Strategies to Promote Metacognitive Engagement in Learning

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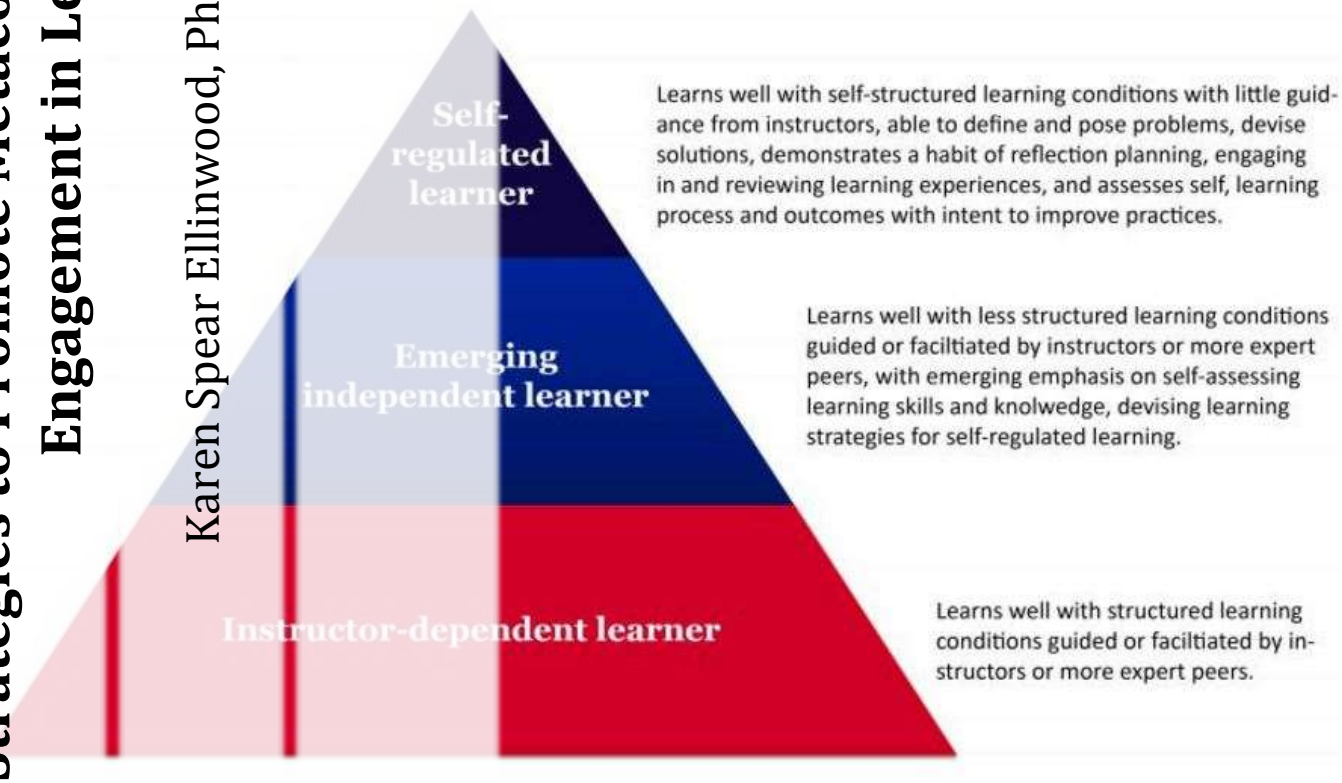

This is a summary of strategies for promoting learners' metacognitive engagement, adapted from a white paper on the topic originally prepared for The University of Arizona Science Center (2008) by the same author.

A Taxonomy of Metacognitive & Provocative Strategies

What are Metacognitive Strategies?[1]

Strategies that utilize metacognitive awareness

Metacognition has been associated with successful learning across disciplines (Bransford, Brown, & Cocking, 1999). The process of development that Vygotsky (1978) refers to as internalization and self-regulation requires learners to use metacognitive strategies, which in turn help learners "to increase awareness of thinking processes" (Thompson & Thompson, p. 249, citing Palincsar & Brown, 1987; also Bransford, Brown, & Cocking, 1999). Optimally, and especially when problem-solving in situations where conditions might change or with the potential for unknowable outcomes, educators should be sure to provide opportunities for learners for "clarifying the potential goals" and "choosing or inventing an effective metacognitive strategy to achieve a selected goal" (Lin, Schwartz, & Hatano, 2005, p. 253). The goal is, then, for learners to develop mindful learning as a regular practice across settings and situations. In medical education, this is referred to as reflective practice (Marmede & Schmidt, 2004). When students use these strategies, they necessarily use reflection as a tool for thinking.

