St Andrew's College Preparatory School

Quality Questioning Using the SOLO Taxonomy

Workshop

Adapted from a presentation by the NZ Uniservices asTTle team

Who will find this workshop useful?

- Teachers
- Parents (for information)

How to use this workshop:

To update, review and/or reflect on classroom questioning practice.

As a focus for professional development in assessment for learning.

For information.

Introduction

When asTTle items were being designed the developers needed to ensure that test questions had differing levels of cognitive demand that required students to think deeply as well as at a surface level.

Why was this an issue?

Levels of thinking

As we know, not all thinking or knowing is the same. Yet 80% or more of all questions teachers ask (spoken or written) can be answered with lower-order thinking skills: – by recall or remembering – by knowledge – by simple handling of a restricted set of ideas, data, knowledge

If we can develop students' higher-order thinking skills this will enhance their metacognitive abilities and hence their learning.

Taxonomy

The asTTle team looked for a set of broad cognitive categories (a taxonomy) that would describe thinking processes in a scale of increasing difficulty or complexity.

SOLO is such a taxonomy

You may also be familiar with Bloom's Taxonomy of Educational Outcomes.

Why use SOLO?

SOLO is a true hierarchic taxonomy – increasing in quantity and quality of thought

SOLO is a powerful tool in differentiating curriculum and providing cognitive challenge for learners

SOLO allows teachers and learners to ask deeper questions without creating new ones

SOLO is a powerful metacognitive tool

All asTTle tests have been developed with a minimum of 25% surface and 25% deep questions – the balance can be anything…

What is SOLO?

SOLO stands for the Structure of Observed Learning Outcomes. It was developed by Biggs and Collis (1982).

Biggs describes SOLO as "a framework for understanding".

SOLO identifies five stages of understanding.

Each stage embraces the previous level but adds something more.

The following slides identify and describe the five levels or stages and provide examples of each.

The stages of SOLO

Prestructural – the student acquires bits of unconnected information that have no organisation

Unistructural – students make simple and obvious connections between pieces of information

Multistructural – a number of connections are made, but not the meta-connections between them

Relational – the students sees the significance of how the various pieces of information relate to one another

Extended abstract – at this level students can make connections beyond the scope of the problem or question, to generalise or transfer learning into a new situation

Surface and deep thinking

Unistructural and multistructural questions test students' surface thinking (lower-order thinking skills)

Relational and extended abstract questions test deep thinking (higher-order thinking skills)

Use of SOLO allows us to balance the cognitive demand of the questions we ask and to scaffold students into deeper thinking and metacognition

Unistructural questions

To answer the question students need the knowledge or use of only one piece of given information, fact, or idea, that they can get directly from the problem.

Multistructural questions

Students need to know or use more than one piece of given information, fact, or idea, to answer the question, but do not integrate the ideas.

This is fundamentally an unsorted, disorganised list.

Turn and talk 1

Think of some examples from recent classroom learning that are:

a. unistructural

b. multistructural and discuss these with a colleague.

Relational questions

These questions require students to integrate more than one piece of given knowledge, information, fact, or idea.

At least two separate ideas are required that, working together, will solve the problem.

Extended abstract questions

These questions involve a higher level of abstraction.

The items require the student to go beyond the given information, knowledge, information, or ideas and to deduce a more general rule or proof that applies to all cases.

Turn and talk 2

Discuss examples of questions that are:

a   relational

b   extended abstract

How can I create deeper questions?

Take a unistructural question – ask for a list of 2 or more things… **multistructural** question

Put the list of things into the question – ask what they have in common… **relationa**l question

Ask what class of event, personality, situation, rule, etc. applies? – generate a list of possible wrong answers to go with correct answer to create a multi-choice question… **extended abstract** question

Algebra: Patterns in number

Houses   **1 2 3**
Sticks   **5 9 __**

How many sticks are needed for 3 houses? (unistructural)

How many sticks are there for 5 houses? (multistructural)

If 52 houses require 209 sticks, how many sticks do you need to be able to make 53 houses? (relational)

Make up a rule to count how many sticks are needed for any number of houses. (extended abstract)

Try it out

From recent classroom learning, take a unistructural question and develop it into a:

multistructural,

relational, and

extended abstract question

Some things to think about

Response versus requirement – A question must be phrased in such a way as to gain the type of response required.

Deep thinking and difficulty – Questions that are hard and require long responses do not necessarily require students to think deeply

Deep thinking and learning – Deep thinking can be a given if it becomes a learned response – Today's extended abstract question can become tomorrow's relational question

Surface and deep thinking

Both 'surface' and 'deep' questions are needed – one is not better than the other.

Some examples:

Question: What is a tappet? (unistructural and technically hard)
Answer: A cylindrical component that transmits motion from the cam to the valve stem. (relational and technically hard)

Question: What is most important in a car: grunt, looks, safety, or economy? And why? (extended abstract but easy)
Answer: Grunt and looks (multistructural but easy)

In summary

SOLO is a true hierarchic taxonomy – increasing in quantity and quality of thought

SOLO is a powerful tool in differentiating curriculum and providing cognitive challenge

SOLO allows teachers and learners to ask deeper questions without creating new ones

SOLO is a powerful metacognitive tool