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Unlocking higher-order thinking skills

Exploring systems thinking, problem-solving and metacognition in secondary schools

Abigail Barnett, Biljana Savikj

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Future-ready: preparing learners to thrive

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Presenters

Abbi Barnett

Director of Cambridge 3-19 Curriculum

Biljana Savikj

Senior Commissioning Editor

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Today's workshop

This workshop delves into the connections between skills and knowledge in the Cambridge Pathway. You will:

- explore systems thinking, kind and wicked problem-solving, analogical and metacognitive skills
- discuss best teaching practices and share experiences
- examine the relationship between higher order thinking skills and the Cambridge learner attributes
- participate in activities to help learners develop these skills.

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Let's start with a question

What will be more important for today's learners, thinking about equipping them well for the future (considering technology change, sustainability issues, the pace of change, wellbeing):

A. Knowledge?

B. Skills?

C. Both knowledge and skills?

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Won’t we be able to access all the knowledge and information we need instantly?

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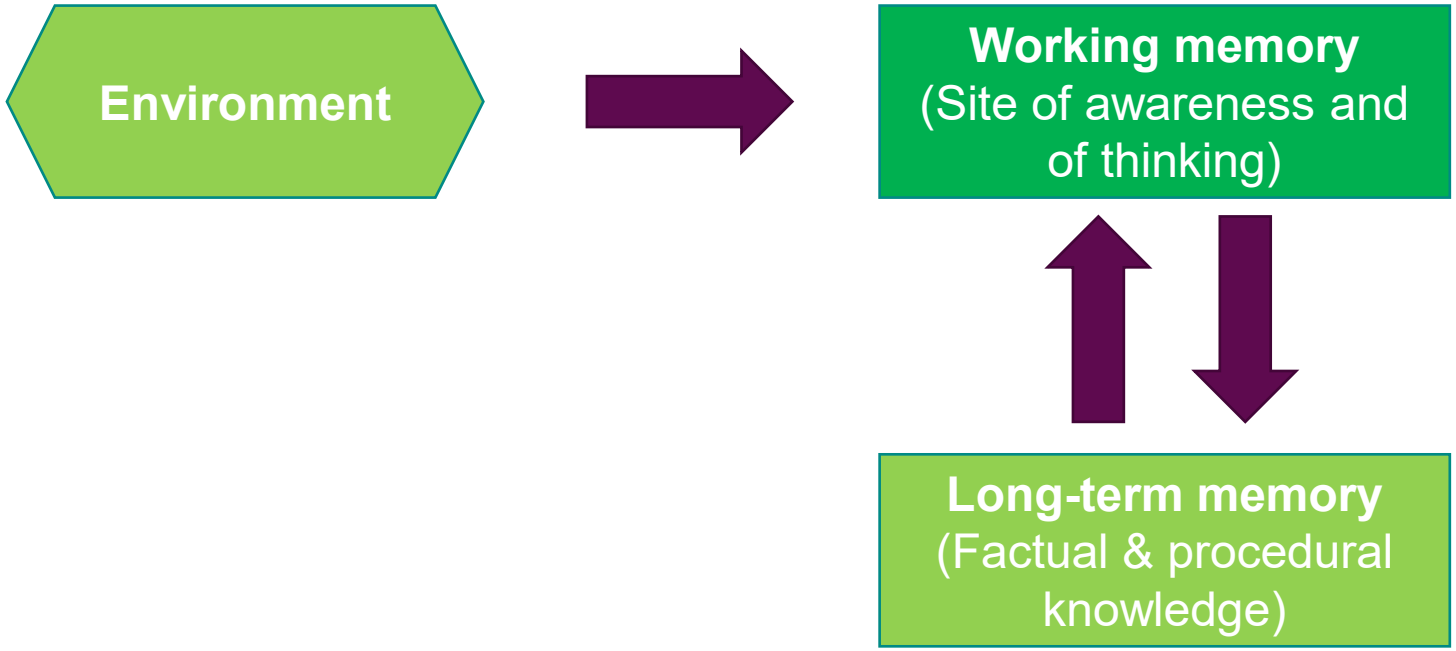
The good news

Curricula can be both knowledge-rich AND skills-rich.

Skills and knowledge are deeply intertwined.

