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Developing CS pedagogy through shared lesson resources

Dr Elizabeth Hidson

Senior Lecturer in Education

International Teacher Education Team

 @DrHidson @PGCEIDL



**University of
Sunderland**

Dr Elizabeth Hidson

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Senior Lecturer in Education: Programme Leader for PgCert Education (SCITT)

My teaching background began in UK secondary education (ages 11-18). I trained as a teacher of Information Technology in 1999, and spent 14 years in London schools. I have held multiple school leadership roles up to and including sole Deputy Headteacher. Strategic projects that I have worked on include the Specialist Schools programme, Building Schools for the Future (BSF), academy conversion and setting up a new sixth form.

As an accredited Advanced Skills Teacher (AST), Lead Practitioner and Chartered London Teacher, I mentored teachers at all stages of their careers across London in primary and secondary schools. I was also a national TDA Teacher Advocate and part of their first 'Talk to a Teacher' Facebook campaign, as well as being the featured ICT teacher in the national teacher recruitment 'Class of Today' interactive DVD.

I moved to the North East to study full-time for my doctorate at Durham University. I also worked as a post-doctoral Research Associate at Newcastle University on a range of funded international educational technology research projects and taught on Sutton Trust, supported progression, PGCE, MA and doctoral researcher training courses at Durham University and Newcastle University before joining the University of Sunderland's International Teacher Education Team in 2018.

As a Senior Lecturer, I now lead the PgCert Education (SCITT) programme working with School Centred Initial Teacher Training partners in the north of England and I'm Assistant Programme Leader for the international [PGCE Education \(IDL\)](#). I am module leader for EDPM01: Development of Learning, a Level 7 MA module where trainees use case study research design to explore school-based interventions. I am also an assessor on the [Assessment-Only](#) Route to QTS.



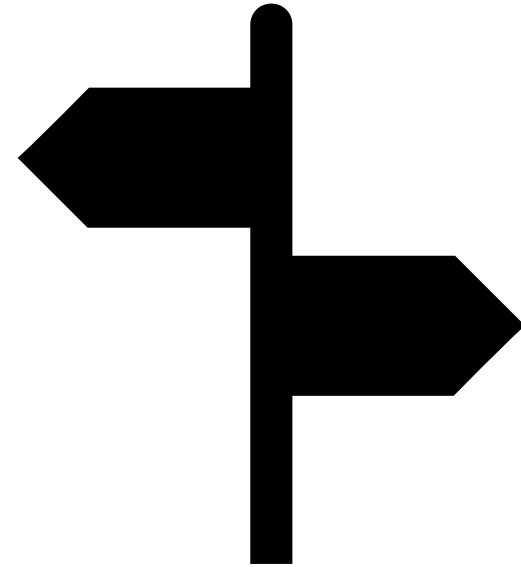
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👤 She/Her

In this session

1. A curriculum policy change that needed research, because none had been done
2. Questions about policy and practice
3. Key things that the research uncovered
4. Practical application of that research to practice and to teacher education
5. Points to take away





Department for Education
Computing programmes of study: key stages 1 and 2
National curriculum in England

Purpose of study
A high-quality computing education equips pupils to use computational thinking and creativity to understand and change the world. Computing has deep links with mathematics, science, and design and technology, and provides insights into both natural and artificial systems. The core of computing is computer science, in which pupils are taught the principles of information and computation, how digital systems work and how to put this knowledge to use through programming. Building on this knowledge and understanding, pupils are equipped to use information technology to create systems and a range of content. Computing also ensures that pupils become digitally literate – able to use, and express themselves and develop their ideas through, information and communication technology – at a level suitable for the future workplace and as active participants in a digital world.

Aims
The national curriculum for computing aims to ensure that all pupils can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation, and have the confidence to create digital content and solve computational problems through the use of technology.

Department for Education
Computing programmes of study: key stages 3 and 4
National curriculum in England

Purpose of study
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Aims
The national curriculum for computing aims to ensure that all pupils:
• can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation, and have the confidence to create digital content and solve computational problems through the use of technology.

