SOLO Taxonomy & Metacognition.

How metacognition can be enhanced with HOT Mapping and a common understanding of the learning process.

Pam Hook
www.pamhook.com
“Metacognition” is not just teaching students to ask “Mrs Potter’s Questions”

**During a task:**
What are you trying to do? (planning)
What are you doing well? (monitoring)
What are you not doing so well? (monitoring)
How could you improve? (regulating)

**After completing a task:**
What did you do well? (evaluating)
What didn’t you do so well? (evaluating)
How could you improve? (regulating)
Did you complete the task? (evaluating)
What does the research say about self regulated learning?

- Student initiated
  Proactive rather than reactive

Zimmerman and Martinez-Pons (2004)
The key questions to ask are:

- Does the learner show initiative?
- Does the learner persevere?
- Does the learner display adaptive behaviours?

Zimmerman and Martinez-Pons (2004)
SELF REGULATION PROCESSES

(ZIMMERMAN, 1989)

Planning and goal setting
Self monitoring and recording
Self evaluating (performance and records)
Self rewarding and self punishing
Environmental structuring
Ree and Pintrich’s 10 Powerful Self Regulated Learning Strategies

Ree and Pintrich 2004

Regulation of Cognition
- Elaboration Strategies
- Metacognitive Strategies
- Organisational Strategies
- Rehearsal strategies

Regulation of Context
- Adaptive help seeking
- Study Environment Control

Regulation of Behaviour
- Effort Management
- Time management

Self Regulated Learning Strategies
- Interest Enhancement
- Increase Utility Value
- Self Efficacy Control
- Control of anxiety
- Self Rewards

Student initiated evaluations of quality or progress of work.

“I work out how deep my understanding is using SOLO Taxonomy.”

“I go back and assess my work using the success criteria in a HOT SOLO coded Map rubric to see if I can improve my learning outcome.”

Ree and Pintrich 2004
SOLO Taxonomy - Biggs and Collis 1982
The Structure of Observed Learning Outcomes

HOT Visual Mapping and Self Assessment Rubrics (coded against SOLO Taxonomy)

<table>
<thead>
<tr>
<th>Definition</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition identifies several relevant ideas and links these to the whole. Taken into another context</td>
<td></td>
</tr>
<tr>
<td>Definition identifies several relevant ideas and links these to the whole</td>
<td></td>
</tr>
<tr>
<td>Definition identifies several relevant ideas</td>
<td></td>
</tr>
<tr>
<td>Definition identifies one relevant idea</td>
<td></td>
</tr>
<tr>
<td>Needs teacher assistance</td>
<td></td>
</tr>
</tbody>
</table>
# Hooked on Thinking SOLO coded Self Assessment Rubric for Drama Y0 to Y2

<table>
<thead>
<tr>
<th>“Doing Stuff” Drama Y0 -2</th>
<th>Prestructural</th>
<th>Unistructural</th>
<th>Multistructural</th>
<th>Relational</th>
<th>Extended Abstract</th>
</tr>
</thead>
<tbody>
<tr>
<td>n.b. Can replace text with images</td>
<td>Tacit</td>
<td>Aware</td>
<td>Strategic (because, give reasons, explain)</td>
<td>Reflective</td>
<td></td>
</tr>
</tbody>
</table>

## Use of Voice
- I cannot be heard by others.
- I can be heard by the audience (volume/projection).
- I can show “a feeling” from the story using my voice (e.g. angry, sad).
- I can be heard by the audience and I can alter my voice to be loud or quiet when they listen to me.
- I can show more than one feeling from the story using my voice.
- I can choose how to use my voice to show a feeling to the audience. (volume and expression).
- I can choose how to use my voice to show a feeling to the audience and change this at the right time and in the right way. (change in response to the changes in the storyline - improvise).

## Facial Expression
- I (my face) cannot be seen by others.
- I can show the audience my face.
- I can show “a feeling” from the story using my face (e.g. angry, sad) when asked.
- I can make my face show more than one feeling to the audience.
- I can show different feelings from the story on my face when asked.
- I can choose how to change my face to show a feeling from the story to the audience.
- I can choose how to use my face to show a feeling to the audience and change this at the right time and in the right way. (change this in response to changes in the storyline - improvise).

