Developing questioning

ART

This document has been written to support teachers in developing effective questioning based on Bloom's revised Taxonomy and utilising the 'Knowledge Dimension' and 'Cognitive Process Dimension'. Focusing on knowledge acquisition recognises the OFSTED expectation that schools must ensure pupils are taught knowledge, as well as skills, in all subjects. It also reflects the research into effective teaching that underpins the latest OFSTED handbook and Inspection Framework grade descriptors.

Metacognition is a proven way to rapidly improve pupils' learning and progress. The Education Endowment Foundation's 'Teaching and Learning Toolkit' states, "Metacognition and self-regulation approaches have consistently high levels of impact…"

Education inspection framework: Overview of research (OFSTED January 2019)

Effective questioning is one of the most widely studied aspects of teaching. We therefore have considerable evidence in this area. Teachers provide substantive feedback to pupils, resulting either from pupils' questions or from answers to teachers' questions. Most questions can elicit correct or at least substantive answers.

Correct answers need to be acknowledged in a positive but business-like fashion. When a pupil answers a question partially correctly, the teacher can prompt that pupil to find the remaining part of the answer before moving on to the next pupil. When a pupil answers a question incorrectly, the teacher needs to point out swiftly that the answer is wrong. If the pupil has answered incorrectly due to inattention or carelessness, the teacher needs to try and prompt the pupil to answer correctly. If the answer is incorrect due to lack of knowledge, the teacher can move swiftly on to the next pupil.

Teachers need to make sure that girls and shy pupils, who may be less assertive, have the chance to answer questions.

The types of questions asked are typically varied and depend on the knowledge and skills to be mastered. The best strategy would appear to be to use a mixture of recall and higher-order questions, increasing the latter as the level of understanding increases. This does not mean that a mix should be used in all lessons; depending on where the lesson sits within a sequence of lessons about a particular topic, the balance can be strongly towards one or the other. Teachers can use both product questions (calling for a single response from pupils) and process questions (calling for explanations from pupils).

Again, the balance will depend on the lesson and topic. Pupils can be encouraged to ask questions, which can be redirected to the class before being answered by the teacher.

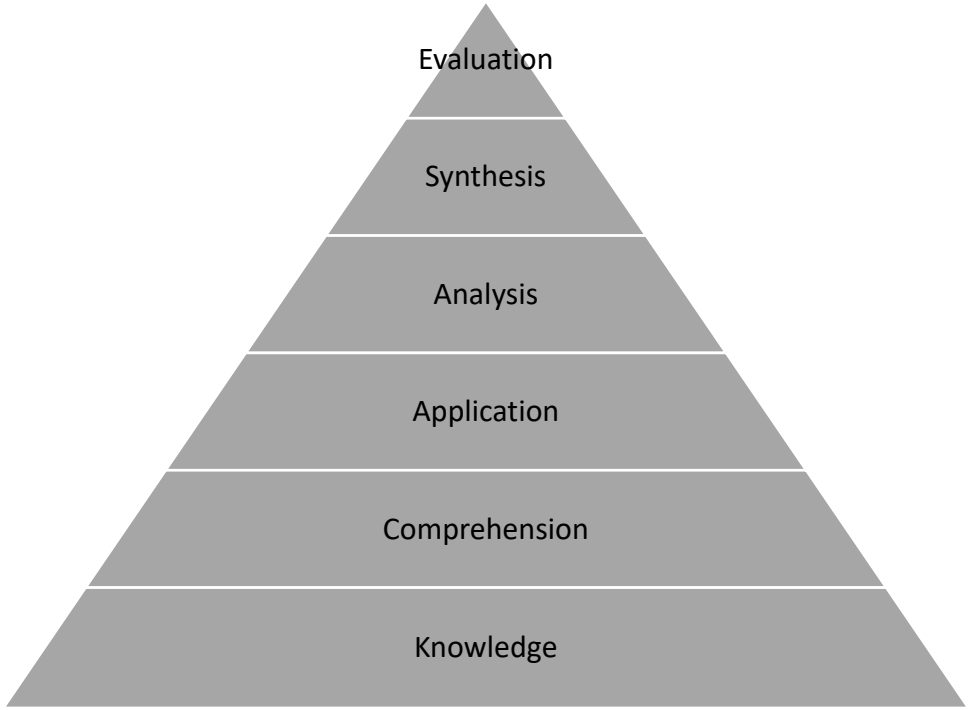
Bloom’s Taxonomy

In 1956, Benjamin Bloom headed a group of educational psychologists who developed a classification system for levels of cognitive skills and learning behaviour. The classification system they created is often referred to as Bloom's Taxonomy. The word taxonomy means classifications or structures. Bloom's Taxonomy classified thinking according to six cognitive levels of complexity:

1. Knowledge
2. Comprehension
3. Application
4. Analysis
5. Synthesis
6. Evaluation

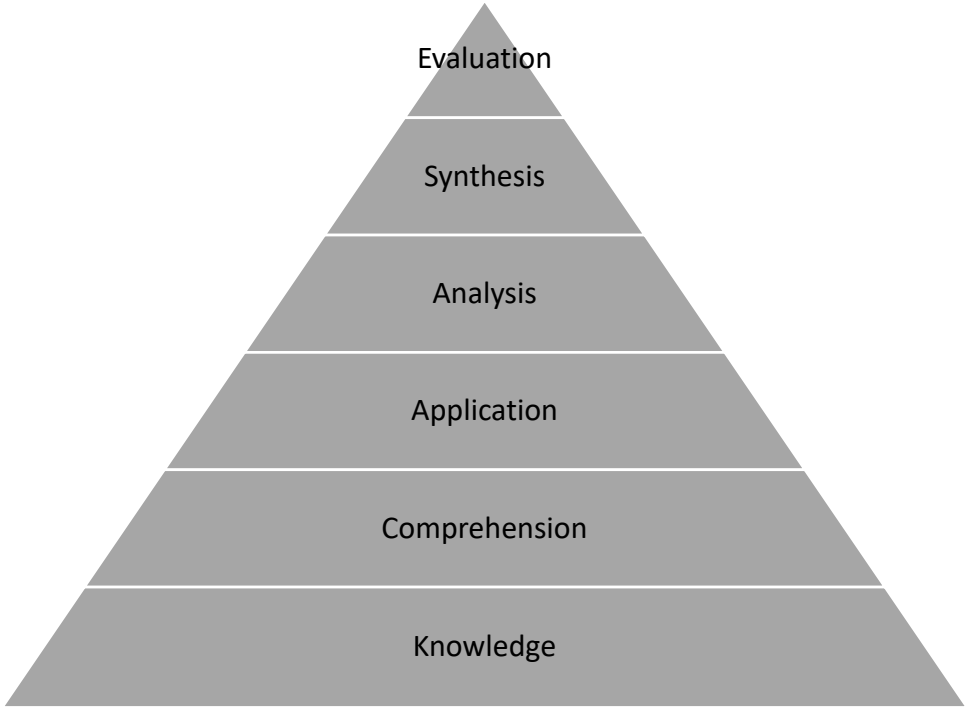
The categories are ordered from simple to complex and from concrete to abstract. The classification is often referenced as a progressive climb to a higher level of thinking with the highest level being "evaluation."

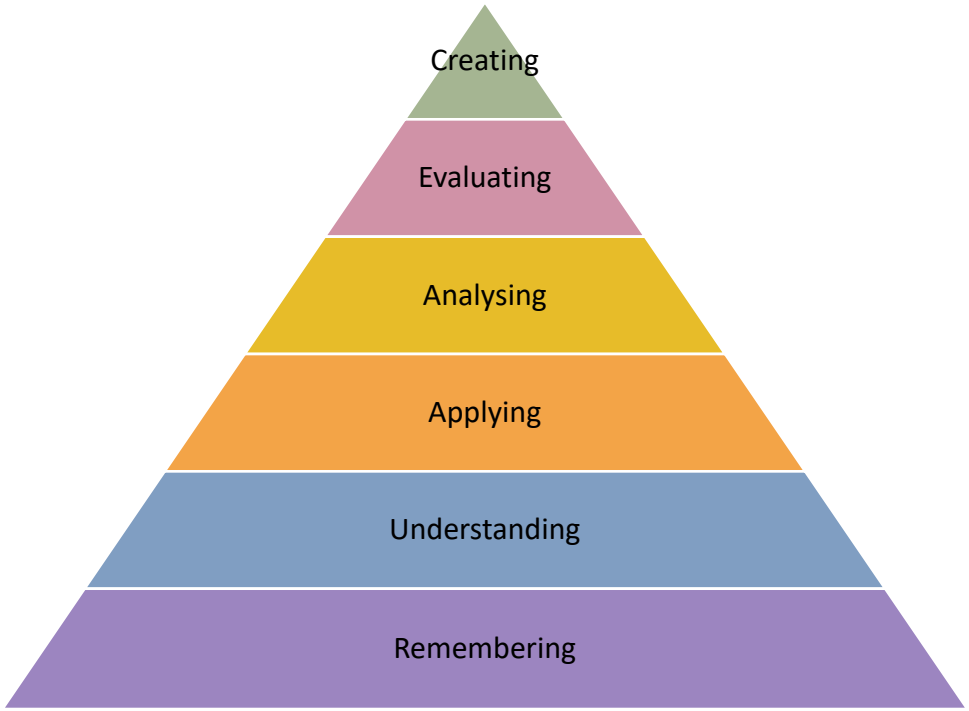
The basic or lowest level in the taxonomy deals with simple knowledge acquisition. At this level, people simply memorise, recall, list, and repeat information. The cognitive complexity grows at every level. At the highest levels, people are able to build a mental structure from diverse elements and are able to put parts together to form a whole, as well as make judgments about the value of ideas.