IT
Information
Technology

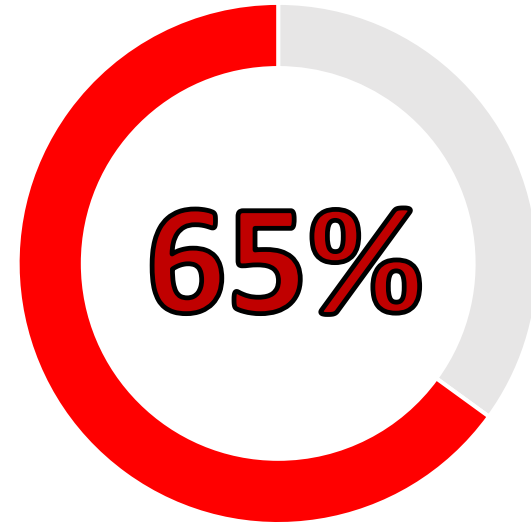
DL
Digital
Literacy

CS
Computer
Science



How do these teachers know how to teach Computer Science?

Do not have a relevant first degree and teacher training qualification to teach ICT



Source: Royal Society
2012, p. 71-72

Video-calling and desktop-sharing (Hidson, 2020)



<https://doi.org/10.1163/23644583-00501001>

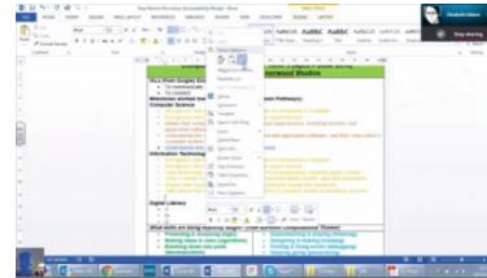
Internet Video Calling and Desktop Sharing (VCDS) as an Emerging Research Method for Exploring Pedagogical Reasoning in Lesson Planning

Profiling Emerging Research Innovations

In: [Video Journal of Education and Pedagogy](#)

Author: [Elizabeth Hidson¹](#) [View More +](#)

Online Publication Date: 26 Sep 2020



[View Full Size](#)

Feature

Elizabeth Hidson's article comprises two videos, which can be viewed [here](#).

Citation: *Video Journal of Education and Pedagogy* 5, 1 (2020); [10.1163/23644583-00501001](https://doi.org/10.1163/23644583-00501001)

[Download Figure](#)

[Download figure as PowerPoint slide](#)

☰ Hide files

VJEP_5.1_Hidson_Video 1.wmv
22.4 MB

VJEP_5.1_Hidson_Video 2.wmv
45.06 MB

Stop Motion Animation [Compatibility Mode] - Word

FILE HOME INSERT DESIGN PAGE LAYOUT REFERENCES MAILINGS REVIEW VIEW DEVELOPER DESIGN LAYOUT

Arial - 12 - A Aa -

Clipboard Font Paragraph Styles Editing

Computing medium term: Term 3 (April - June 2016)
Years 3 & 4 - Manorwood Studios

IALs (from Quigley essentials):

- To communicate
- To connect

Milestones worked towards (from CAS Progression Pathways):

Computer Science

- Recognises the role of computers in society
- Knows that computers are used in a wide range of applications
- Understands the basic components of a computer system
- Understands the role of software in a computer system

Information Technology

- Recognises and can use a range of input and output devices
- Uses technology with increasing independence to purposefully organise digital content
- Uses a variety of software to manipulate and present digital content, data and information
- States their experiences of technology in school and beyond the classroom
- Talks about their work and makes improvements to solutions based on feedback received
- Collects, organises and presents data and information in digital context (e.g. spreadsheets)
- Creates digital content to achieve a given goal through combining software packages and internet services to communicate with a wider audience (e.g. blogging (Blogger))
- Makes appropriate improvements to solutions based on feedback received and can comment on the success of the solution (e.g. using a feedback form)

Digital Literacy

- R
- M
- D

V2_Progression_Pathways_by_CS_IT_and_DL...