“Deeper thinking skills need content on which to work. You cannot use deeper thinking skills unless you have something to think about.” (John Hattie, 2015)

Just about the simplest model of the mind possible



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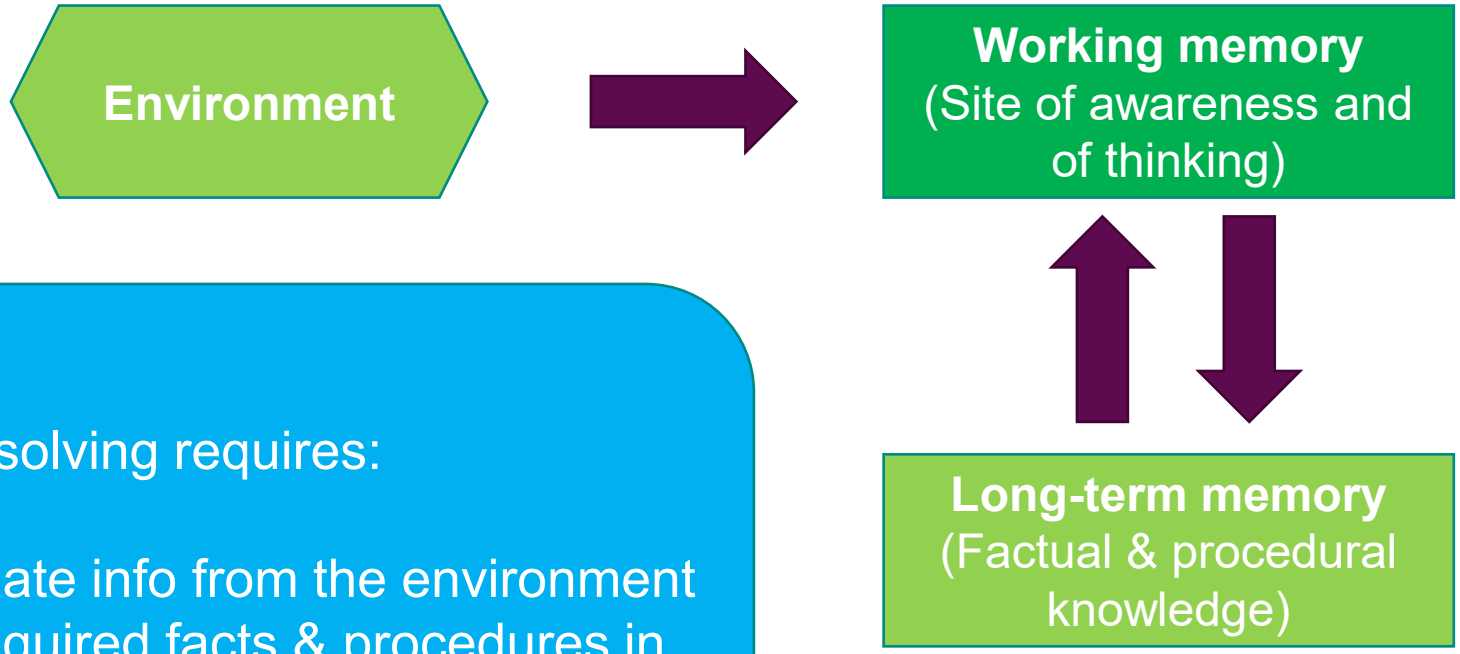

Problem-solving requires:

- Adequate info from the environment
- The required facts & procedures in the long- term memory
- Room in the working memory

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What are ‘future’ skills?

- There are hundreds of skills that could be considered necessary for the future.
- Researchers in the Digital Education Futures Initiative (DEFI) reviewed 99 frameworks. Their analysis generated this figure.