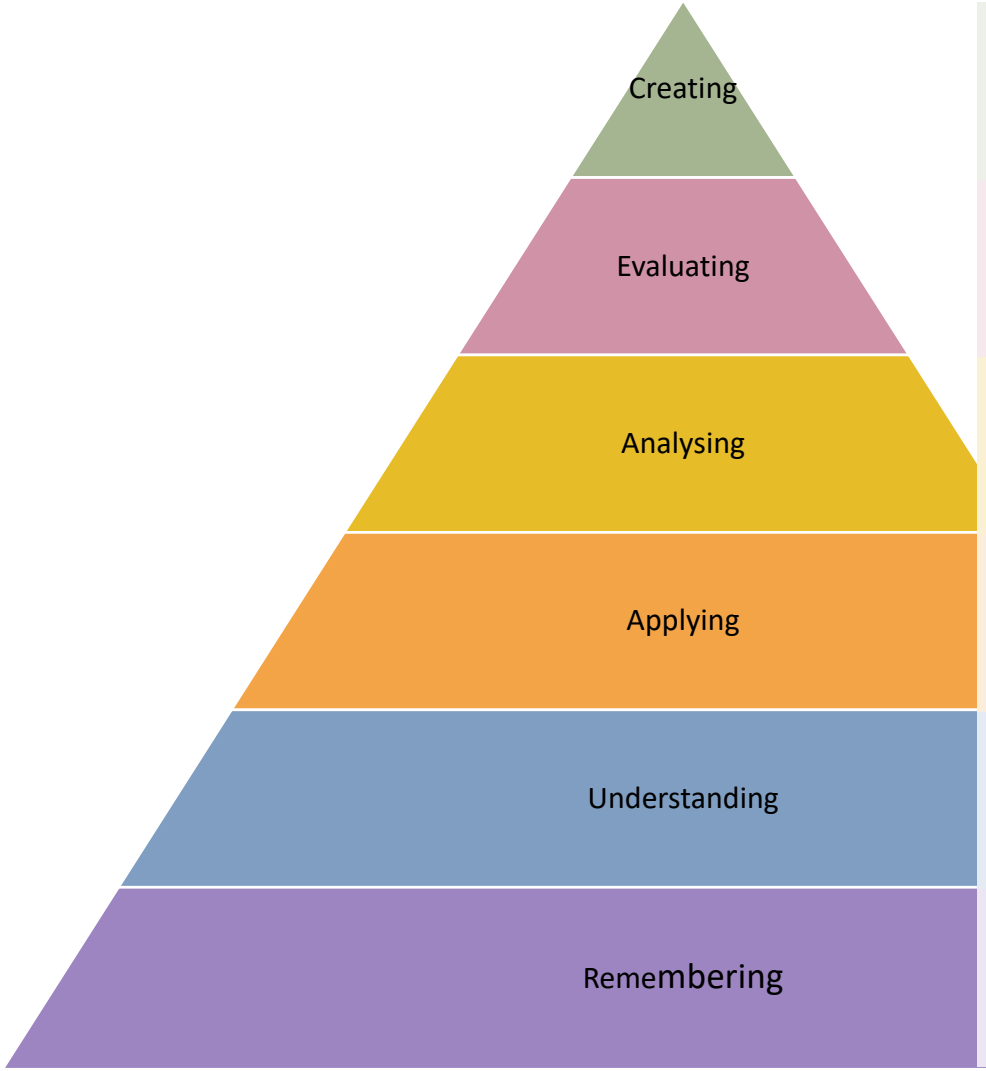
During the 1990's, Lorin Anderson and a group of cognitive psychologists, including David Krathwohl, updated the taxonomy. The revisions they made appear fairly minor, however, they do have significant impact on how people use the taxonomy. The first thing most people recognise is the different terminology. The revised version changes the names of each of the six levels. For example, the lowest level of the original taxonomy, "knowledge", was renamed and classified as "remembering." It is also important to note the change from nouns to verbs to describe the different levels of the taxonomy. The names of the major cognitive process categories were changed to indicate action because thinking implies active engagements. Knowledge is an outcome or product of thinking; it is not a form of thinking. Consequently, since the word "knowledge" inaccurately described a category of thinking, it was replaced with the verb "remembering."