## Movement
- I can move my body to tell the story with teacher direction.
- I can move my body to show “a feeling” from the story when asked.
- I can move my body to show different feelings from the story when asked.
- I can choose how to move my body to show different feelings from the story.
- I can choose how to move my body to show different feelings from the story and change this at the right time and in the right way - improvise.
2. **Organising and transforming**

Student-initiated overt or covert rearrangement of instructional materials to improve learning.

I look at the WALT and choose the best HOT Maps to use for the learning task.

“I look at the expected learning outcomes against SOLO Taxonomy and construct a rubric with SOLO coded success criteria before I start my writing.”

Ree and Pintrich 2004
HOT Maps and SOLO Taxonomy

 hooked
thinking

www.hooked-on-thinking.com
# Self Assessment Rubrics

**NAME:** [Name]  
**DATE:** 28/05/09

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Extended Abstract</strong></td>
<td>I can identify all parts of the fly, explain its functions and tell you what would happen if they weren’t there, whilst linking describing and predicting what may happen in the future.</td>
</tr>
<tr>
<td><strong>Relational</strong></td>
<td>I can identify all the parts to a fly explain its functions and explain what would happen if the part was missing.</td>
</tr>
<tr>
<td><strong>Multistructural</strong></td>
<td>I can identify several parts to a fly and tell you its function what would happen if the part was missing.</td>
</tr>
<tr>
<td><strong>Unistructural</strong></td>
<td>I can identify 1 part of a fly and its function.</td>
</tr>
<tr>
<td><strong>Prestructural</strong></td>
<td>I can not identify parts of the fly or its function.</td>
</tr>
</tbody>
</table>

**Next Steps:** (WTN)
3. Goal-setting and planning

Student initiated setting of educational goals and planning for sequencing, timing, and completing activities related to those goals.

“I use HOT SOLO self-assessment rubrics to set my ‘where to next goals.’
“I use a GANTT chart and the HOT SOLO Taxonomy inquiry rubric to plan the “where to next” stages in my inquiry research, I check my progress regularly.”

Ree and Pintrich 2004
<table>
<thead>
<tr>
<th>STUDENT INQUIRY</th>
<th>Inquiry Question</th>
<th>Planning the Inquiry</th>
<th>Collect</th>
<th>Connect</th>
<th>Create and Communicate</th>
<th>Reflection (formative and summative)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prestructural</strong>&lt;br&gt;Learning outcomes show unconnected information, no organisation. Task not attacked in an appropriate way.</td>
<td>I need help to ask a question.</td>
<td>I need help to find resources. I need help to make a timeline.</td>
<td>I need help to identify relevant information. I need help to record information.</td>
<td>I need help to do more than &quot;cut and paste&quot; what I found.</td>
<td>I need help to look at the connected information in a new way.</td>
<td>I need help to know what I'm doing. I need help to know whether it is going well. I need help to know what I should do next.</td>
</tr>
<tr>
<td><strong>Unstructural</strong>&lt;br&gt;Tactile use&lt;br&gt;Learning outcomes show connections are made, but significance to overall meaning is missing.</td>
<td>I can ask a simple question.</td>
<td>I can make an inquiry timeline.</td>
<td>I can identify relevant information from one source. I can record information in one way.</td>
<td>I can connect my information if I am told what to do.</td>
<td>I can look at the connected information in a new way. I can share what I found out.</td>
<td>I know what I am doing. I can tell you what I am doing.</td>
</tr>
<tr>
<td><strong>Multistructural</strong>&lt;br&gt;Aware use&lt;br&gt;Learning outcomes show simple connections but importance not noted.</td>
<td>I can ask a question to collect information.</td>
<td>I can locate several different resources. I can make an inquiry timeline with all relevant stages in the right order.</td>
<td>I can identify relevant information from several sources. I can record information in more than one way.</td>
<td>I can aware of several ways to connect my information but I need help to know when to use them.</td>
<td>I can look at the connected information in several new ways. I can share what I found out in several different ways.</td>
<td>I know what I am doing. I can tell you what I am doing and describe it.</td>
</tr>
<tr>
<td><strong>Relational</strong>&lt;br&gt;Strategic use&lt;br&gt;Learning outcomes show full connections made, and synthesis of parts to the overall meaning.</td>
<td>I can ask a question to connect information.</td>
<td>I can locate several different relevant resources from different media. I can make an inquiry timeline with all relevant stages in the right order and explain why the decisions were made.</td>
<td>I can identify relevant information from several sources, and link this to my inquiry questions. I can record information in more than one way, and explain why I have chosen these ways. (I know when and how to use HOT SOLO maps!)</td>
<td>I can look at the connected information in several new ways AND explain why I have chosen these ways. I can communicate this in an appropriate way for my audience AND explain why I have chosen this way.</td>
<td>I can tell you what I am doing and describe it. I can tell you whether it is going well or not (self-assessment feedback).</td>
<td></td>
</tr>
<tr>
<td><strong>Extended Abstract</strong>&lt;br&gt;Reflective use&lt;br&gt;Learning outcomes go beyond subject and make links to other concepts - generalities.</td>
<td>I can ask a question to create and communicate information.</td>
<td>I can locate several different relevant resources from different media AND evaluate the validity and reliability of them. I can make an inquiry timeline with all relevant stages in the right order and explain why the decisions were made AND I can adapt and modify my timeline where necessary.</td>
<td>I can identify clear, relevant, reliable and valid information from a wide range of sources. I can record information in more than one way and explain why I have chosen these ways AND I can justify my decisions.</td>
<td>I can look at the connected information in several new ways AND explain why I have chosen these ways AND justify my decision. I can communicate this in an appropriate way for my audience AND explain why I have chosen this way AND justify my decision.</td>
<td>I can tell you what I am doing and describe it. AND I can tell you whether it is going well or not (self-assessment feedback). AND I can predict what I should do next. OR what I would do next time.</td>
<td></td>
</tr>
</tbody>
</table>
4. Seeking Information

