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Developing Online Worksheets That Work

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Christian Moro and Shelley Kinash

In many schools and universities, online portals have become fundamental platforms for the provision of information between lecturers, tutors and students. Online communications open a range of opportunities to provide information, worksheets, and lecture notes to entire cohorts. However, with this ease of providing resources, the supporting functions of the educator need to be maintained. This includes questioning techniques, clear instructions and clarification of textbook and curriculum statements. Students learn in different ways and although many lecturers are familiar with how to provide individual, personalised information and questions in tutorial and classroom settings, many are unsure how to facilitate through the digital realm. With the use of analytical terminology, probing questions, and the provision of targeted information, online platforms can be used to engage the individual learner and deliver effective teaching resources to a diverse range of students.

Choosing The Correct Command Terms For Worksheets

Command terms (also called action verbs or instructional verbs) provide a method to define expectations when answering a question, and clearly indicate the tested skills. A scan of current online resources in an institution will reveal dozens of scanned worksheets which include "calculate the..." or "what is the..." as the main and recurrent questions and objectives. These sheets correspond and add to the content provided in textbooks, through additional questions and problems. However, their main purpose is usually unidentified and unclear. Rather than providing these 'rote learning' styles of questions and exercises, online resources could be used to bring about a far greater understanding of a topic. Prior to submitting an online resource, it is important for the educator to analyse:

- The main objective for the provision of the online resource. Are these worksheets meant to help the student understand the information; is it a test of the students knowledge in the area; or are they provided to give harder, more complex questions to challenge the student?
- What kind of thinking level is required to complete the task or test? Will knowing a formula in the textbook be enough, or will the student be required to understand the applications in the real-world?
- The target audience. Can all students complete these worksheets or are they only provided as an extension exercise for those who seek greater challenges?

The simple use of command terms can assist in demonstrating the educator's objectives to the student and the required use of higher thinking skills (Figure 1).

Thinking Skills

Figure 1: The basic underlying principles of higher-order thinking in relation to the question requirements. Online resources simply based around knowledge recall involve a lower level of thinking than resources that require evaluations of information. Image adapted from Bloom (1956).

Preparation Of Online Resources

Questions that commence with the command terms: Define, List, Label or State, tend to involve knowledge and comprehension activities which are targeted at the introductory or foundational level of a student's understanding. Apply, Describe, Distinguish and Outline, are commands that usually necessitate application and analytical thinking. Analyse, Compare, Deduce, Discuss, Evaluate and Explain, are commands that can require higher-level thinking skills, such as those related to synthesis and evaluation.

It is likely that set subject textbooks provide an acceptable range of knowledge and comprehension activities. Newer textbooks also encourage application and analysis of the work provided. However, there is a gap between what is developed through the textbook and what is addressed through examination; in that most of the latter have questions requiring synthesis and evaluation skills. Online resources can bridge this gap between the textbook information and the assessment requirements. After a student

Table 1: Various command terms and thinking levels related to a statement:

The cat sat on the mat	
Knowledge and comprehension	List the activities the cat is performing.
	Label the cat's preferred seating.
	State what the cat is doing.
	Define the role of the mat in relation to a cat's activities.
Application and analysis	Apply the information provided to infer what would occur if a larger cat walked into the room.
	Distinguish the difference between the sizes of mats and the preference of the cat, referring to the information provided.
	Outline what might occur if there was no mat.
Synthesis and evaluation	Compare a cat and a dog using the information provided in the statement, and suggest the activities of a dog when presented with a mat.
	Analyse what would occur if a dog walked into the room.
	Discuss the benefits of placing a mat into houses that contain cats.
	Evaluate what would occur if there was no mat.
	Explain why the cat would want to sit on the mat.
	To what extent does a mat benefit a cat.

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has read the textbook and completed the lecture/lesson/tutorial, online resources can be designed to specifically target synthesis or evaluation thinking. Command terms greatly assist in designing these types of questions.

Generally, textbooks and course materials tend to provide a number of declarative statements which the student has to find a way to understand and recall when required. Effective questioning techniques can demand a greater understanding or knowledge of the information provided and help the learner to better grasp the content. Table 1 outlines the use of command terms to test the understanding of a simple statement: The cat sat on the mat. In this case, the knowledge and comprehension questions can be answered after a quick read of the statement; however, the synthesis and evaluation command terms require a far greater understanding of the statement and its implications. Many online resources ask students to complete knowledge-type questions yet it would be far more beneficial for the educator to provide synthesis and evaluation activities, which require the student to draw upon a range of information provided in the topic to answer each scenario.

Consider A Variety Of Learning Styles For The Content On The Worksheet

Students learn in diverse ways. One helpful model to accommodate diversity when designing online worksheets is the Visual, Aural/Auditory and Kinaesthetic (VAK) (Figure 2). Most students prefer a combination of methods when learning. This is particularly evident in groups such as first year medical students who have extremely high demands placed on them to learn large amounts of content. The simplicity of the VAK model makes multiple means of information salient when designing online worksheets. Giving thought to each of the three modes of learning when preparing online worksheets will support the provision of a diverse and educational supplement which can facilitate student learning beyond that obtained from a textbook.

Figure 2: A simple version for quick reference of the VAK principle. Consideration of different learning theories will assist in the preparation of a variety of informative and useful online resources.

Some educators focus far too much on simply providing visual information or straightforward questions on online worksheets. For some topics, it is useful to think of ways to present information so that it benefits students who like to learn through auditory or kinaesthetic methods as well. Table 2 depicts a variety of activities which select each of the three VAK learning styles to assist in students' understanding of a statement.

In summary, educators can use online worksheets as a bridge between the declarative statements provided in lectures and by textbooks, and the synthesising and evaluative demands made by examinations. Workable online worksheets are designed by intentionally using command terms that match the desired progression of thinking in the education taxonomy. In addition, worksheets can be designed so that they draw upon visual, auditory and kinaesthetic cognitive activities. ETS

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Table 2: Various activities which can stimulate visual, auditory or kinaesthetic learning.

The cat sat on the mat	
Visual learning	Using the supplied image of a cat sitting on a mat, label the key features on the cat, the mat, and the surroundings.
	Write down other activities that cats enjoy. Make this into a pie chart based on your understanding of cat's enjoyment.
	Construct a flow chart of a cat's daily activities.
Auditory learning	In the lesson, we discussed the fact that most cats like to sit on mats, however, there were scenarios where this generalisation was incorrect. Explain in your own words why we encountered this problem and what were the best arguments used.
	Identify the main points that you learnt in the lesson this week, and use that information to describe why cats like to sit on mats.
	What would you say to describe the cat's activities to a person who had never seen a cat.
Kinaesthetic learning	Measure the area on the floor which would be taken up by the mat needed to accommodate a medium-sized cat.
	Draw an image of this scenario, showing the key features on both the mat and the cat. Use coloured pencils to emphasise these features.
	Design a ball-and-stick model of the cat and a mat.
	Transfer the information provided in class onto your phone or tablet.

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