1026 WORDS

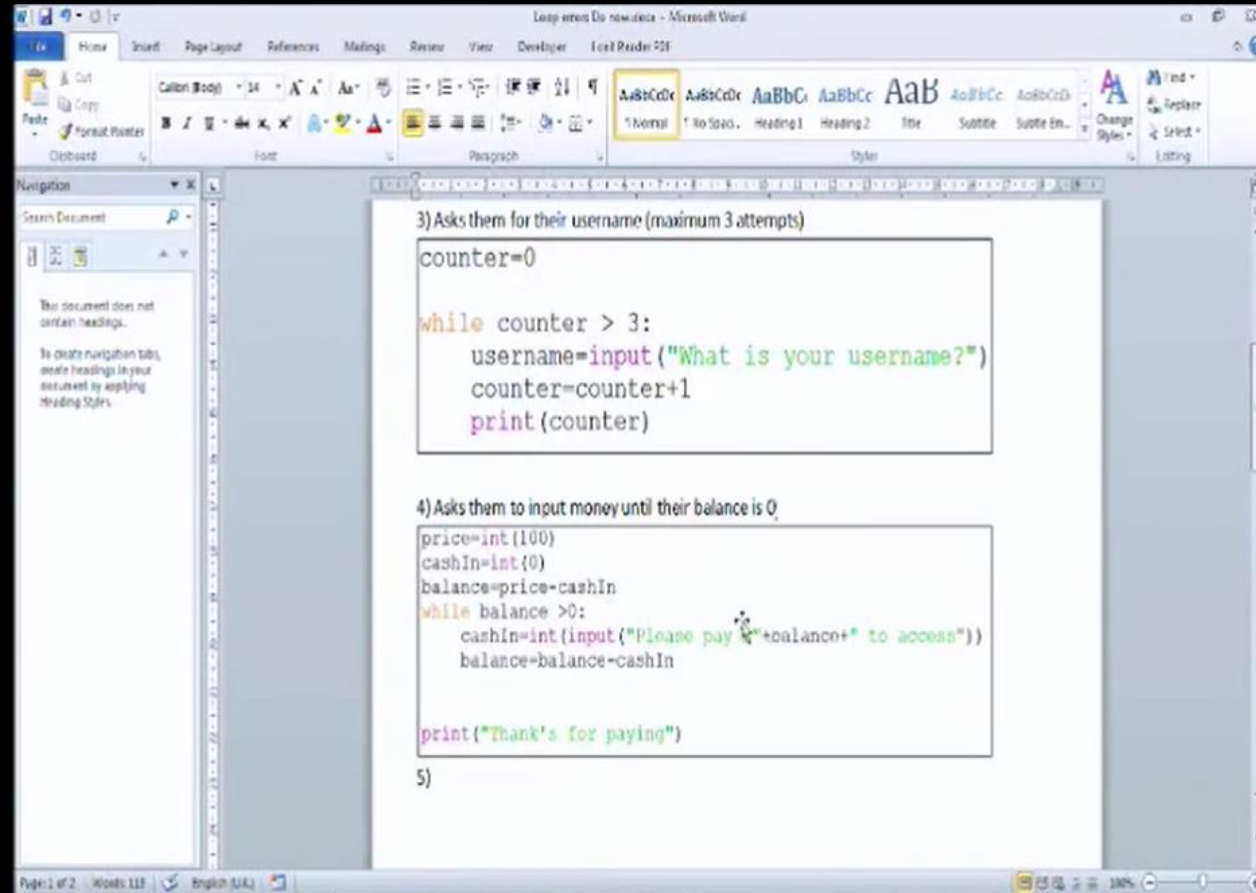
00:12 02:20 10:52 15/04/2016

Stop sharing

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VJEP_5.1_Hidson_Video 1.wmv
22.4 MB