Student – initiated efforts to secure further task information from non social sources when undertaking an assignment.

“Before I start I check the intranet for SOLO multistructural learning strategies, so I can collect as much relevant information as possible concerning the topic.”

Ree and Pintrich 2004
<table>
<thead>
<tr>
<th>SOLO</th>
<th>Unistructural</th>
<th>Multistructural</th>
<th>Relational</th>
<th>Extended Abstract</th>
</tr>
</thead>
<tbody>
<tr>
<td>hooked on thinking (HOT) Maps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Thinking Tools and Maps</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Dr Bono’s Hats</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>D.A.T.T.</td>
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<tr>
<td>Metacognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curriculum &amp; Learning Based Thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Where these tools fit depends on the type of questions asked)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tools for Gathering Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Question Matrix</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Questioning Strategies</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

- **Unistructural**: Describe, Define, Describe, Identify
- **Multistructural**: Relate, Compare, Contrast, Classify, Categorize
- **Relational**: Reason, Cause, Effect, Analysing, Modelling
- **Extended Abstract**: Generalise, Evaluate, Predict, Blue Hat, Green Hat, C.A.S (Consequence & Sequence), A.G.O. (Aim, Goal, Objectives), A.P.C. (Alternatives, Possibilities, Choices), Deep Into Ones, Predict
5. Keeping Records and Monitoring

Student initiated efforts to record events/results.

“I keep a learning log of my SOLO LO’s outcomes for each LI.”
“I blog post notes of the class discussion.”
“I use my phone to send pxt of my design work each day.”
“I tweet the URL’s of articles I find online.”
“I txt my questions about each lesson”
“I video the results of my experiments with my phone”
“I voice record/podcast my impressions of the film”

Ree and Pintrich 2004

Student initiated efforts to select or arrange the physical setting to make learning easier.

“I turn off FaceBook so that I am not distracted by my friends messages when I am revising.”

Ree and Pintrich 2004
7. Self-consequences

- Student imagination of rewards/punishment for success or failure.

“If I do well on this assignment, I am going to spend all Saturday at the beach hanging out with friends.”

Ree and Pintrich 2004
8. Rehearsing and memorising

- Student initiated effort to memorise material by practice.

“In preparing for a test, I use mnemonics and make mind maps in Inspiration to help me remember the important ideas.”

Ree and Pintrich 2004
9. **Seeking social assistance.**

- Student initiated efforts to solicit help from peers/teachers/adults.

“When I get stuck on a homework problem, I ask my FaceBook friends for help.”

Ree and Pintrich 2004
10. **Reviewing records**

- Student initiated efforts to re-read/prepare.

  "When preparing for my speech, I use a webcam to video myself and review my presentation."

  – Ree and Pintrich 2004
11. Others

- Learning behaviour that is initiated by other persons.

“I just do what the teacher tells us to do on our class wiki.”