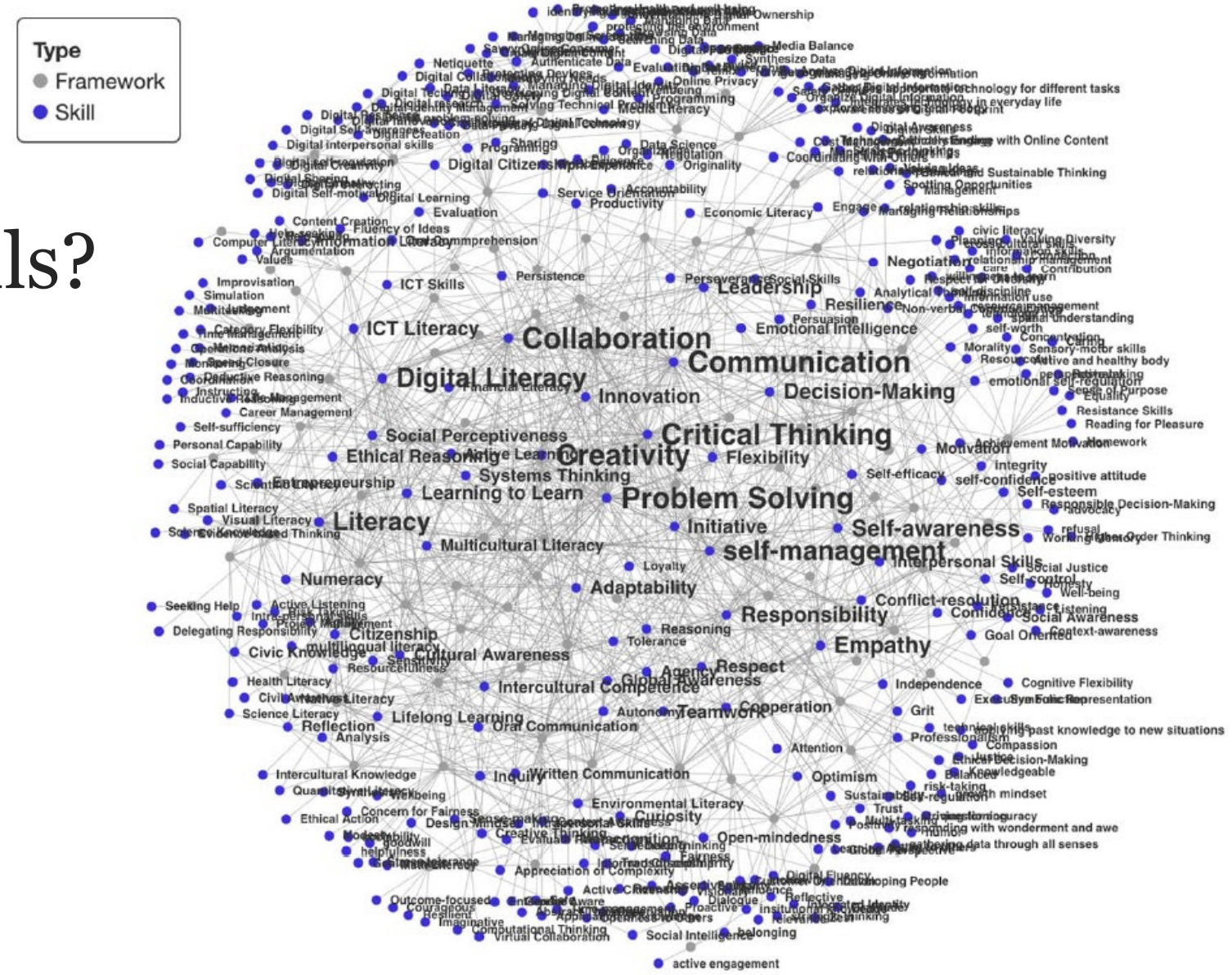

Figure 3. Two Mode Network Diagram of Frameworks and Skills.

9 Meta-categories of future skills

DEFI researchers recently conducted a scoping review (Kotsiou et al. 2022), analysing 99 frameworks of future skills which cover 341 skills.

These skills were grouped into 9 meta-categories.

- Higher order thinking skills
- Dialogue skills
- Digital & STEM literacy
- Values
- Self-management
- Lifelong learning
- Enterprise/ innovation
- Leadership skills
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Systems thinking skills

- About examining relationships and dynamics within systems that are often complex, enabling informed decisions that account for broader contexts and long-term consequences of actions.
- Arguably, some of the most pressing global issues, such as war, famine, poverty, and climate change, are fundamentally the result of systemic failures.

