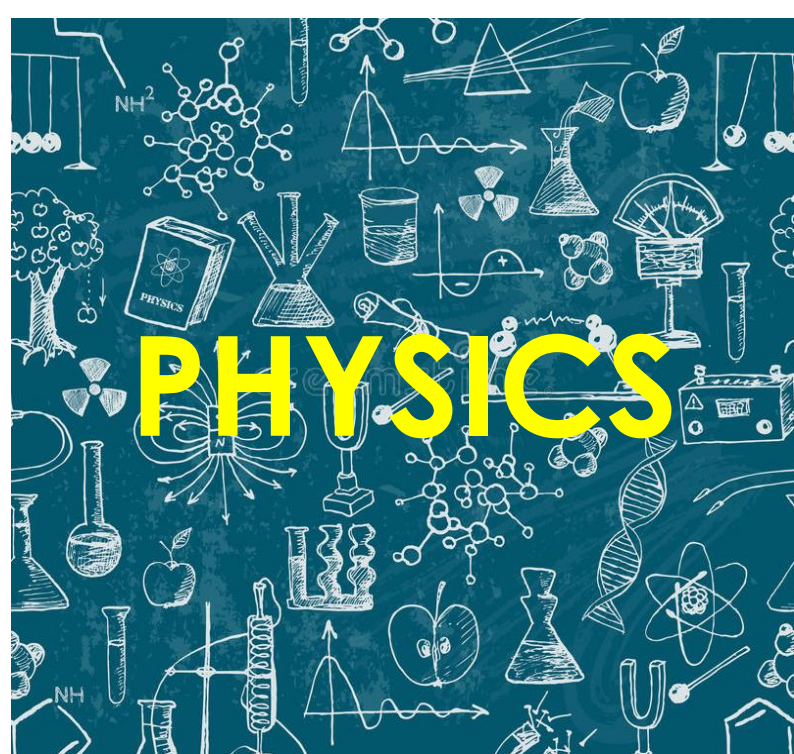
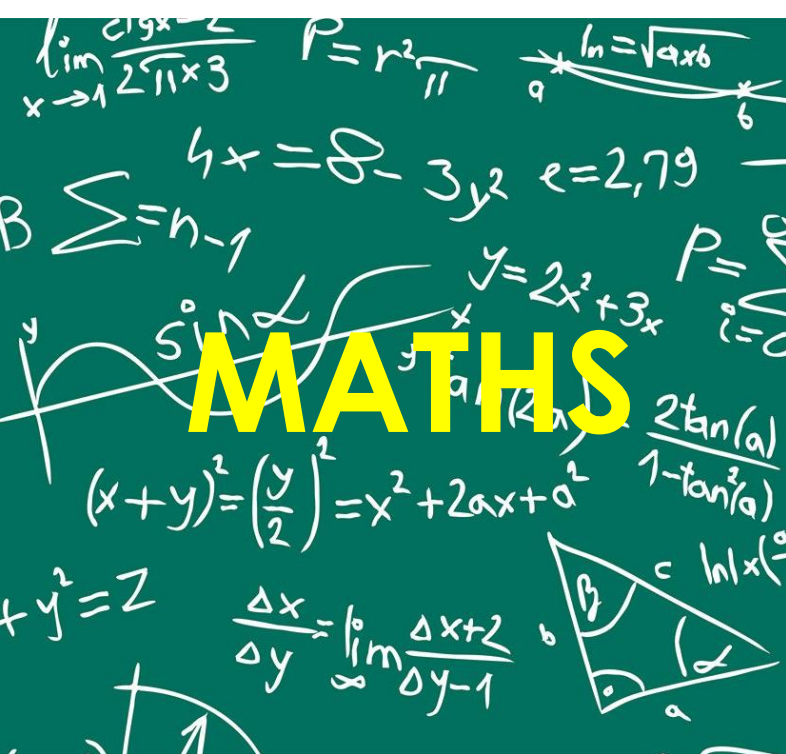




# Teacher Subject Specialism Training 2020-2021



## Course Handbook



## Teacher Subject Specialism Training (TSST) 2020-2021 Course Design

The course is comprised of an initial two-day conference (**2<sup>nd</sup> and 3<sup>rd</sup> December 2020**) followed by two, half-day training sessions (**12<sup>th</sup> January and 3<sup>rd</sup> March 2020**).