The revision emphasizes the use of taxonomy as a tool for alignment of curriculum planning, instructional delivery, and assessment. Additionally, the revision is aimed at a broader audience. The original taxonomy was viewed as a tool best applied in the younger year groups at school. The revised version is more universal and easily applicable at primary and secondary levels, as well as in adult training.





The Cognitive Process Dimension



Creating	Putting elements together to form a coherent or functional whole; reorganising elements into a new pattern or structure through generating, planning, or producing. This includes generating new ideas, products, or ways of viewing things.
Evaluating	Making judgments based on criteria and standards through checking and critiquing. This includes justifying a decision or course of action.
Analysing	Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organising, and attributing.
Applying	Carrying out or using a procedure through executing, or implementing. Basically, this is using the information in another familiar situation.
Understanding	Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarising, inferring, comparing, and explaining. This is essentially demonstrating understanding of information by explaining ideas or concepts.
Remembering	Retrieving, recognising, and recalling relevant knowledge from long-term memory. This level is simply remembering or recalling previous learned information.

Just like the original taxonomy, the revised version provides a valuable framework for teachers, trainers, and instructional designers to use to focus on higher order thinking. By providing a hierarchy of thinking, both versions can help in developing performance tasks, creating questions, or constructing problems.

The following illustrates the level of thinking and the expectation of the learner at each level of the hierarchy. It helps gauge if the learner can demonstrate his or her ability at that level.

Levels	Measurement
Remembering	Can the learner recall or remember the information?
Understanding	Can the learner explain ideas or concepts?
Applying	Can the learner use the information in a new way?
Analysing	Can the learner differentiate between the various parts or components or the whole?
Evaluating	Can the learner justify a position or decision?
Creating	Can the learner create a new product, generate a new idea, or create a different thought process?

Moving to the Higher Order of Thinking

Below is an example of moving from the lower levels of the taxonomy to the higher levels as you teach a topic, in this case, 'fruit'. Each level is built on the preceding lower level. As you move higher, each level becomes more challenging.

Levels	Challenge
Remembering	List different types of fruit
Understanding	Explain why they are classified as fruits
Applying	Draw and label a diagram of the parts of your favourite fruit
Analysing	Compare each fruit finding the characteristics that make it different from the others
Evaluating	Determine and justify which fruits are the healthiest
Creating	Create a drink using three fruits that would be considered extremely healthy

Assessing mastery at each level - below is a list of examples you can use to ascertain the level of mastery:

Remembering

- Write the definition of a vocabulary word
- List the parts of a bicycle
- Name the main characters in the book
- Name the counties in Africa

Understanding

- Summarise the main idea of the story
- Draw a picture showing the word's meaning
- Classify the parts of speech in the sentence given
- Predict what will happen to the object when placed in water

Applying

- Describe how you would use this net to catch fish
- Write a sentence using three new vocabulary words
- Apply the principles of learning to the workshop
- Solve the problem using the concepts given

Analysing

- Compare how the climate is similar between two counties
- Explain why the main character decided to make the decision she did
- Determine which part of the bicycle is most important
- Research the best methods of removing stains from clothing

Evaluating

- Explain the best alternative among the three choices
- Determine which character in the stories was the most impacted by the events
- Decide which parts of speech are most valuable to creating a sentence
- Assess the value of the items on the table

