Key Ideas:

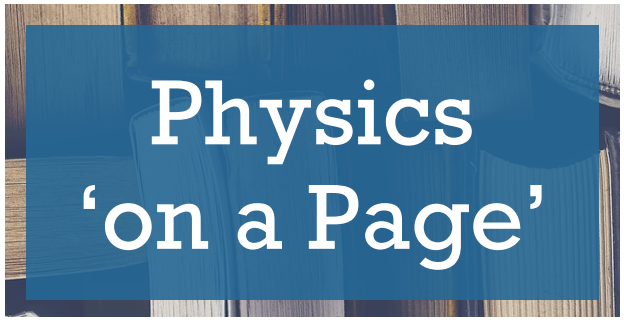
- **Misconceptions**
- **Self-regulation and metacognition**
- **Using Models**
- **Using technology**
- **Supporting retention and retrieval**
- **Purposeful practical work**
- **Scientific literacy**
- **Developing assessment and feedback that deals with misconception, language and scientific models**
- **Attitudes towards science**

Who should I follow on Twitter

Rosalind Walker- @Rosalindphys
Tom Norris - @PhysicsUK
Adam Boxer - @adamboxer1
Ben Rogers - @BenRogers Edu
Niki Kaiser - @chemDrK
Pritesh Raichura - @Mr_Raichura
Jasper Green - @sci_challenge
John Eyre - @flippedaround
The Physics Teacher - @TptJournal
E=mc2andallthat - @emc2andallthat
The Physics Teaching Podcast - @physicstp
UYSEG - @UYSEG
Bernard Rand - @BernardRand
Alom Shaha - @alomshaha
Bill Wilkinson - @DrWilkinsonSci
Richard Pepperell - @Mr_pepperell

CTSN Research & Development Group

Follow @CamTSNet for more 'subjects on a page'



Physics 'on a Page'

On The Blogosphere

Rosalind Walker writes extensively about curriculum, behaviour and the nature of knowledge. Most useful is her subject specific take on assessment and pedagogical approaches to unpick the abstract nature of science.
https://rosalindwalker.wordpress.com/

In his great scientific literacy blogs, Ben Rogers beautifully advocates slow learning and investment in the building blocks of science so that long term retention is achieved and ideas can then be used in more advanced study.
https://readingforlearning.org/author/secondary2primary/

An example of a teacher thinking deeply about issues facing school and science teacher Pritesh Raichura writes beautifully about knowledge rich science curriculums and ways in which to approach them.
https://bunsenblue.wordpress.com/

Adam Boxer is a chemistry teacher and writing extensively on what ideas in cognitive science look like in the science classroom and in curriculum design.
https://achemicalorthodoxy.wordpress.com/

Although chemistry themed, Niki Kaiser highlights the strengths of unpicking misconceptions and using assessment which targets this directly.
https://chemdrk.wordpress.com/

The science teacher, Jasper Green, provides resources for a range of topics and discusses practical approaches to pedagogy that unpick many of the things that making teaching and learning science tricky.
https://thescienceteacher.co.uk/writing-in-science/

What should I read?

A starting point for any teachers interested in science education research is the recently published EEF: Improving Secondary Science report (2018). It summarises recent research and highlights things worth investigating thought into. The research findings are presented quite broadly and so use this as a diagnostic tool to then find more specific research into it's 7 strands. A more specific research summary is *Good Practice in Science Education,* eds. Jonathan Osborne and Justin Dillon (Open University Press, 2010). The book has contributions from many leading academics and provides both examples of **what** should be done and reasons **why** they should be done.

The book which has changed my thinking the most is Keith Taber's *Student Thinking and Learning in Science* (Bloomsbury, 2014). Based on a full review of 50 years of research into how students learn science as well as the authors own research contributions into students misconceptions in science this book unravels the subject specific nature of students ideas; the ideas students may hold; and how we can become a *learning doctor,* diagnosing wrong thinking and knowing how to deal with it. On this theme of the science learner the University of York Science Education group's current project: the BEST Evidence Science project, presents the current best resources for unpicking science learning for the practitioner. Each activity logically explains what research says about science topics, and what student's responses mean.

https://www.stem.org.uk/best-evidence-science-teaching. The York teams fine focus on assessment can be read in a paper on their website (Whitehouse, 2013), and will change thoughts on lesson design.

Physics on a page would not be complete without mentioning practical work. Millar and Abrahams (2009) provide a framework for developing practical work and the multi-faceted reasons for doing them: including for understanding content, understanding the scientific process, and enjoyment of science. They identify the issues with 'traditional practical work' and give the teacher guidance of when to use it. Science education is not just about **activities** or **knowledge acquisition,** and the research into attitudes towards science is a brilliant example of this complexity. Bennett and Hogarth (2009) broadly split attitudes into attitudes towards school science and attitudes towards science as a discipline. The research suggests that there are teaching choices that can be made to shift attitudes towards science, to the benefit of the STEM sector and post-16 uptake.

Finally, of note is Ben Roger's book *The Big Ideas in Physics and How to Teach them* (Routledge, 2018), This riveting read presents pedagogy ideas that offer clarity in physics teaching. Although disappointing that the decades of work into science education research are seemingly ignored, he shows how a teacher can engage with wider educational theory, cognitive load theory, and implement it in a subject specific discipline.