Brilliant Club Scholar Programme Case Study:
Teaching Climate Change With KS2 Pupils

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Abstract
Since the autumn of 2022, I have become a Brilliant Club Scholar Programme tutor, delivering university-style lectures on Climate Change to KS2 pupils with underprivileged background. I appreciate the opportunity to contribute and be part of pupils' progress in their understanding of this subject and try to engage them in a range of learning activities. It is essential for pupils to understand climate change at a young age and grow up to be adults who positively contribute to the zero-carbon future. This paper aimed to introduce the course design process guided by the Brilliant Club and reflect on the delivery of the Climate Change course in primary schools in Wales in 2022/23. Good practices were discussed and concluded.

Keywords: Brilliant Club, Climate Change, University Style Teaching, KS2 Pupils

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1. Introduction

The Scholars Programme by the Brilliant Club is to link PhD researchers to pupils at age 8 to 18 in schools across the UK. The core purpose of this programme is to inspire and help underprivileged pupils to develop the knowledge, skills and confidence to secure a place at a competitive university. At the same time, PhD researchers are well supported by the Brilliant Club to develop their teaching skill. In 2022/ 2023, 473 tutors supported 17,649 pupils through 1276 placements across the UK. Positive feedback from pupils and tutors were reported (Brilliant Club, 2023).

Based on my experience of delivering the Climate Change course in 11 primary schools in 2022/2023, this paper reflects on how to effectively engage pupils in the learning process. Good practices are discussed and concluded.

2. Course Design

Extensive trainings were provided to all tutors, from safe guarding, to course planning, delivery, assessment and feedback to ensure the tutors are well equipped to deliver the course in classroom.

All courses were designed using Backward Planning (Figure 1), an approach for curriculum design put forward by Wiggins and McTighe in their book 'Understanding by Design'. It is similar to constructive alignment proposed by Biggs and Tang (2011) which also starts with the learning outcome. Backward Planning focuses specifically on what successful fulfilment of the learning outcomes looks like. The main benefit of using this model is to design appropriate assessments to guide students through an effective learning process and achieve the planned learning outcome.
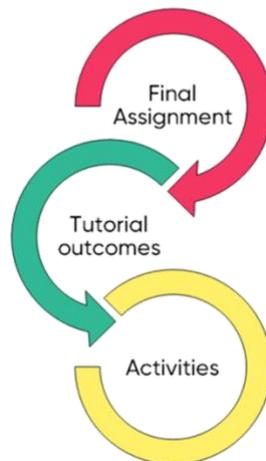

Figure 1: Backward Planning (Brilliant Club, 2022a)

It provided a 3-step process and ensured the course design to achieve the intended learning outcomes:
Step 1: Identify the learning outcomes and design the final assessment
- what the pupils will understand and be able to do after taking the course
- what the success will look like for the pupils
- how to know if the pupils have learnt
Step 2: Plan the learning outcomes for each tutorial

- what the pupils will understand and be able to do after taking this tutorial

Step 3: Design the learning activates for each tutorial
- what learning activities will guide the pupils to the learning outcomes and ways to check

An easy to follow template was provided by the Brilliant Club to further support the design of each tutorial (Appendix A). For each tutorial, following the set of tutorial objectives, a starter activity is designed to hook students' interest or check their learning from the previous session to ensure they are ready for the new session. Then, the main learning activities are designed to deliver key concepts with consideration of how students can demonstrate their learning. Finally, a plenary session is designed to assess pupils' understanding and provide opportunity for them to reflect on their learning.

Brilliant Club also provided further advice on assessment, marking and feedback:
- Assessment: An assessment should not be viewed as to rank, label and category as many studies identified in practice (Ramsden, 2003; Rowntree, 1987). It is important for both tutors and pupils to understand the purpose of an assessment is to ensure and support the quality of teaching and learning (Atkins et al., 1993).
- Feedback: The power of the feedback is to help students close the gap between where they are aiming to be and where they are now (Sadler, 1989). Feedback is no longer a transmissive process and simply passing information from teachers to learners, but an interactive process involving teachers giving, student receiving and taking actions (Black & Wiliam, 1998; Carless & Winstone, 2020; Nash & Winstone, 2017). It is important to overcome characteristics of poor feedback (Huxham, 2017), including 1) ambiguity and opacity, 2) negativity, 3) lateness and 4) uncertainty about criteria and contexts.