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Problem-solving skills

- Often involves overcoming obstacles to achieve goals.
- **Analogical thinking**, which identifies similarities across different contexts, is often critical.
- **Kind** problems are well-defined with clear goals, established rules, reliable feedback, and predictable solutions (e.g. chess problems, computer programming).
- **Wicked** problems are poorly-defined, multifaceted, ever-evolving challenges. Info is often incomplete or contradictory (e.g. deforestation, political problems).

Metacognitive skills

- Thinking about one's own thinking.
- This involves planning, monitoring, evaluating, changing, and reflecting on one's own learning behaviours.
- **Metacognitive knowledge:** (e.g. I have trouble remembering dates).
- **Metacognitive regulation**: (e.g. This problem-solving strategy isn't working so I should try something else).

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Where do these skills feature in Cambridge subjects?

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Activity

We have collated a number of specimen questions from different AS and A level subjects (English Language, Geography, Physics and Psychology).

Using the definitions of the future skills we have highlighted, consider whether tackling these questions would help learners to develop these skills.

Discuss with a partner

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Feedback

How did you find the task?

What can we do to help learners understand the skills they are developing through studying subject disciplines?

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Nurturing skills nurtures the Cambridge Learner attributes

Cambridge learners	Cambridge teachers
Confident in working with information and ideas – their own and those of others.	**Confident** in teaching their subject and engaging each student in learning.
Responsible for themselves, responsive to and respectful of others.	**Responsible** for themselves, responsive to and respectful of others.
Reflective as learners, developing their ability to learn.	**Reflective** as learners themselves, developing their practice.
Innovative and equipped for new and future challenges.	**Innovative** and equipped for new and future challenges.
Engaged intellectually and socially, ready to make a difference.	**Engaged** intellectually, professionally and socially, ready to make a difference.

Where can you see links between the skills we've been discussing and our Learner and Teacher Attributes?

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Higher-order thinking skills in published resources

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How can we support students with these skills?

LEARNING INTENTIONS

Learning intentions open each topic. These help you to navigate through the coursebook and highlight the most important learning points in each topic.

KEY TERMS

Key vocabulary is highlighted in the text when it is first introduced. An accompanying definition tells you the meanings of these words and phrases. You will also find definitions of these words in the Glossary at the back of the book.

TASK: Study Source

Some tasks are accompanied by source material such as maps, images, and charts which you will use to answer questions, complete tasks and develop your geographical skills.

Detailed Specific Examples

Detailed specific examples are case studies that allow you to actively explore the concepts in each topic and apply them to a recent, real-life context. Each example has accompanying sources and tasks for you to further practice and develop your skills. In the digital version of the coursebook, you will also have access to a video for the detailed specific example in each topic, alongside additional questions available in the Teacher's Resource.

GETTING STARTED

At the beginning of each topic there is a getting started activity. These are pair, group or class activities that introduce you to the topic and provide you with the opportunity to show how much you already know about the topic you will be learning.

TASK

You will find a variety of tasks throughout the coursebook. These give you opportunities to think about what you have learned, discuss topics, answer questions or produce your own work either individually, in pairs or in groups.

TIP

These are helpful reminders or notes that give advice on skills or methodology. You will find them most often near activities, where they will be directly relevant to the task.

REFLECTION

These activities enable you to look back on your work and encourage you to think about your learning. You will reflect on and assess the process that you used to arrive at your answers.

THINK LIKE A GEOGRAPHER

This is an opportunity for you to use the skills you are developing within the topic and apply them to your lives today. You will begin to make connections between employment and studying geography.

Skills

Learning and developing geographical skills is an important part of this course. As well as a dedicated skills section, individual tasks highlight using **bold text** when a skill is being used.

The Digital Coursebook contains videos to accompany the detailed specific examples. The videos encourage students to talk about the themes of the topic, introduce topic vocabulary and describe and explain concepts, processes and job roles related to the detailed specific example. Additional questions to accompany the videos are included in the Teacher's Resource.

IMPROVE THIS ANSWER

Each topic includes an example of an answer to an extended writing question, with detailed analysis of how the answer is successful and areas for improvement. You can use these examples to write your own answer to the question, and to help you think about how to answer practice questions later on.

PROJECT

Each topic contains a project that uses the skills you develop throughout the coursebook. The project encourages you to apply these skills to a real-world task in pairs or groups.