VJEP_5.1_Hidson_Video 2.wmv
45.06 MB



The screenshot shows a Microsoft Word document with two code blocks. The first block is titled "3) Asks them for their username (maximum 3 attempts)" and contains a Python code snippet for a login loop. The second block is titled "4) Asks them to input money until their balance is 0" and contains a Python code snippet for a payment loop. The code is color-coded: keywords in blue, strings in red, and numbers in green.

```
3) Asks them for their username (maximum 3 attempts)
counter=0
while counter > 3:
    username=input("What is your username?")
    counter=counter+1
    print(counter)

4) Asks them to input money until their balance is 0
price=int(100)
cashIn=int(0)
balance=price-cashIn
while balance > 0:
    cashIn=int(input("Please pay "+balance+" to access"))
    balance=balance-cashIn

print("Thank's for paying")

5)
```



Communities of practice: 'anytime, anywhere personal learning networks' (Trust, 2016)

- Internet searching as a starting point
- Online sharing platforms
- Computing At School organisation – face-to-face and online
- Commercial and 'cottage industry' providers
- Programming reference sites



Teaching materials

1. **Bespoke** lesson resources, created by teachers for a specific purpose
2. **Gathered**, unmodified resources located and used with little or no change
3. **Repurposed** lesson resources, gathered and modified by the teacher to fit their lesson objectives more effectively



Look to the theory

- We want to know what is going on – we look for **evidence** in **practice**
- We want to look at **specific** things and relate them to **general** things
- This gives us a **theoretical underpinning** so that practice, evidence and theory can be used to move away from '**gut instinct**' towards a situation of **evidence-informed practice**



EVIDENCE



THEORY



PRACTICE



Representation of Shulman's (1986) three categories of teacher knowledge

Subject Matter Content Knowledge

The amount and the organization of knowledge in the mind of the teacher

Content can be represented and theorised in various ways

The teacher's subject matter content understanding in relation to the discipline

Pedagogical Content Knowledge (PCK)

Subject matter *for teaching*

Aspects of content most germane to its *teachability* Representations: analogies, illustrations, examples, explanations, demonstrations

Understanding of what makes the learning of specific topics easy or difficult

Curricular Knowledge

[educational] programs designed to teach particular subjects and topics

Instructional materials: texts, software, programs, visual materials, films, demonstrations etc.

Understanding of the characteristics of the materials



Subject



PCK



Curriculum

Nascent pedagogies

“Teachers need robust pedagogical frameworks built on verified foundational theories, with clearly identified learning models and effective instructional techniques” (p. 53)

Waite, J., (2017) *Pedagogy in teaching Computer Science in schools: A Literature Review*. (After The Reboot: computing education in UK Schools). The Royal Society. Available at: <https://royalsociety.org/-/media/policy/projects/computing-education/literature-review-pedagogy-in-teaching.pdf>