- **Reflective meta-discourse** evidences verbal expressions of what someone thinks others are thinking (Tomasello, 1999). Having to imagine what someone else is thinking, and why or how it applies to a given situation, requires the learner to consider his/her own thinking.

- **Embedded mental-state language** is a process of imagining and evaluating what others think we think ("She thinks that I think X") (Tomasello, 1999), and serves as a form of self-monitoring.

- **Concept mapping/Taxonomy-building**. Learners create concept maps connecting ideas with data or models or structures for organizing data.

- **Shifting Paradigms**. The learner evaluates his/her framework for thinking, worldview, or perspective and engages in some comparative analysis (e.g., with someone else's perspective, or as against experience) to determine whether a change in perspective is called for and then contemplates what that perspective should be. Piaget's concept of accommodation – adjusting one's existing 'schema' for making sense of the world to accommodate new information would be an example of this process.

[1] Author: Karen C. Spear Ellinwood, adapted for undergraduate medical education from the original prepared for The UA Science Center 2008

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- **Meta-memory**. The deliberate use of some artifact as a mnemonic device, that is, to help you remember (to do) something, e.g., VINDICATES. Creating or learning new mnemonic devices involves metacognition because the learner must think of the connection between device, concept and its application.

- **Representational re-description**. The learner masters some knowledge or process and re-presents it or re-imagines its application outside of the context in or the application for which it was learned.

- **Inference, Evaluation, & Reflective Practice**. Awareness and understanding of how one learns, what one knows, and the strategies one uses to engage in particular tasks or within particular domains, e.g., reading, using computers. Deliberately sizing up information to determine whether and to what extent reasonable inferences can be drawn and how to assess their reasonableness in a given situation. Reflecting during and following a learning experience to enhance awareness of self, process and outcome and the inter-relationship of these.

- **Adaptive expertise**. The learner is aware of the expertise s/he has and whether it adequately addresses a new situation; realizes there is a gap between what s/he knows or his/her abilities, knowledge, perspective, and what the new situation demands, and adjusts or adapts (or seeks to find out how to adjust or adapt) his/her knowledge, practices or skills to meet those differing demands.

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What are Provocative Strategies?

Strategies that are used to Provoke (or promote) Metacognition

Provocative strategies present learners with problems to solve and require them to reflect on what skills or information they need to do so, or that call on them to reflect on others' performances or strategies. In other words, they encourage learners to use metacognitive strategies since each provocative strategy necessarily involves the student's use of higher psychological functions such as self-assessment, self-evaluation, and self-questioning, or some form of comparative analysis (Glaubman, Glaubman, & Ofir, 2001; Tomasello, 1999; Chamot & O'Malley, 1990).

In short, provocative strategies encourage learners to develop mindful practices that call for reflection on self, process and outcome as they learn and after they complete learning. They encourage the learner to think about how they might approach the problem differently, or how to apply what they have learned to new situations or problems. In working toward the ability to adapt one's expertise and practices to new situations and problems, many theorists promote a reflective approach to teaching and learning in individual and collaborative learning situations (Lin, Schwartz & Hatano, 2005). A collaborative learning situation, in and of itself, always has the potential to provoke the learners' use of metacognitive strategies or critical reflection because it necessarily involves the potential for dissonance among perspectives. Some provocative strategies below are more suitable for face-to-face engagement, others for online use, while some may be employed in both settings.

- **Think Alouds** – Facilitator would create learning conditions that require the learner(s) to think out loud while performing the task individually or in collaboration with others to increase awareness of how the learner is thinking about and approaching the task as they do it. Doing this in collaboration sets up the use of the Dissonance strategy below.

- **Dissonance & Harmony** – This strategy pertains to Individual action or collaborative activity designed to create dissonance between what the learner expects and what actually happens in a particular situation or experience. The problem or data should promote dissonance, for example, among competing perspectives, approaches or possible conclusions. The dissonance requires the learner to (re)establish harmony among the data, collaborators' perspectives, etc. through individual or collective thinking and application of knowledge or abilities. The dissonance is identified and articulated or explained with deliberate strategizing for how to resolve differences in approaches, outcomes or processes.