SELF-EVALUATION CHECKLIST

The summary checklists provide you with a series of statements at the end of each topic outlining the content you should now understand. When you are revising, you might find it helpful to rate how confident you are for each of these statements. You should also provide an example to support your chosen statement.

Practice questions

At the end of each theme, you will find a set of practice questions for each topic that use the command words from the syllabus. To answer these, you will need to apply what you have learned throughout the topics you have just studied.

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Resource creation activity

Objective: Create new resources that promote higher-order thinking.

Activity: In groups, create a new educational resource (e.g., a worksheet, project outline, or assessment) designed to develop higher-order thinking skills.

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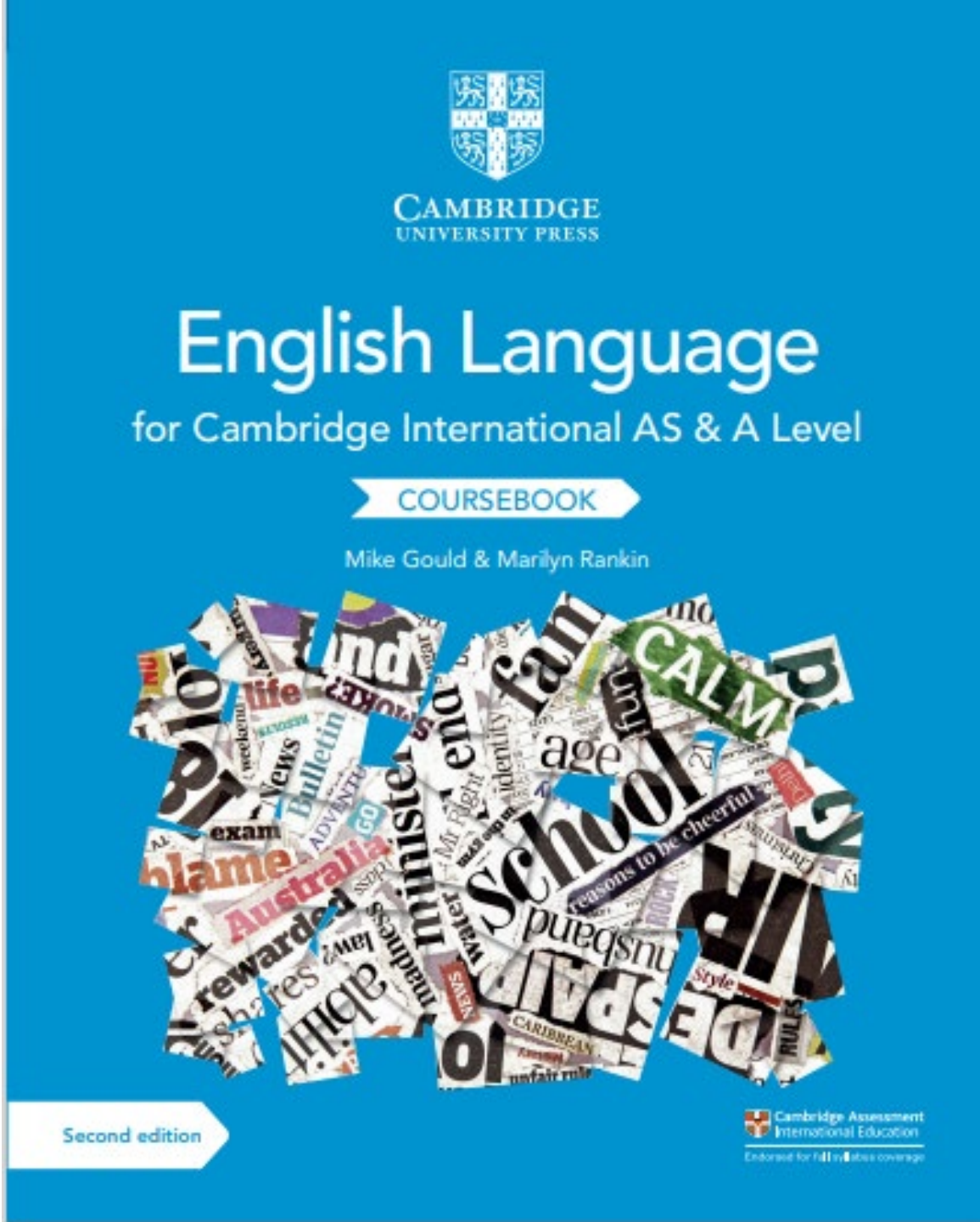
AS & A Level English

Take the following learning objectives to create a resource that develops higher-order thinking skills:

LO1: Understand what voice and viewpoint are.