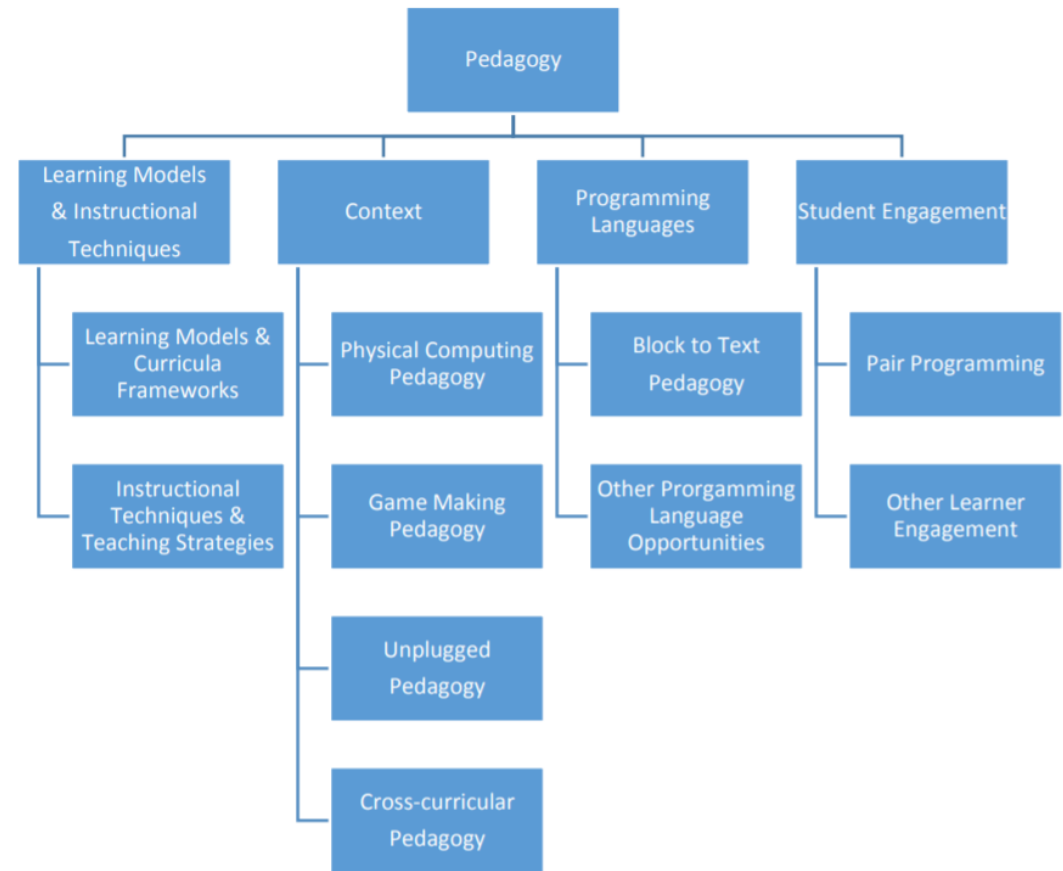