A Scholar Programme includes seven tutorials at schools, with one starting event inspiring the participating pupils and one event to celebrate their graduation at well-known universities (Figure 2). The course on a chosen subject is delivered in the first five tutorials. At the end of the fifth tutorial, an assignment is introduced to the pupils to consolidate their learning. Tutorial six is dedicated to give individual feedback on pupils' draft assignment. Then, pupils have two to three weeks to continue working on their assignment before the final submission. Tutorial seven intends to give one to one feedback on the final assignment after the marking and moderation of the assignment. To evaluate the impact of the course, a baseline assignment is set at the end of the first tutorial to capture pupils' knowledge before the scholar programme.
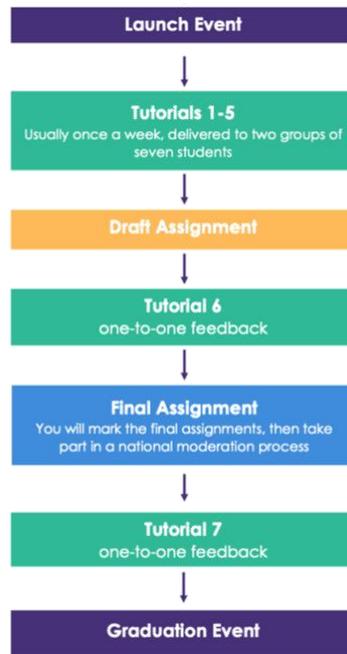
Figure 2: Course structure (Brilliant Club, 2022b)

3. Climate Change Course Design

The Climate Change course was designed in partnership with the Department of Meteorology at the University of Reading and the Met Office.

The course rational is our climate is changing, and all humans need to do take action to protect our planet (The University of Reading & The Met Office, 2022). The academic skills that this course aims to help pupils with are:
- how to use evidence to support arguments
- how to write reports
- how to reason scientifically

The Climate Change course is well designed with a wide range of resources and activities to engage pupils, including discussion, role play, etc**.** It covers what climate change is, what the causes are, what the impacts are and what actions we can take to mitigate and adapt to climate change:

Tutorial 1 – An introduction to climate change + *Baseline Assignment*
Tutorial 2 – The physics of climate change
Tutorial 3 – What are/might be the effects of climate change?
Tutorial 4 – What can we do?
Tutorial 5 – Bringing it all together + *Final Assignment*
Tutorial 6 – Draft assignment feedback and reflection
Tutorial 7 – Final assignment feedback and reflection

A baseline assignment and a final assignment are set to demonstrate pupils' learning:
- Baseline homework: pupils are asked to write a 300-word essay about what climate change is based on the first lesson, learning to use references and captions.
- Final assignment: the pupils will write a 1000-word letter to convince their head teacher that the school should take specific actions to mitigate and adapt to climate

change. The work is assessed in three criteria, including subject knowledge, critical thinking and written communication, with clear rubric set in the workbook.

4. Climate Change Course Delivery

The course delivery was well supported by the programme officer and teachers from schools. Most pupils were well engaged in each tutorial. After the first-round delivery, I reflected on my experience in supporting pupils' learning:
1. Feedback on the baseline homework should be delivered to pupils in an effective way. Pupils did not know how to use their feedback.
2. A more effective way to help pupils remember the last lesson can be explored. Pupils forgot what they learnt a week ago.
3. When setting the final assignment, the criteria used to mark the final assignment should be discussed with the pupil. Their focus was on the typo, punctuation, etc.