Each participant will identify their areas of strength and development. It is expected that an area of strength may still need development – just at a higher level.

You will be asked to complete a subject knowledge audit at the two-day conference. This will take the form of a questionnaire with a range of methods for self-assessment including opportunities to rate your confidence levels, with straight forward test questions in a GCSE style and questions which require some comment on a student's worked example. The audit will help to identify areas of strength and development. It will also help inform the topics selected for the two half-day training sessions in 2021.

Throughout the course you will work on your areas of strength and areas for development and record your progress using a Personal Learning Log. (An example is provided.) You may formulate your own version – it is simply asked that:

- lesson 'Reflections' are used;
- formal and informal lesson observation feedback forms are included;
- there is evidence of having observed another maths/physics teacher at work and reflected on the lesson observed;
- data is gathered on a chosen class or classes which aims to evidence impact on students' achievement (perhaps by showing progress towards targets, or progress from a baseline, or progress across a series of tests).

### Reading and Research

There is no core text or any compulsory reading material. It is not proposed that participants will all come out with the same teaching styles, rather that you gain the confidence, tools and enhanced subject knowledge to teach Mathematics or Physics in your own way. It must be acknowledged however that the pedagogical content of the course design draws upon the work of Dylan William and Paul Black, as well as some of the teaching methods from Paul Ginnis and the Kagan Cooperative Learning Approaches. These and other influences are acknowledged and referenced at the end of this handbook.

Reference will also be made to materials offered by:

- National Centre for Excellence in the Teaching of Mathematics
- The Further Mathematics Support Programme
- Plymouth University Subject Knowledge Enhancement course
- Jurassic Coast Teaching Schools' Alliance
- Institute of Physics

## Two-Day Conference Overview (The Blue School, Wells)

Dates: Wednesday 2<sup>nd</sup> and Thursday 3<sup>rd</sup> December 2020

### Day One:

Wednesday 2<sup>nd</sup> December, 9am-4:30pm

	Mathematics	Physics
<b>Session 1</b> 9:00 – 10:40	Welcome and introductions	
	Diagnostic/Self-Assessment of Subject Knowledge	Diagnostic/Self-Assessment of Subject Knowledge
<b>Break - 10:40-11am</b>		
<b>Session 2</b> 11:00 – 12:00	Course Outline Modes of study Review Subject Knowledge Audit	
	<b>Lunch - 12-1pm</b>	
<b>Session 3</b> 1:00 – 2:30	Workshop 1 'M' Modules	Workshop 1 'P' Modules
	<b>Break - 2:30-2:45pm</b>	
<b>Session 4</b> 2:45 – 4:15	Workshop 2 'M' Modules	Workshop 2 'P' Modules
	4:15 – 4:30	Plenary / Refreshments (Depart)

### Day Two:

Thursday 3<sup>rd</sup> December, 9am-4:30pm

	Mathematics	Physics
<b>Session 1</b> 9:00 – 10:40	Workshop 3 'M' Modules	Workshop 3 'P' Modules
	<b>Break - 10:40-11am</b>	
<b>Session 2</b> 11:00 – 12:00	Workshop 4 Using ICT and professional organisations to support teaching in maths and physics	
	<b>Lunch - 12-1pm</b>	
<b>Session 3</b> 1:00 – 2:30	Workshop 5 'M' Modules	Workshop 5 'P' Modules
	<b>Break - 2:30-2:45pm</b>	
<b>Session 4</b> 2:45 – 4:15	Revisit Subject Audit / Plan for the two half-day sessions	
	4:15 – 4:30	Plenary / Refreshments (Depart)