Ree and Pintrich 2004
Research into Student Use of Different Metacognitive Strategies

- Flexibility
- Frequency
- Consistency

Zimmerman and Martinez-Pons 1986
Are academically successful students more likely to use self regulatory strategies to enhance their learning than less successful students?

Zimmerman and Martinez-Pons 1986
Gender Differences

- Girls displayed more goal setting and planning and more keeping records and monitoring strategies than boys.

- Boys reported significantly more non-self regulatory “other” responses than girls.

Zimmerman and Martinez-Pons 1986
Gifted students surpassed regular students at each grade level on measures of

1. Self regulatory learning strategies
2. Self efficacy

Zimmerman and Martinez-Pons 1986
Planning Phase

Task Analysis
- Goal setting
- Strategic planning

Self-motivation Beliefs
- Self-efficacy
- Outcome expectations
- Intrinsic interest/value
- Goal orientation

Monitoring Phase

Self-control
- Self-instruction
- Imagery
- Attention focusing
- Task strategies

Self-observation
- Metacognitive monitoring
- Self recording

Evaluation Phase

Self-judgment
- Self-evaluation
- Causal attribution

Self-reaction
- Self satisfaction/affect
- Adaptive/ Defensive

Zimmerman and Martinez-Pons 1986
Monitoring Phase
- Self–control
- Self–observation

Planning Phase
- Task Analysis
- Self–motivation Beliefs

Evaluation Phase
- Self–judgement
- Self–reaction

Phases of self regulation
after Zimmerman and Campilo 2003
LEARNERS
PROACTIVE VS REACTIVE

Planning and Monitoring phase

Post-performance self reactions
**Planning Phase:** Task Analysis Processes

Proactive learners set specific, proximal and hierarchical goals for themselves. They select specific strategic methods that enhance their performance.

Reactive learners are unstructured and vague about their goals. They have hazy plans.

Zimmerman and Martinez-Pons 1986
**PLANNING PHASE:** Self motivational Beliefs

Proactive learners have;
- enhanced perceptions of self efficacy,
- outcome expectations,
- intrinsic interest and
- learning goal orientation.

Zimmerman and Martinez-Pons 1986
MONITORING PHASE: Strategy Use

**Proactive learners** deploy strategies that were planned during the planning phase.

**Reactive learners** tend to plunge into learning tasks.

Zimmerman and Martinez-Pons 1986
Monitoring Phase  Self Observation

**Proactive learners** engage in systematic self observation, such as metacognitive self monitoring and self recording.

**Reactive learners** are struggling so hard to learn they often cannot think metacognitively.

Zimmerman and Martinez-Pons 1986
**EVALUATION PHASE** Self-judgments

**Proactive learners**
Self evaluate by comparing their learning performance to their planning phase goals.

**Reactive learners**
Fail to evaluate because they failed to set specific goals. Fall back on social comparisons with peers.

Causal attributions:
Controllable variables
e.g. learning strategies

Causal attributions:
Uncontrollable variables
e.g. fixed ability

Zimmerman and Martinez-Pons 1986
Evaluation Phase

Adaptive & defensive inferences

Self-satisfaction

Self-reactions

Helplessness/ procrastination/ task avoidance/ cognitive disengagement/ apathy

Elation/ anxiety

Zimmerman and Martinez-Pons 1986
Helping students become self-regulated learners

How can we help students better know themselves as learners?

- Common understanding the learning process
  - learned through Key Competencies and SOLO Taxonomy
    - The New Zealand Curriculum identifies five key competencies that are "key to learning": thinking, using language, symbols, and texts, managing self, relating to others, participating and contributing.
    - SOLO Taxonomy: Structured overview of student learning outcomes, Biggs and Collis 1982 identifies five levels of complexity in student learning outcome.

- Common language of learning process
  - learned through Language of instruction referenced to SOLO Taxonomy
    - Define, describe, compare, contrast, sequence, cause and effect, part-whole, classify, analogy, predict, generalise, evaluate, create, reflect.

- Common tools and strategies to enhance learning process
  - learned through Learning interventions referenced to SOLO Taxonomy and the Key Competencies
    - Questioning frameworks, thinking strategies, visual mapping, Habits of Mind, think pair share, Information communication technologies, Web 2.0 etc

- Common classroom practice
  - learned through Teacher planning and modelling referenced to SOLO Taxonomy and the Key Competencies
    - Including learning intentions, learning outcomes, learning experiences and formative and summative assessment.
Contact

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