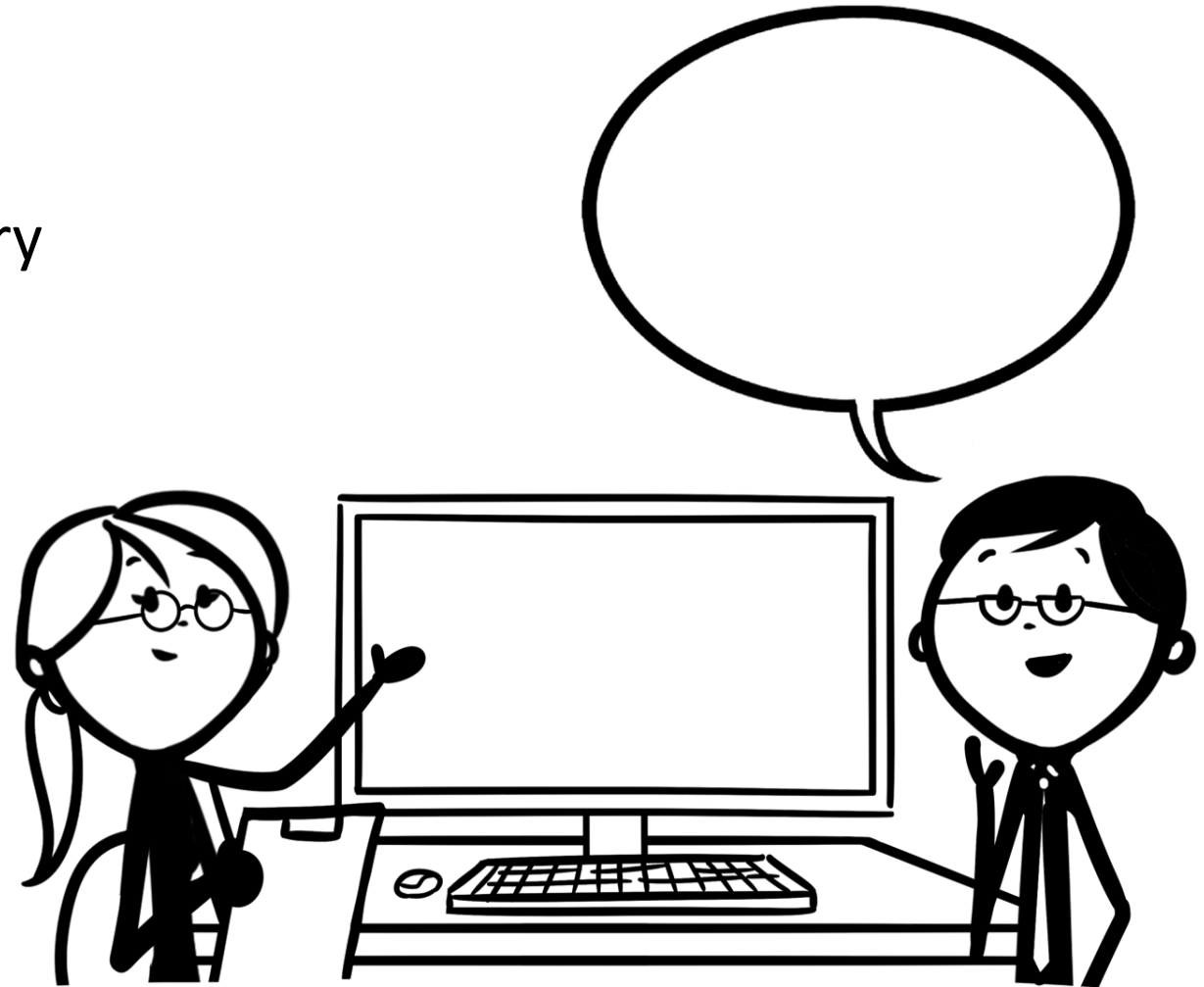