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- **Making the implicit explicit**. This strategy calls for making a process – or something that is hidden or implicit, explicit. The idea is that making the process explicit, it would be difficult for the learner not to become aware metacognitively or to apply knowledge in a metacognitive way. Learning situations employing this strategy would ask the learner to make something that is implicit, explicit to self and others. An example of educators doing this, is in making the structure for thinking explicit, such as in providing a structure for problem-solving. A method to promote reflection here would ask the students to brainstorm collectively about the connections between this now explicit structure and its relationship to clinical reasoning before affirming those connections.

- **Reflective writing.** The educator provides the experience for the learner to draft his/her thinking to make it visible to him/her, as a mirror on his/her thinking process and outcomes. This strategy requires reflection, which could be done individually or collaboratively with those working on the same task or ones aimed at achieving the same goal. The activity should provide opportunities for revision and encourage the learner/author of ideas to reconsider the purpose and structure of the writing, what it communicates to others, and how it has been or might be received by particular audiences, and so on. Asking students to articulate their thinking in writing is also a form of making something implicit (hidden) explicit. Whether they do this in ThinkSpace or in session or using an online forum, this method requires students to be reflective and deliberative.

- **Socratic questioning** – Socratic questions are designed to reflection in collaborative activity, such as in CBI sessions. They can also be used as prompts in a forum or ThinkSpace, enacting the strategic assistance that facilitators might give if they were working with the student face to face. There are several types of socratic questions, including questions that:
    - probe implications and consequences of decisions at each juncture
    - identify or investigate perspectives and biases
    - probe assumptions & for potential errors
    - require the learner to distinguish fact from opinion, known from unknown
    - call for the learner to clarify the meaning of what they have said, someone else has said or the interpretation of data. and
    - probe how learners are using (or not) the ideas of others to advance their own thinking.
- **Narrative: Dialogue & "Storytelling"** - To convey a story's meaning, a storyteller must think about how to present or articulate ideas, the form or structure of the narrative, how to organize and convey difficult or complex concepts. Thus, asking the learner to structure their contributions to

discussion, whether in live session, ThinkSpace or an online forum, as if they were constructing a narrative requires reflection. This strategy asks learners to think about what they want to contribute to some dialogue as a narrative, and so to think in terms of "plot" as a strategy for articulating their ideas or defend positions. In other words, the learner must determine where they are going and how they will bring others to their final destination. They need to organize their thoughts, outline their narrative, and anticipate how it might be received in terms of its meaning and delivery. This can be modeled by facilitators in session and learners can provide cooperative critiques or engage in reflective writing as they work through cases online, alone, in forum or in session.

- **Finely controlled Release** – This is used in case-based instruction. The facilitator requires the student to request information in the first instance and to provide the rationale for the request. No information is supplied unless the request is reasonable and the rationale appropriate to the request.

- **Solicited Release -** Solicited Release allows for the release of information where the request is reasonable but it lacks the appropriate rationale. Prior to releasing critical information for problem-solving, facilitators could ask students to consider what the appropriate rationale would be. Having made an attempt to reason through the process the students would be given access to the critical information requested. The facilitator also invites the student to discuss how they might have determined from the data in the case the official case rationale. Students also may consider peer ideas, scholarly articles, or other relevant information in addition to case information.

- **Concept Mapping** – The facilitator asks the learner to identify the purposes, functions, or characteristics of concepts, data or tools, and the relationship between these and their application to a particular case. Concept mapping is a form of taxonomy building. This strategy can be modeled by peers or facilitators and calls for students to generate a concept map of their thinking as they do when they generate hypotheses early in a case. It requires them to think about how or why they have chosen to represent the concepts and their connections in one way or another. Students may evaluate whether the concept map they used provided an effective framework for reaching a reasonable conclusion in the case, or not, and compare/contrast their framework with others'. This process can help learners learn how to devise a framework.

- **Guided Mastery/Master Guides** – This strategy calls upon the learner to become their own teacher and then to become a mentor for peer learners once the learner has mastered some

knowledge or practice. Having to re-present what s/he has learned to others with the intent to help peer or near peer learners acquire the knowledge, skill, or understanding calls to mind the idea that one learns by teaching. This affords the learner a sense of accomplishment and confidence, and requires them to engage in reflective awareness in devising successful strategies for teaching, which, in turn, may become successful strategies for their own learning.

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Web-based Resources

Six types of Socratic questioning. University of Michigan. http://Www.engin.umich.edu/~cre/probsolv/strategy/cthinking.htm

The role of Socratic Dialogue. http://www.Criticalthinking.org