Supplemental Material

CBE—Life Sciences Education

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Appendix 1: Motivated Strategies for Learning Questionnaire scores.

1 Cognitive and metacognitive strategies: rehearsal

Basic rehearsal strategies involve reciting or naming items from a list to be learned. These strategies are best used for simple tasks and activation of information in working memory rather than acquisition of new information in long-term memory. These strategies are assumed to influence the attention and encoding processes, but they do not appear to help students construct internal connections among the information or integrate the information with prior knowledge.

2 Cognitive and metacognitive strategies: elaboration

Elaboration strategies help students store information into long-term memory by building internal connections between items to be learned. Elaboration strategies include paraphrasing, summarizing, creating analogies, and generative note-taking. These help the learner integrate and connect new information with prior knowledge.

3 Cognitive and metacognitive strategies: organization

Organization strategies help the learner select appropriate information and also construct connections among the information to be learned. Examples of an organizing strategies are clustering, outlining, and selecting the main idea in reading passages. Organizing is an active, effortful endeavor, and results in the learner being closely involved in the task. This should result in better

performance.

4 Cognitive and metacognitive strategies: critical thinking

Critical thinking refers to the degree to which students report applying previous knowledge to new situations in order to solve problems, reach decisions, or make critical evaluations with respect to standards of excellence.

5 Cognitive and metacognitive strategies: self-regulation

Metacognition refers to the awareness, knowledge, and control of cognition. We have focused on the control and self-regulation aspects of metacognition on the MSLQ, not the knowledge aspect. There are three general processes that make up metacognitive self-regulatory activities: planning, monitoring, and regulating. Planning activities such as goal setting and task analysis help to activate, or prime, relevant aspects of prior knowledge that make organizing and comprehending the material easier. Monitoring activities include tracking of one's attention as one reads, and self-testing and questioning: these assist the learner in understanding the material and integrating it with prior knowledge. Regulating refers to the fine-tuning and continuous adjustment of one's cognitive activities. Regulating activities are assumed to improve performance by assisting learners in checking and correcting their behavior as they proceed on a task.

6 Value component: intrinsic goal orientation

Goal orientation refers to the student's perception of the reasons why (s)he is engaging in a learning task. On the MSLQ, goal orientation refers to student's

general goals or orientation to the course as a whole. Intrinsic goal orientation concerns the degree to which the student perceives his/herself to be participating in a task for reasons such as challenge, curiosity, mastery. Having an intrinsic goal orientation towards an academic task indicates that the student's participation in the task is an end all to itself, rather than participation being a means to an end.

7 Value component: extrinsic goal orientation

Extrinsic goal orientation complements intrinsic goal orientation, and concerns the degree to which the student perceives his/herself to be participating in a task for reasons such as grades, rewards, performance, evaluation by others, and competition. When one is high in extrinsic goal orientation, engaging in a learning task is the means to an end. The main concern the student has is related to issues that are not directly related to participating in the task itself (such as grades, rewards, comparing one's performance to that of others). Again, this refers to the general orientation to the course as a whole.

8 Value component: task value

Task value differs from goal orientation in that task value refers to the student's evaluation of how interesting, how important, and how useful the talk is ("What do I think of this task"). Goal orientation refers to the reasons why the student is participating in the task ("Why am I doing this?"). High task value should lead to more involvement in one's learning. On the MSLQ, task value refers to students' perceptions of the course material in terms of interest, importance, and utility.

9 Expectancy component: control of learning beliefs

Control of learning refers to students' beliefs that their efforts to learn will result in positive outcomes. It concerns the belief that outcomes are contingent on one's own effort, in contrast to external factors such as the teacher. If students believe that their efforts to study make a difference in their learning, they should be more likely to study more strategically and effectively. That is, if the student feels that he/she can control her academic performance, she is more likely to put forth what is needed strategically to effect the desired changes.

10 Expectancy component: self-efficacy for learning & performance

The items comprising this scale assess two aspects of expectancy: expectancy for success and self-efficacy. Expectancy for success refers to performance expectations, and relates specifically to task performance. Self-efficacy is a self-appraisal of one's ability to master a task. Self-efficacy includes judgments about one's ability to accomplish a task as well as one's confidence in one's skills to perform that task.

11 Affective component: test anxiety

Test anxiety has been found to be negatively related to expectancies as well as academic performance. Test anxiety is thought to have two components: a worry, or cognitive component, and an emotionality component. The worry component refers to students' negative thoughts that disrupt performance, while the emotionality component refers to affective and physiological arousal aspects of anxiety. Cognitive concern and preoccupation with performance have been found

to be the greatest sources of performance decrement. Training in the use of effective learning strategies and test-taking skills should help reduce the degree of anxiety.

12 Resource management strategies: time and study environment

Besides self-regulation of cognition, students must be able to manage and regulate their time and their study environments. Time management involves scheduling, planning, and managing one's study time. This includes not only setting aside blocks of time to study, but the effective use of that study time, and setting realistic goals. Time management varies in level, from an evening of studying to weekly and monthly scheduling. Study environment management refers to the setting where the student does his/her class work. Ideally, the learner's study environment should be organized, quiet, and relatively free of visual and auditory distractions.

13 Resource management strategies: effort regulation

Self-regulation also includes students' ability to control their effort and attention in the face of distractions and uninteresting tasks. Effort management is self-management, and reflects a commitment to completing one's study goals, even when there are difficulties or distractions. Effort management is important to academic success because it not only signifies goal commitment, but also regulates the continued use of learning strategies.

14 Resource management strategies: peer learning

Collaborating with one's peers has been found to have positive effects on achievement. Dialogue with peers can help a learner clarify course material and reach insights one may not have attained on one's own.

15 Resource management strategies: help seeking

Another aspect of the environment that the student must learn to manage is the support of others. This includes both peers and instructors. Good students know when they don't know something and are able to identify someone to provide them with some assistance. There is a large body of research that indicates that peer help, peer tutoring, and individual teacher assistance facilitate student achievement.