## Two-Day Conference Mathematics Modules

Topic Heading	Part i Aimed at becoming better at imparting this knowledge	Part ii Aimed at enhancing your own knowledge
<b>M1.</b> <ul style="list-style-type: none"> <li><b>Fundamentals of maths teaching</b></li> </ul>	Language of mathematics Key facts How to use a Scientific Calculator Common misconceptions	
<b>M2.</b> <ul style="list-style-type: none"> <li><b>Probability</b></li> </ul>	(i) Probability of two or more events	(ii) Conditional Probability
<b>M3.</b> <ul style="list-style-type: none"> <li><b>Gradients and Straight Lines</b></li> </ul>	(i) Line equations	(ii) Equations of tangents to circles
<b>M4</b> <ul style="list-style-type: none"> <li><b>Using ICT</b></li> </ul>	Using ICT and professional organisations to support teaching	
<b>M5.</b> <ul style="list-style-type: none"> <li><b>Surds</b></li> </ul>	(i) Manipulation – Simplifying/rationalising the denominator	(ii) Applications – trigonometrical functions, geometric series and Pythagoras

### Mathematics Modules

- **M1.** Fundamentals of maths teaching: Language; Key facts, How to use a Scientific Calculator; Common misconceptions (NEW)
- **M2.** Conditional probability
- **M3.** Teaching the gradients of perpendicular lines, line equations and equations of tangents to circles
- **M4.** Using ICT
- **M5.** Manipulation of surds, particularly in the use of common trigonometric values and as a common ratio in geometric progressions

*Modules are adjusted according to the needs of participants.*

## Two-Day Conference Physics Modules

Topic Heading	Part i Aimed at teaching these concepts	Part ii Aimed at applying these concepts when stretching the more able students
<b>P1</b> <ul style="list-style-type: none"> <li>• <b>Conceptual understanding of DC Circuits</b></li> <li>• <b>Ohms Law</b></li> <li>• <b>Power equations</b></li> <li>• <b>The use of transformers in power distribution</b></li> </ul>	(i) Understanding Current, Voltage and Resistance ideas to help pass this onto students	(ii) Models and analogies to understand Current, Voltage and Resistance. Using units to derive equations. Linking equations to practical uses
<b>P2</b> <ul style="list-style-type: none"> <li>• <b>Radioactive decay and half-life</b></li> </ul>	(i) Confidence demonstrating radioactive samples and linking the properties of radiation to their uses	(ii) Analogies to show exponential decay. The processes involved in $\alpha$ , $\beta$ , and $\gamma$ emission
<b>P3</b> <ul style="list-style-type: none"> <li>• <b>Use of equations and ideas relating to conservation of energy and momentum</b></li> </ul>	(i) Helping students deal with simple and more complex equations.	(ii) Deriving equations for KE and GPE. Questions involving multiple stages
<b>P4.</b> <ul style="list-style-type: none"> <li>• <b>Digital Resources</b></li> </ul>	Digital resources used in Physics	
<b>P5</b> <ul style="list-style-type: none"> <li>• <b>The Motor Effect and Electromagnetic Induction</b></li> </ul>	(i) Demonstrations and theory to help students understand the principles of electromagnetic induction	(ii) How electric and magnetic fields interact and equations relating to this

### Physics Modules

- **P1.** Conceptual understanding of DC circuits, Ohm's Law, power equations and the use of transformers in power distribution
- **P2.** Radioactive decay and half-life
- **P3.** Use of equations and ideas relating to conservation of energy and momentum
- **P4.** Digital resources used in Physics
- **P5.** The Motor Effect and Electromagnetic Induction

## Teacher Subject Specialism Training: Two Half-Day Sessions

Towards the end of the two-day conference, time has been allowed for you to reflect on your training and use the information to inform your choices for the two half-day training sessions.

Below is an outline of the likely topics that will be covered in the half-day training sessions, other topics will be negotiated with participants so that the course can be personalised as far as possible.