Figure 1 Pedagogy literature review categories

The educative role of resources – “PCK by proxy”

- The **unwritten / unheard** commentary that is part of any lesson resource
- This **knowledge** is the key to PCK
- A state of *transitional* pedagogical reasoning – scaffolded by a more knowledgeable other
- External knowledge **validation** – resources and support



**But weren't these just
very tech-savvy
teachers?!**



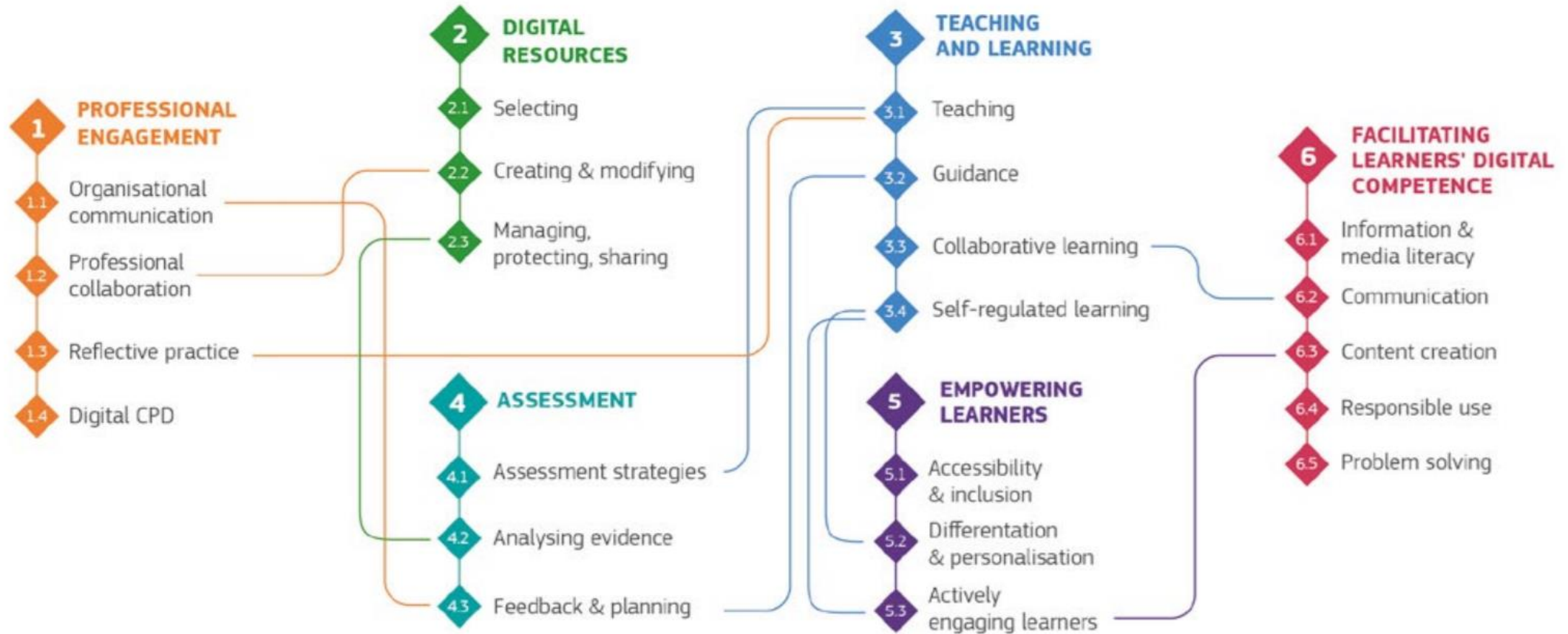
ALL teachers need digital competence



Educators' professional competences

Educators' pedagogic competences

Learners' competences



Digital Resources



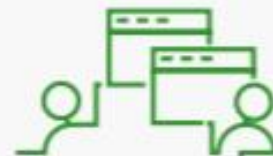
Selecting digital resources

To identify, assess and select digital resources for teaching and learning. To consider the specific learning objective, context, pedagogical approach, and learner group, when selecting digital resources and planning their use.



Creating and modifying digital resources

To modify and build on existing openly-licensed resources and other resources where this is permitted. To create or co-create new digital educational resources. To consider the specific learning objective, context, pedagogical approach, and learner group, when designing digital resources and planning their use.

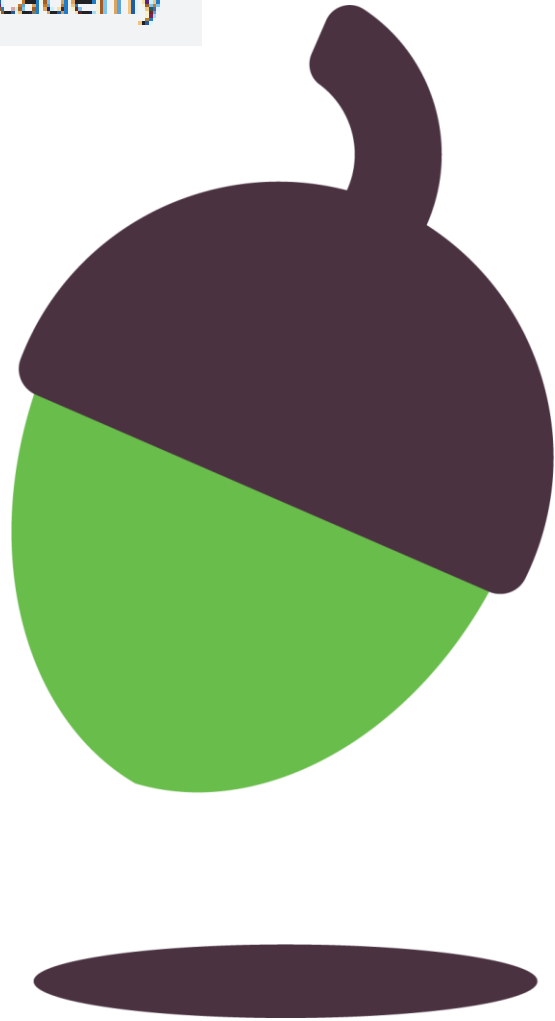


Managing, protecting and sharing digital resources

To organise digital content and make it available to learners, parents and other educators. To effectively protect sensitive digital content. To respect and correctly apply privacy and copyright rules. To understand the use and creation of open licenses and open educational resources, including their proper attribution.

