PGCE Science Subject Knowledge & Pedagogy Assignment

Teaching for understanding: Taking account of students’ misconceptions when planning and assessing

**The purpose of this assignment is for you to**:

* Find out about the types of misconceptions students may have about your chosen topic
* To consider the impact of those misconceptions on the understanding students may gain from your lesson
* To talk to some students in your placement school about some of their ideas in science
* To consider how to assess whether students understand what you would hope they would from a teaching episode
* To consider the possible impacts on future learning of students not understanding a particular topic.

In completing this assignment, you will first choose a misconception to explore, draft a lesson plan to address this misconception, and prepare to use some diagnostic questions with some children in your placement school to help you gain insight into how some children you may teach think about your chosen science topic. You will write up a critical analysis of literature about your misconception and a draft lesson plan and submit these as a 1500-word formative assignment on **28th October.** In your placement in November, you will use the diagnostic questions you have prepared and talk to children and teachers about your chosen misconception following which you will revise your lesson plan in light of any insights gained. You will draw on this in your summative assignment, which will bring together your insights from the formative, from your work with pupils and teachers, and from critical reading of literature on assessment. Overall, in the summative assignment which you will submit on **4th January by 2pm** you will summarise your learning about how planning, teaching and assessment of a key topic in science in which misconceptions commonly arise.

In completing this assignment, you will synthesise some key ideas from across the ITT Core Content Framework within a science context, including 3.2-3.7, 4.1-4.7, 5.2, 6.1-6.4

# Formative assignment (1500 words)

1. **Identifying misconception**

Choose a topic from the science curriculum. Find out what the research has to say about your topic, why students might find it difficult and what misconceptions they may hold. Think about the types of questions which may help you to find out if they hold those misconceptions.

Choose 2 or 3 questions from the BEST website (see below) or other resources which will help you to find out what children think about your topic. You will use this in your placement school in November to explore the topic with some children, which you will reflect on and discuss in your summative assignment.

1. **Planning learning**

Plan a lesson to support students to learn to understand your chosen topic in a scientific way.

We recommend you choose a key stage 3 topic, but it does not have to be.

You can plan the lesson with a particular class you have met in mind, but you do not have to.

You should aim to teach an aspect of this lesson as part of your Autumn Term peer teaching.

## Your Formative Assignment Submission (1500 words)

## Submission via Science PGCE ELE on the assignments tab

Produce a draft lesson plan aiming to address the misconception you have chosen to explore (500 words equivalent). Write a 1000 word critical reflection explaining how your plan will help pupils understand the science and address your chosen misconception, illustrating key ideas with reference to your accompanying plan. Make sure that your understanding of the science is correct.

* Include:
  + Literature sources including peer reviewed journal articles and books
  + Websites such as the BEST resources (see below)
* Make sure you show *criticality* of your sources. For example, for research consider where and when it was carried out, the age of pupils, sample size, strengths, and weaknesses of the study. Consider how relevant the findings are to your pupils.
* Compare what you find from each source of knowledge and show where they agree and where they disagree. Think about sources of disagreement.
* Reflect on what you needed to consider when planning a lesson on this topic and if there are particular tasks or types of tasks you have included.

A good place to start is the University of York Science Education Group’s BEST (Best Evidence in Science Teaching) website. You will need to create a username and password, but access to the resources is free.

A good book for explaining why it is important to understand misconceptions and a summary of the evidence available at the time is Ros Driver’s Making Sense of Secondary Science.

Note when you are searching for sources that researchers also use the terms preconceptions, alternative conceptions, misunderstandings and alternative understandings.

## Resources to get you started

BEST resources <https://www.stem.org.uk/best-evidence-science-teaching>

Allen, M. (2019). Misconceptions in Primary Science 3e. McGraw-hill education (UK).

Driver, R., et al. (1994). Making Sense of Secondary Science: Research into Children's Ideas, London, UK: Routledge.

Kind, V. (2004) Beyond appearances: Students’ misconceptions about basic chemical ideas. London: Royal Society of Chemistry. <https://edu.rsc.org/download?ac=15564>

Kampourakis, K., & Reiss, M. J. (Eds.). (2018). Teaching biology in schools: global research, issues, and trends. Routledge.

Reiss, M. (2021) Teaching secondary biology available as an ebook <https://encore.exeter.ac.uk/iii/encore/record/C__Rb4484288>

Rogers, B. (2018). The Big Ideas in Physics and How to Teach Them: Teaching Physics 11–18. Routledge.

Taber, K. (2002) Chemical misconceptions volume 1 and 2. London, Royal Society of Chemistry.

No need to buy it, all of it is freely available online: <https://edu.rsc.org/resources/chemical-misconceptions/1967.article>

# Summative assignment (4000 words)

When you are in school, arrange to spend a few minutes of a lesson finding out about students’ ideas, using the questions you selected when preparing your formative. You could either give the questions to the whole class to write their answers or talk to a few students about their ideas and note down what they have to say. Talk to your mentor or other science teachers about what they think students find difficult about your topic.

Remember: You are **not** trying to carry out research that will require you collect large quantities of data. This is a small study about students’ misconceptions, you are acting as a teacher might before they teach a topic to a class.

Note: We suggest you use approximately 2000 words on each part of this assignment. This is guidance only and you may choose to write slightly more or lesson each part. You must, however, ensure your total word count for both parts is 4000 words +/- 10%, excluding references.

## Part 1 of assignment: Critical discussion of misconception (approx. 2000 words)

Your reflective discussion should include:

1. A summary of your chosen misconception, the difficulties it causes for pupils’ learning and why, and the implications for teaching. Draw on the literature, and your conversations with pupils and teachers. Refer to your lesson plan and your own teaching of the lesson to your peers to illustrate and exemplify your analysis as relevant.
2. A discussion of what future learning might be impacted if students do not understand this topic. *What would you as classroom teacher need to do about this?*

Please note that this should be new writing and should not cut and paste from your formative assignment!

You should use your experience of teaching the lesson planned for the formative in your peer teaching to support your analysis as well as on your reading about teaching and learning, including general theories of learning and subject specific ideas.

## Part 2 of assignment: Critical discussion of assessment (approx. 2000 words)

How will you assess student understanding of your chosen topic? Consider a range of possible strategies which you could use before, during and at the end of the lesson you planned for the formative assignment.

Your reflective discussion should include:

1. A critical review of research literature related to assessment and, in particular, to assessment in science.
2. Discussion of your own teaching experiences so far and/or your observations when in school and/or your discussion with experienced teachers.
3. Some possible assessment strategies with respect to your chosen misconception and the advantages and disadvantages of each.
4. An in-depth reflection on the relationship between research, theory, the principles you've learned from the taught course, policy and the practical realities of the classroom.

## Appendices (not included in the word count)

* Your formative assignment with feedback
* Your lesson plan and any related resources
* Your reflection / focused reflection on your peer teaching episode.