<b>Mathematics</b>	<b>Physics</b>
<p>KS3 Number / KS4 Number</p> <p>KS3 Algebra / Sequences &amp; Vectors</p> <p>KS3 Geometry &amp; Construction / Angle Geometry &amp; Circles</p> <p>Maths: Trig Basics / Trig Advanced</p> <p>KS4 Algebra Algebraic Manipulation / Functions and Graphs</p>	<p>Forces, Vectors and Archimedes Principle</p> <p>Wave behaviour, (Lenses) and Colour</p> <p>Moments and Circular Motion</p> <p>Electric Fields and Static (application of)</p> <p>Kinetic Theory and Gas Laws</p>

## Expectations of Participants

### A Teacher Subject Specialism Training participant should:

- Be familiar with all the requirements of the course as outlined in the Course Handbook;
- Attend all scheduled sessions and complete all subject knowledge audits as requested by the course tutor;
- Complete all evaluation forms and 'impact' analyses.
- Be willing to be observed during the process and understand that this observation does not form any part of their own school's Performance Management Processes;

## Expectations of Participants' Schools

### A Teacher Subject Specialism Training participant's school should:

- Provide a mentor for the TSST participant who is already trained in Physics or Mathematics and who is willing to be observed and undertake observations.
- Provide non-contact time to TSST participants so that they can undertake observations, and complete reading and research.
- Provide the necessary release time for TSST participants to attend all training sessions, including an early departure for half-days.

## Recommended Reading and Research

The following texts either underpin the ideas behind the training, or are simply recommended by the tutors as useful and enjoyable:

### Teaching and Learning

Ginnis, P. *The Teacher's Toolkit: Raise Classroom Achievement with Strategies for Every Learner*

Smith, J. *The Lazy Teacher's Handbook: How your students learn more when you teach less* (Independent Thinking Series)

Cohen, L. *Research Methods in Education*

Shulman, L.S. *The Wisdom of Practice-Collected Essays of Lee Shulman: Vol 1*

Hattie, J. *Visible Learning and the Science of How We Learn*

William, D. *Embedded Formative Assessment*

William, D. *Inside the Black Box: Raising Standards Through Classroom Assessment: 1*

Kagan, S. *Cooperative Learning*

Povey, T. *Professor Povey's Perplexing Problems: Pre-University Physics and Maths Puzzles with Solutions*

### Mathematics

Chambers, P. *Teaching Mathematics in the Secondary School (Developing as a Reflective Secondary Teacher)*

Hodgen, J. *Maths Inside the Black Box*

Maor, E. *To Infinity and Beyond: A Cultural History of the Infinite* (Princeton Paperbacks)

### Physics

Lockett, K. *Physics in the Real World*

Susskind, L. *The Theoretical Minimum: What You Need to Know to Start Doing Physics*

by David Sang *Teaching Secondary Physics 2nd Edition* (Ase Science Practice)



## Personal Learning Log Example

Date	Activity Undertaken	Notes/Reflections/Actions
	<input type="checkbox"/> Observe another teacher <input type="checkbox"/> Observation of my teaching <input type="checkbox"/> Lesson reflection <input type="checkbox"/> Reading and research <input type="checkbox"/> Online study <input type="checkbox"/> Data analysis <input type="checkbox"/> Other	
	<input type="checkbox"/> Observe another teacher <input type="checkbox"/> Observation of my teaching <input type="checkbox"/> Lesson reflection <input type="checkbox"/> Reading and research <input type="checkbox"/> Online study <input type="checkbox"/> Data analysis <input type="checkbox"/> Other	
	<input type="checkbox"/> Observe another teacher <input type="checkbox"/> Observation of my teaching <input type="checkbox"/> Lesson reflection <input type="checkbox"/> Reading and research <input type="checkbox"/> Online study <input type="checkbox"/> Data analysis <input type="checkbox"/> Other	
	<input type="checkbox"/> Observe another teacher <input type="checkbox"/> Observation of my teaching <input type="checkbox"/> Lesson reflection <input type="checkbox"/> Reading and research <input type="checkbox"/> Online study <input type="checkbox"/> Data analysis <input type="checkbox"/> Other	
	<input type="checkbox"/> Observe another teacher <input type="checkbox"/> Observation of my teaching <input type="checkbox"/> Lesson reflection <input type="checkbox"/> Reading and research <input type="checkbox"/> Online study <input type="checkbox"/> Data analysis <input type="checkbox"/> Other	
	<input type="checkbox"/> Observe another teacher <input type="checkbox"/> Observation of my teaching <input type="checkbox"/> Lesson reflection <input type="checkbox"/> Reading and research <input type="checkbox"/> Online study <input type="checkbox"/> Data analysis <input type="checkbox"/> Other	
	<input type="checkbox"/> Observe another teacher <input type="checkbox"/> Observation of my teaching <input type="checkbox"/> Lesson reflection <input type="checkbox"/> Reading and research <input type="checkbox"/> Online study <input type="checkbox"/> Data analysis <input type="checkbox"/> Other	