According to Haigh (2005) and (Gossman 2008), I adopted the three R (rules, reflection and research) model to assist my teaching development: 1) identify factors affecting teaching and formulate a set of rules, 2) reflect on my practice and refine and develop new rules and 3) conduct research into teaching. In my second-round delivery of the Climate Change course, I updated my tutorials in relation to my reflection and research on effective teaching and support learning:
1. Use an example baseline assignment to show pupils the good part, and the part that can be improved, ask pupils to talk about how they did their homework and ask them to revise their own work. As Sadler (1998) concluded that we should focus on not just the technical structure of the feedback (such as its accuracy, comprehensiveness and appropriateness) but also its accessibility to the learner (as a communication), its catalytic and coaching value, and its ability to inspire confidence and hope. Feedback should be learner-centered and be used by students to achieve their academic goals and build their confidence, instead of being teacher-centered and instructing how to correct an error in a piece of work. It is also an opportunity to reassure the pupils and recognise their efforts.
2a. Have a 5 to 10-minitue quiz at the beginning of each class and ask pupil to write down the answers. Research showed that testing could improve students' memory of the tested information and their ability to remember related information (Brame & Biel, 2015).
2b. Ask pupils to draw a picture in relation to climate change to engage pupils, which is an exciting activity for most of the pupils, and they demonstrated great creativity (Figure 3). According to Hardiman et al. (2019), memories associated with arts are powerful—arts experiences are thought to elicit emotional cognition, employ creative thinking pathways, and recruit cognitive processes that inherently facilitate long-term recall. Alternatives are offered to students do not feel comfortable to draw, such as creative writing, etc.
3. Discuss critical thinking, written communication and subject knowledge with pupils with examples. Ramsden (2003) pointed out that it is important to discuss assessment expectations with students. I found simply sharing the criteria was not effective and students didn't understand these criteria due to cognitive overload or the lack of knowledge and experience. With examples, Pupils can learn from emulation (Sadler, 1989).

Figure 3: Drawings created by pupils

In addition, two more challenges have been recognised. While communicating with the programme officer, practical and effective advice was provided:

1. How to help the pupils who did not get it?
   - Coming up with a few simple analogies for 'Climate Change'/a few of the trickier concepts
   - Using graphics to support with showing pupils the processes involved in and the effects of Climate Change
2. How to keep pupils motivated throughout each session?
   - Starter ideas (helps to -recap' content of previous session, making sure that pupils are engaged from the beginning)
   - Planary/review ideas (can motivate learners because they feel that they've 'learned something' during that tutorial)

5. Conclusion

After the successful delivery of the Climate Change course in 2022/23, I reflected on the future Scholar Programme course design and delivery:

- Motivate pupils and guide them to deep learning. Pupils have three main learning approaches, i.e., surface learning and deep learning recognised by Marton and Saljo (1976), and strategic approach identified by Entwistle et al. (1979). Comparing to the surface learning approach to do the minimum to meet course requirements and the strategic approach to achieve the highest possible grades, the deep learning approach seeks to understand the meaning of knowledge and engage the task with an appropriate level of cognitive activities. It is the teachers' responsibility to set up a course that encourages students to use the deep learning approach rather than leave it to pupils' choice.
- Consider applying neuroscience for learning and development (Collins, 2023), Brain Targeted Teaching (Hardiman, 2023; Seegers, 2020) to improve learning, including

making topics multisensory, engaging pupils in active review, chunking, using brain friendly learning models and so on.

- Consider opportunities to design the course with pupils as patterners. According to Healey et al. (2010), actively engaged in one's own learning is the basic level of engagement. How to engage pupils in the co-creation of learning and teaching, as the role of Consultant identified by Bovill et al. (2016), can be explored further.
- Consider the continuality of Scholar Programme support and resource for participating pupils. The ultimate purpose of the programme is to inspire pupils and guide them to become independent learners. The potential to create learning resources that pupils can have access to after the graduation to continue their learning and development.

Acknowledgements

Appendix A: Tutorial Planning Template

Tutorial Planning Template

Tutorial Number:

Tutorial Objectives:

Starter
- Hook students' interest
- Check what they've retained from the previous tutorial

Checking Understanding Question
- Are they ready to learn new content?

Resources

Learning Activity
- Deliver the key concepts of the tutorial
- Consider how students can experience independent or university-style learning

Hinge Point Activity
- How can students demonstrate an understanding of the key concepts?

Resources

Main Activities
- Plan opportunities for students to actively engage with the content
- Encourage student-led and university-style learning

Checking Understanding Question
- How can students demonstrate an understanding of the key concepts?

Resources

Plenary
- Allow students to demonstrate that they have met the tutorial objectives
- Plan opportunities to assess students' understanding

Checking Understanding Question
- How successfully have students met the tutorial objectives?

Resources

Tutorial Notes
- Plan your next tutorial based on students' progress in this tutorial

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