Creating

- Design a device that can pick up small objects
- Create a game that will help students learn vocabulary words
- Write a story that leaves the reader in suspense
- Generate three ideas on how to improve the learning process

The Knowledge Dimension

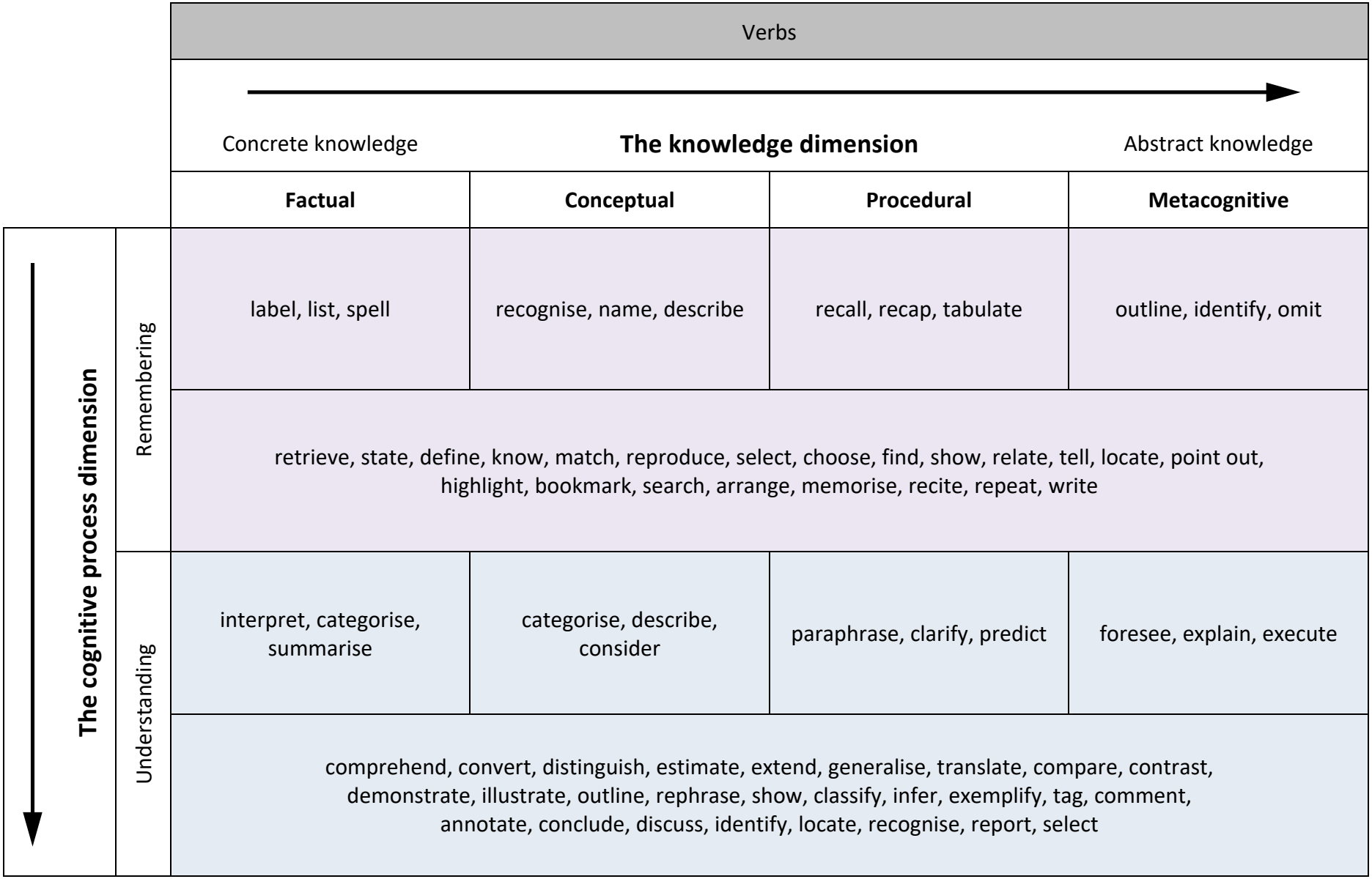
The knowledge dimension represents a range from concrete (factual) to abstract (metacognitive) knowledge.