LO2: Explore how they contribute to the effects of a text.



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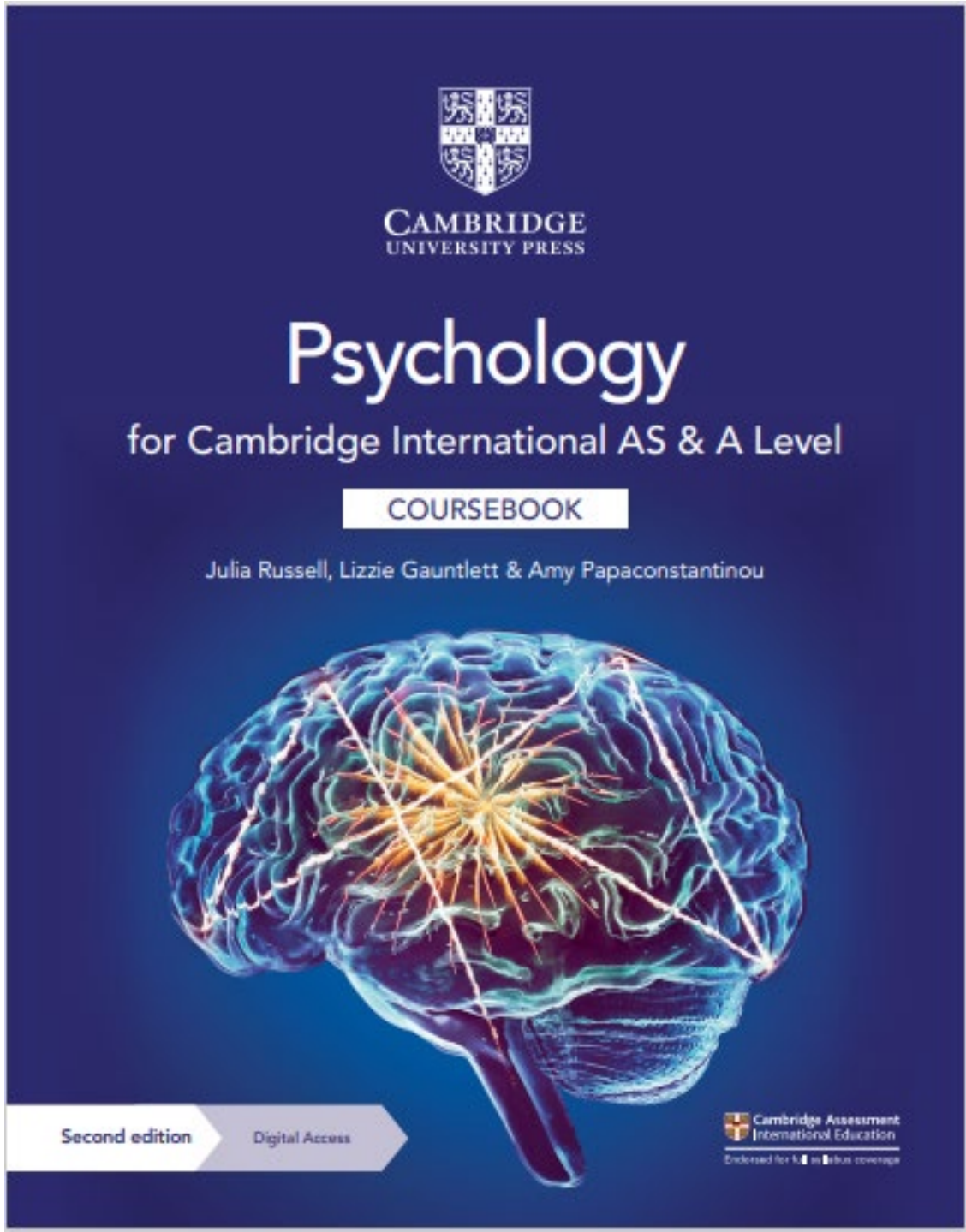
AS & A Level Psychology

Take the following learning objectives to create a resource that develops higher-order thinking skills:

LO1:Evaluate the use of experiments in psychological research including the use of experimental and control groups/ control conditions.

