.

It is 90% efficient.

$$\frac{10}{60} \times 0.16 \text{ h} \times 7 = 1.12.$$

$$\frac{10}{60} = 0.16h \times 7 = 1.12 \times 8.5 = 9.52 \times 13 = 123.76_p$$

Plenary.

1. both hairdryers input = 100J

a. $\frac{80}{100} \times 100 = 80\% \checkmark$

b. $\frac{60}{100} \times 100 = 60\% \checkmark$

2. $0.33h \times 1.5 = 0.09$

12

1. Calculate the efficiency of the following:

- a. A petrol engine that transforms 1000 J of chemical potential energy into 300 J of kinetic energy, and 700 J into wasted heat and sound energy. (2)

$$\frac{300}{1000} \times 100 = 30\% \quad \checkmark$$

- b. An electric motor that transforms 1000J of chemical potential energy into 975 J of kinetic energy, and 25 J of wasted heat and sound energy. (2)

$$\frac{975}{1000} \times 100 = 97.5\% \quad \checkmark$$

- c. A solar cell that transforms 300 J of light energy into 45 J of electrical energy and 255 J of wasted energy. (2)

$$\frac{45}{300} \times 100 = 15\% \quad \checkmark$$

- d. A wind turbine that transforms 500 J of kinetic energy in the wind to 150 J of electrical energy and 350 J of wasted heat and sound energy. (2)

$$\frac{150}{500} \times 100 = 30\% \quad \checkmark$$