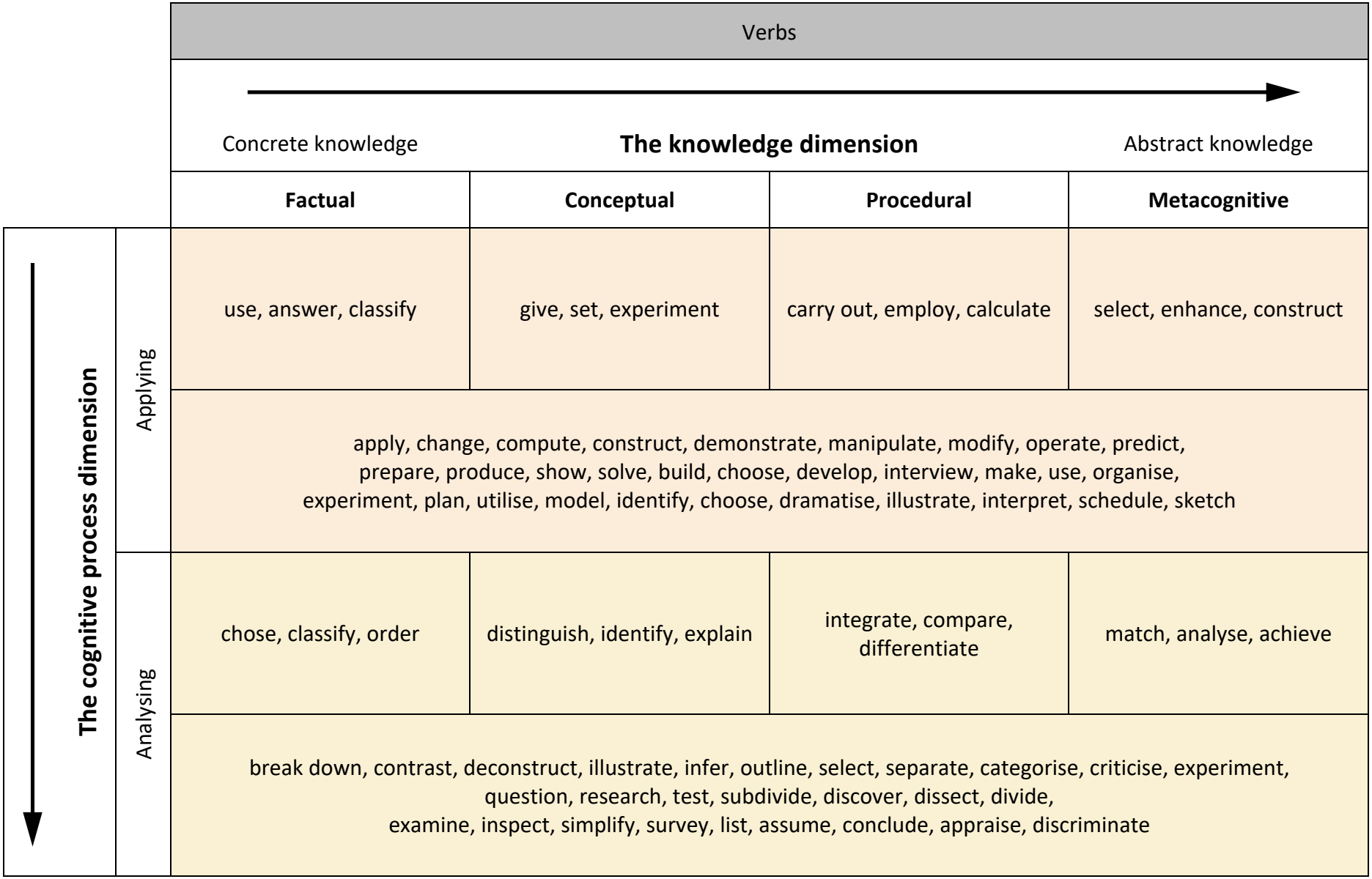
Concrete knowledge	**The knowledge dimension**		Abstract knowledge
Factual	**Conceptual**	**Procedural**	**Metacognitive**
• knowledge of terminology • knowledge of specific details and elements	• knowledge of classifications and categories • knowledge of principles and generalisations • knowledge of theories, models, and structures	• knowledge of subject-specific skills and algorithms • knowledge of subject-specific techniques and methods • knowledge of criteria for determining when to use appropriate procedures	• strategic knowledge • knowledge about cognitive tasks, including appropriate contextual and conditional knowledge • self-knowledge