TABLE 2: AREA 2 - DIGITAL RESOURCES

(Redecker, 2017, p. 20)



OAK NATIONAL ACADEMY



Get ahead this year with Oak

Save time and find inspiration with over 40,000 free, high-quality and adaptable curriculum-aligned resources.



Pupils

Want to find out more about your favourite subject or revise what you've been taught? Missed a lesson at school? Visit our online classroom.

[Lessons](#)

Teachers

Plan ahead and save time with fully sequenced curriculum maps and lesson resources you can download, adapt and share.

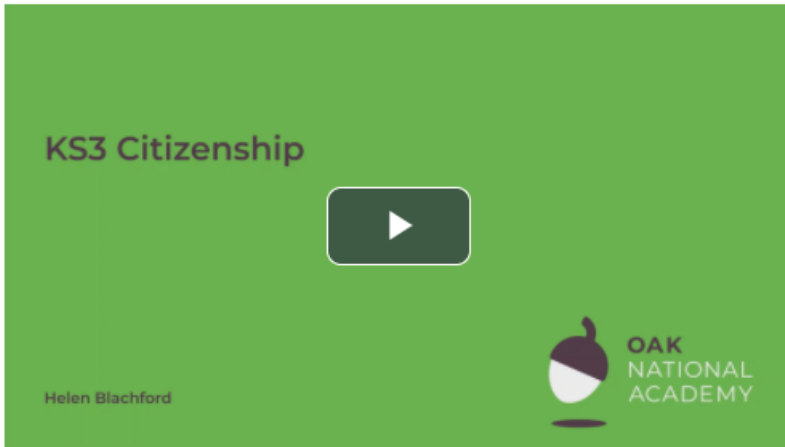
[Teacher hub](#)[Planning](#)



< Lessons for ITT

ITT: How do citizens take action?

Secondary Citizenship KS3



Step 1:

Original Oak Lesson

Step 2:

ITT lesson video

2. ITT lesson video

Here, Helen Blachford provides a perspective on how, as an experienced teacher, they thought about the planning and delivery of this lesson. Watch an explanation of its structure and design and the pedagogical decisions behind it.

01:02 - Prior Knowledge

07:24 - Explanation

11:34 - Check for Understanding

14:53 - Practice

16:54 - Assessment

19:59 - Reflection

Step 1

University of Sunderland Subjects Search Classroom

Browse, customise, save, share & download lessons

Search by subject or topic

Or browse the curriculum

By subject By key stage Specialist lessons

Get started with Oak

Oak's curricula

Download our new-and-improved, fully sequenced curriculum documents and plans spanning the national curriculum.

Oak's curricula

Planning with Oak

Save time and find inspiration with Oak's high-quality, adaptable resources and teaching materials. Find out how Oak can support you this year, from lesson planning to in-class resources.

Lesson planning

Download:

What makes a good website?

Download activities for your lesson:

↓

Presentation (PPTX)

↓

Editable Worksheet (PPTX)

↓

Printable Worksheet (PDF)

↓

Printable Exit Quiz (PDF)

↓

Printable Exit Quiz Answers (PDF)

●●●●●



Implications for teacher education

- Embrace **communities of practice** to develop **PCK** as part of **evidence-informed practice**
- Recognise that developing **pedagogical reasoning** and **digital competence** are part of initial teacher education and professional development

1

Know **what** you need to be able to teach and **why**

2

Know **how** and **where** to find resources and ideas

3

Know how best to **teach** to your students

4

Know how to **re/purpose** materials and ideas





Pedagogy by proxy: teachers' digital competence with crowd-sourced lesson resources



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(Hidson, 2021)

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