LO2: Apply knowledge of experiments to a given novel research scenario.



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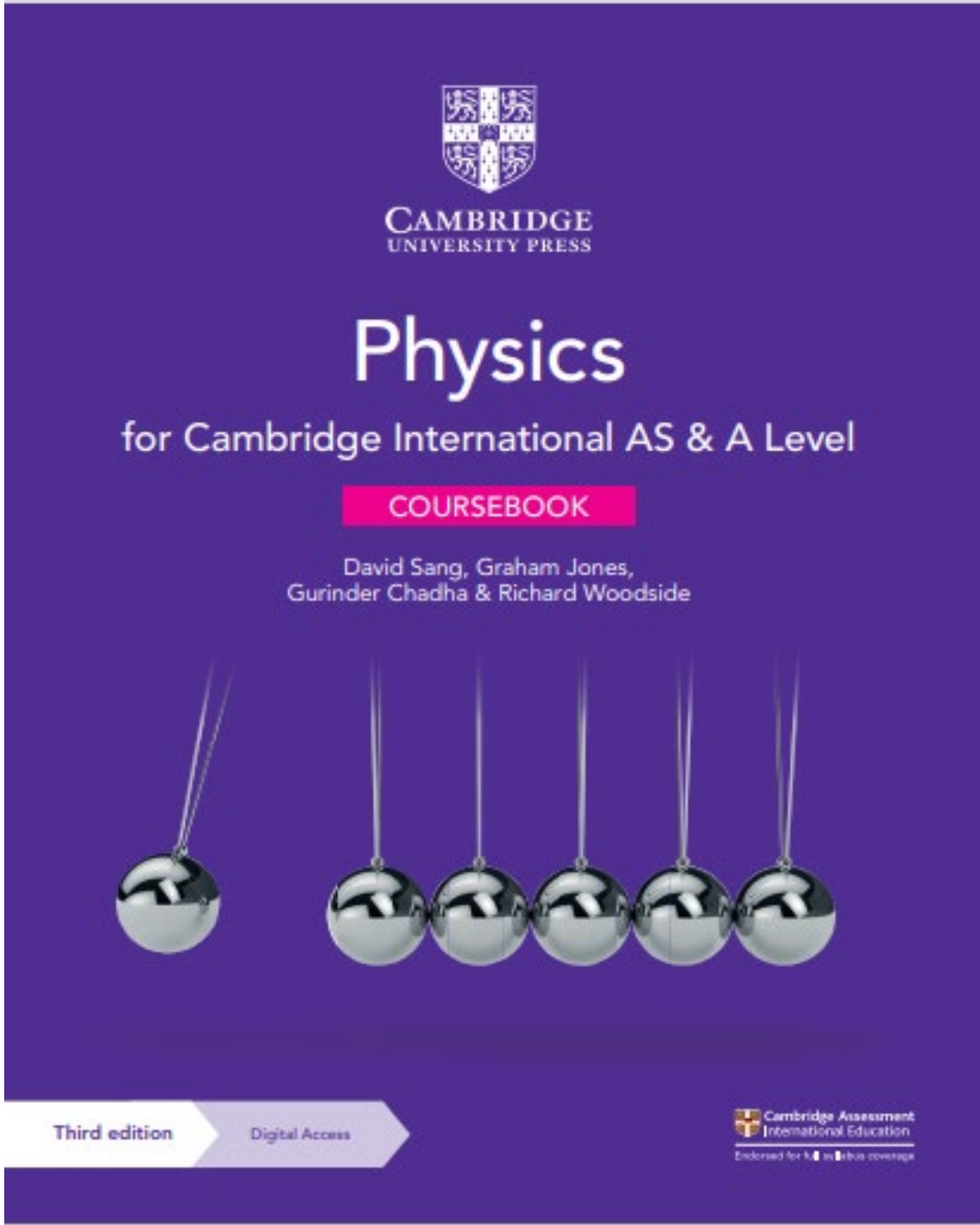
AS & A Level Physics

Take the following learning objectives to create a resource that develops higher-order thinking skills:

LO1: Understand the use of X-rays in imaging internal body structures, including an understanding of the term contrast in X-ray imaging.