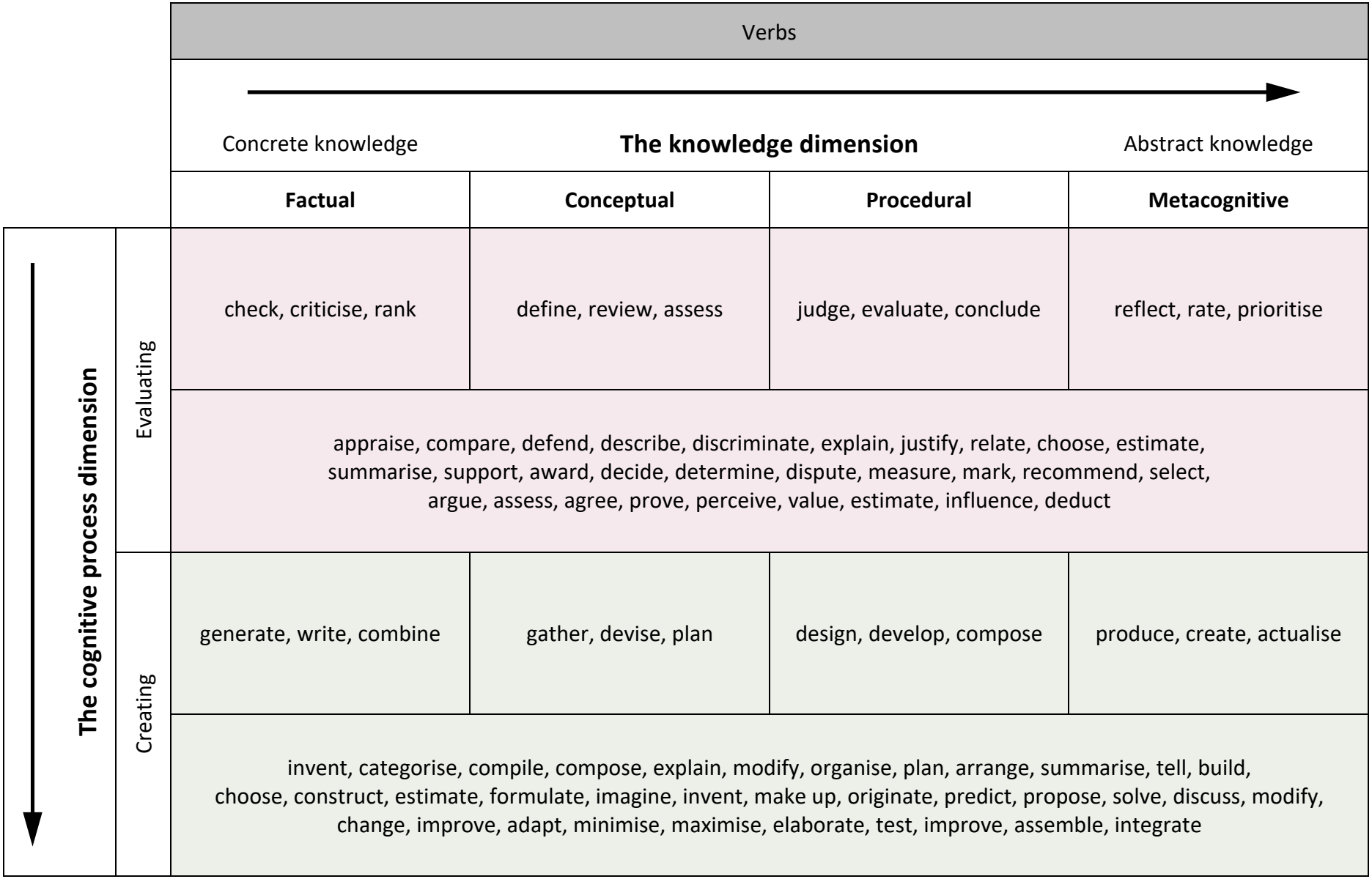
Bloom's Taxonomy - action verbs

The chart on the following pages shows action verbs for each level of the revised taxonomy. By creating learning objectives and questions using these action verbs, teachers indicate explicitly what the learner must do in order to demonstrate learning.

Subject level questions, which follow, are based on these action verbs within the context of the 'Knowledge Dimension' and 'Cognitive Process Dimension', and relate to the National Curriculum Programme of Study (2014).







