Biggs and Collins (1982) developed the SOLO (Structure of Observed Learning Outcomes) taxonomy as a systematic way of describing how a learner's performance grows in complexity when mastering tasks. Performance levels of learners range from the lower end (Pre-structural) to the higher end (Extended Abstract) as shown in Diagram 1.

**WHAT IS IT?**

**SOLO 1: Pre-Structural Level**
- The student does not have any kind of understanding, uses irrelevant information and/or misses the point altogether.

**SOLO 2: Uni-Structural Level**
- The student can deal with one single aspect and make obvious connections. The student can use terminology, recite (remember things), perform simple instructions/algorithms, paraphrase, identify, name or count.

**SOLO 3: Multi-Structural Level**
- The student can deal with several aspects but these disconnected. He/she is able to enumerate, describe, classify, combine, apply methods, structure, execute procedures, etc.

**SOLO 4: Relational Level**
- The student may understand relations between several aspects and how they might fit together to form a whole. The understanding forms a structure and may thus have the competence to compare, relate, analyze, apply theory, explain in terms of cause and effect.

**SOLO 5: Extended Abstract Level**
- The student may generalize structure beyond what was given, may perceive structure from many different perspectives, and transfer ideas to new areas. He/she may have the competence to generalise, hypothesise, criticize or theorise.
### VERBS WHICH CAN DESCRIBE PERFORMANCE AT DIFFERENT SOLO LEVELS

<table>
<thead>
<tr>
<th>SOLO LEVEL</th>
<th>VERBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLO 1: Unistructural</td>
<td>Define, identify, name, draw, find, label, match, follow a simple procedure</td>
</tr>
<tr>
<td>SOLO 2: Multistructural</td>
<td>Describe, list, outline, complete, continue, combine, calculate</td>
</tr>
<tr>
<td>SOLO 3: Relational</td>
<td>Sequence, classify, compare and contrast, explain (cause and effect), analyse, form an analogy, organise, distinguish, question, relate, apply, describe</td>
</tr>
<tr>
<td>SOLO 4: Extended abstract</td>
<td>Generalise, predict, evaluate, reflect, hypothesis, theorise, create, prove, justify, argue, compose, prioritise, design, construct, perform, explain, apply, analyse</td>
</tr>
</tbody>
</table>

### APPLYING SOLO TAXONOMY

The following is an example of the Intended Learning Outcomes (ILOs) written for a biology class using the SOLO taxonomy. (Note: Then term Intended Learning Outcomes is interchangeable with the terms Learning Outcomes and Learning Objectives).

At the end of the course, the student is expected to be able to...

- calculate (SOLO 2) recombination frequencies, segregation ratios, inbreeding coefficients, Hardy-Weinberg frequencies, evolutionary equilibria, heritabilities etc.
- explain (SOLO 4) and apply (SOLO 3) linkage analysis, including mapping of genes on chromosomes - describe (SOLO 3) and analyse (SOLO 4) simple patterns of inheritance (i.e. through analysis of pedigrees)
- describe (SOLO 3) and explain (SOLO 4) the concepts of genetic variation, mutation, inbreeding, genetic drift, and natural selection
- describe (SOLO 3) and explain (SOLO 4) evolutionary processes
- analyse (SOLO 4) the inheritance at several genes simultaneously
- explain (SOLO 4) how inbreeding and population mixture influence genetic structure

(Adapted from Brabrand & Dahl, 2009).

### WHAT IF I WANT MORE?

- Characteristics of Deep and Surface Approaches to Learning - University of New South Wales

### CONSIDERATIONS

While the SOLO taxonomy can help identify levels of progression with learning, Biggs (1999) also identifies characteristics of students that signal whether they are adopting a deep or surface level approach to learning.

### WHAT IF I NEED SUPPORT?

For further support contact ITaLI TeachAssist