LO2: Understand that computed tomography (CT) scanning produces a 3D image of an internal structure by first combining multiple X-ray images taken in the same section from different angles to obtain a 2D image of the section, then repeating this process along an axis and combining 2D images of multiple sections.



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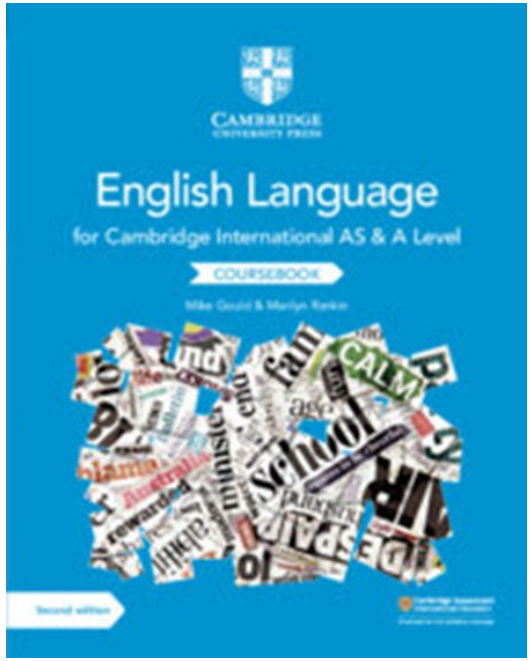
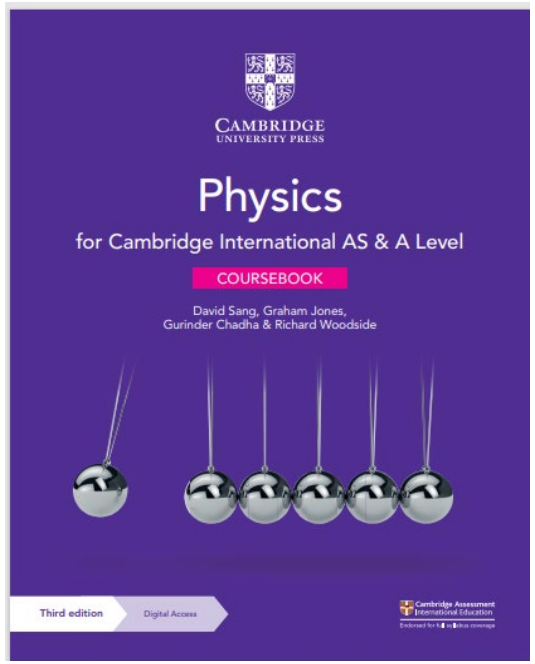
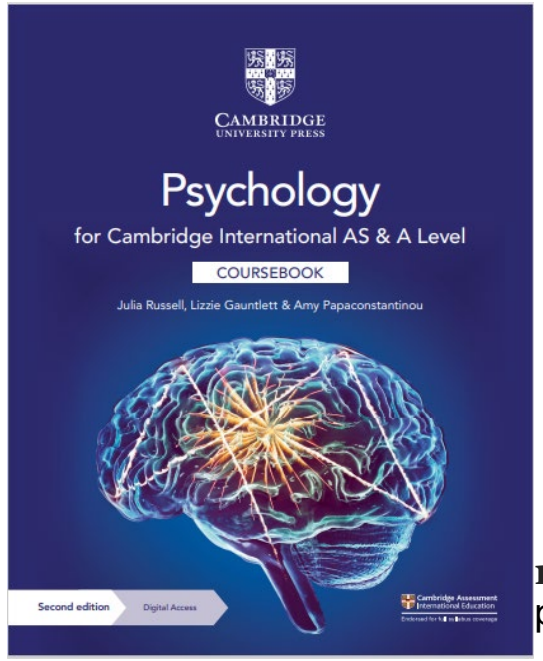
Feedback

Now report back to the whole group about the activity that you created in your group.

How can we develop published resources that support these skills?







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Conclusion

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Any questions?

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Your feedback

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