		Art			
		Concrete knowledge → **The knowledge dimension** → Abstract knowledge			
		Factual	**Conceptual**	**Procedural**	**Metacognitive**
The cognitive process dimension ↓	Remembering	Which artist painted this picture? Can you identify this artist? What colour is this? Which are the primary colours? Which are the secondary colours? Which are the tertiary colours?	Which colours will you mix to make brown? What does [texture/medium/abstract] mean? What is this style of painting called? What tools do we use to shape the clay?	What do you need to remember when working with clay? How did you create that effect? What are the steps to developing the layers? What [process/medium/ technique] did that artist use?	How does your sketch book help you? Which methods did you use? Which resources helped you create the final piece of art work? Have you used similar methods before?
	Understanding	Which technique did you use? Why did you do it this way? Why did the artist choose this [technique/medium/style/colour]?	Can you classify these objects? Which of these pictures are examples of [Neoclassical/Pop Art/Impressionism/Cubism]? What was the main idea or theme the artist was trying to convey? Which of these pictures is the odd one out? Why?	How will you produce this effect? What steps will you follow to make this? Can you explain the [process/style] to a friend? Can you show me what I did when I showed you how to make the clay bowl?	What might help you understand this aspect of art? Can you predict what will happen if…? How does that resource help you? Why is [technique] important?

		Art			
		Concrete knowledge → **The knowledge dimension** → Abstract knowledge			
		Factual	**Conceptual**	**Procedural**	**Metacognitive**
The cognitive process dimension ↓	Applying	What do we know about the media we are using that will be useful in our work? What do you already about colour mixing that might help you? How would you describe…? What is same as the last piece of art you produced?	What theme links these examples of art? How could you create a 3D effect here? How might these two different media be used together? How is this typical of art in this [style/period]?	How do you use this [tool/technique/medium] in this situation? Can you use the same steps as before? What technique/s will you use to develop your final piece? How can you develop the range of colours on the palate?	If you were able to, what questions would you ask the artist? Which techniques will you use to improve your work? How will you present your final piece of artwork? Do you need to adapt a task to fit your preferred learning style?
	Analysing	How is your picture typical of [style]? Could there be another outcome? How do you know the picture is probably by the same artist? Why did the artist change style?	How is … similar to …? How do you distinguish between this piece and the other piece? How is this technique more effective than the first method you tried?	Is there a more effective process? How has the final piece developed from your sketches? Can you explain what must have happened when…? If you used a different process, what might be the impact?	What do you already know about [aspect of art] that might be useful? Do you know how to work through this process? What are the most useful pieces of information? How would seeing more examples of art from this period or style help you?

		Art			
		Concrete knowledge → **The knowledge dimension** → Abstract knowledge			
		Factual	**Conceptual**	**Procedural**	**Metacognitive**
The cognitive process dimension ↓	Evaluating	Why is that section of your picture most in the style of [artist]? What specific art vocabulary best describes the differences between the two pieces? Why does the [dry brush/ink wash/airbrush] technique work in this style of picture? Could you classify the artworks using your own criteria, using the vocabulary we have learned?	Why do you prefer the work of [Monet/Picasso/Rembrandt/ Dali/Seurat]? What influence has … had on art? What do you think about graffiti? Is it a good or a bad thing? What do you think about [abstract art/Expressionism/collage]?	Why did you choose this alternative approach? Can you explain the benefits of [technique]? How would you repeat this artwork again, based on what you have learned? Can you simplify the technique or process?	If you were learning about this aspect of art again, what would you do differently? Why? What helps you learn in art? Why? What do you find most difficult in art lessons? Why? Which are the most useful artistic techniques and knowledge to remember? Why?
	Creating	Can you show how [landscape/portrait] art has developed using a time line? How do you define [artistic term]? How many different emotions can you show using [method]? Where does the frame give the best view of this artwork?	If you could use any media, why would you choose…? Can you create a new version of this work? Can you decide which is the most contrasting pattern? How can you improve the effect to draw the viewers' eyes to the main feature of the picture?	Can you devise your own way to…? What would happen if you changed…? How many ways could you add texture to your work? Can you improve the process to develop light and shade in the piece?	What do you want to learn in this unit of work and why is it useful? Can you select work that demonstrates your learning about…? Can you describe what makes a really great artist? How will you develop your art skills and knowledge next?