## TSST Two-Day Conference - Day One

- 8:45am**      **Please report to The Blue School Reception in the middle of the School Refreshments on arrival** Venue: K1-5
- 9:00am**      **Welcome and introductions**
- 9:10am**      **Session 1: Subject Knowledge Audit**  
In this session there are a series of self-test documents which cover the subject based units to be offered over the two days.
- 10:10am**      **Discussion and completion of The Audit Front-sheet** (to be passed to tutors)
- 10.40am**      **Break** Venue: Bailey Hall
- 11:00am**      **Course outline and modes of study** Venue: K1-5
- During this session the key tenets of the Department for Education requirement will be outlined, but there will be an opportunity to discuss how that may be made workable for you.
- The rationale for the organisation of the two-day training will be explained, as well as the intended outcomes. There will be an opportunity for you to feed in your expectations and for us to adapt the programme accordingly.
- 11:30am**      **Outcomes of the audit**  
Divide into smaller Mathematics groups (in K1-5) and Physics groups (in K117)  
**Sign up for workshops**
- 12:00pm**      **Lunch** Venue: Bailey Hall
- 1:00pm**      **Workshop 1:**  
Mathematics: **M1** in K1-5  
Physics: **P1** in K117
- 2:30pm**      **Break** Venue: Bailey Hall
- 2:45pm**      **Workshop 2:**  
Mathematics: **M2i or M3ii** in K1-5 or K1-4  
Physics: **P2** in K117
- 4:15pm**      **Plenary/Refreshments/Depart** Venue: K1-5
- 4:30pm**      **Depart**

## TSST Two-Day Conference - Day Two

- 8:45am Refreshments on arrival** Venue: K1-5
- 9:00am Workshop 3**  
 Mathematics : **M2ii** or **M3i** in K1-5 or K1-4  
 Physics : **P3** in K117
- 10:40am Break** Venue: Bailey Hall
- 11:00am Workshop 4**  
 Using ICT and professional organisations to support teaching in maths and physics  
 Mathematics : **M4** in K1-5  
 Physics : **P4** in K117
- 12:00pm Lunch** Venue: Bailey Hall
- 1:00pm Workshop 5**  
 Mathematics : **M5i** or **M5ii** in K1-5 or in K1-4  
 Physic : **P5** in K117
- 2:30pm Break** Venue: Bailey Hall
- 2:45pm Revisit Subject Audit / Prepare for Twilights**  
 This session is designed to give reflection time and see if you find you can approach the original audit with more confidence. In discussion with subject tutors you will negotiate the content for the half-day sessions.
- 4:15pm Plenary/Refreshments/Depart** Venue: K1-5
- 4:30pm Depart**

## Lesson Observation Sheet Example

Date	Topic	KS
<b>How well is the topic introduced and developed?</b>		
<b>What does the teacher do?</b>		
<b>What do the students do?</b>		
<b>What are the key strengths of the approach?</b>		
<b>What are the weaknesses of the approach?</b>		



# Teacher Subject Specialism Training



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Department  
for Education