

# Learning Processes through the Use of Methodologies

(Excerpted from the *Faculty Guidebook*)

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Methodologies are multiple-step models for complex processes. Their purpose is to systematically guide learners through a full series of steps that must be internalized in order for growth in a process to occur. Although methodologies are quite helpful, some experts discount them out of a concern for their potential effects on creativity along with a number of other sound reasons. This module analyzes the role of methodologies in learning with particular emphasis on how learners go about internalizing these tools. Also included are tips for teaching with methodologies and a rubric for assessing at what levels the methodologies have been internalized by students.

## Need for Methodologies in Teaching/Learning

An educator's most difficult challenge is to become more effective in facilitating the rapid development of performance in learners (Bransford, Brown, & Cocking, 2000). This involves facilitating growth of procedural knowledge, which is the sequence or series of steps needed to produce or change something. For example, the writing process involves distinct steps that result in a written product (e.g., Bean, 1996). Analogously, there are widely recognized steps in problem solving (e.g., Woods, 2000). Procedural knowledge can be put into steps while conceptual knowledge can be described by using concept maps and other organizational tools. This module focuses on how methodologies can guide the learning of processes that have four or more steps. Application may be special-purpose, such as writing research papers or designing software as well as general-purpose, such as assessment and problem solving. Many processes build on transferable learning skills that involve fewer than four steps. A framework for identifying, measuring, and enhancing these is presented in Classification of Learning Skills.

## Challenges in Growing Process Knowledge

Performance of a process requires that the conceptual understanding be put into action through some application. Most problems students encounter link back to incomplete process knowledge or an inability to draw upon the process knowledge that is needed within a specific context. Examples include completing a proof, constructing a free-body diagram, doing a self-analysis, and classifying biological specimens. Many specialized disciplinary processes draw upon transferable process knowledge. This is the reason many evaluations of educational methods focus attention on critical thinking, problem solving, and other transferable processes that are difficult to grow.

## Historical Use of Methodologies

Experts have always guided the learning of novices by using methodologies, either explicitly or implicitly. For example, Aristotle and other philosophers recommend specific steps in the syllogistic method for checking the "truth" of the logic between varying types of statements. John Dewey (1938) argues that logic is only one component of inquiry and that an "inductive-deductive" cycle of processes is involved in any inquiry. His inquiry methodology included recognition of an "indeterminate situation," conceptual specification of the problem, determination of a hypothetical solution, reasoning to check meaning and relevance of the hypothesis, collection and interpretation of "facts-meanings," and judging whether outcomes attained resolve the problem situation. Basically, Dewey's inquiry methodology involves a pattern similar to that of Pacific Crest's Problem-Solving Methodology. Examples of methodologies could be

added from literally centuries of experience in every culture with arts, crafts, mechanics, management, and professional applications of many kinds. There are methodologies on thinking (e.g., DeBono, 1994), nursing procedures for effective stroke unit procedures (e.g., Langhorne & Pollock, 2002), and engineering methodologies for safety evaluation of chemicals (e.g., Smith, Janfunen, & Goldstein, 2002). Methodologies have universal features that are presented in Table 1.

**Table 1** Distinctive Features of Methodologies

**Methodologies:**

- Are logical and practical rule-of-thumb (i.e., heuristic) guides for complex processes
- Involve set-up, performance, and reflection
- Are self-help tools
- Are a “bridge” for guiding learners from incomplete, tacit knowledge to systematic, assessed knowledge
- Involve at least four steps, each of which is essential for completion of a quality process
- Involve integration of skills from multiple domains
- Require flexibility about the amount of attention each step receives in a given task context
- Facilitate metacognitive understanding of a process through the repeated assessment of steps and outcomes
- Speed communication between learners and educators or between advanced learners
- Internalization of several methodologies will greatly increase the ease of learning additional ones

**Reasons for Currently Limited Use of Methodologies**

Educators rightly express concerns about using methodologies for at least four good reasons. First, it is realistic to be concerned that novices may use methodologies as rulebooks that limit their growth and ownership of the learning processes. Novices tend to want to take shortcuts when they are challenged in new arenas requiring complex performances that are difficult to learn. This can easily occur if learners use methodologies as directive shortcuts that reduce their engagement in the thinking and problem solving essential for achieving the desired internalization of the process. Novices want a “silver bullet” solution rather than a full, deep mastery of the process.

Second, experts have already internalized a stronger, richer process than the methodology. Experts want to transfer this richness to the learner and may believe that they can produce a better version of the methodology. In addition, experts are usually concerned more about helping novices learn several methods for approaching a task than firmly establishing steps for only one basic process.

Third, educators may assume on the basis of experience and from observation that processes work mainly in specific contexts. Experience with learners tends to support the hypothesis that they often do not transfer knowledge from course to course or from courses to work settings. Belenky, Clinchy, Goldberger, & Tarule (1996) provide extensive interview evidence of this difficulty, especially in adults without growth-enhancing opportunities.

Fourth, some educators may prefer to work on processes without the constraints of system or outcome specifications, timing, and criteria. Negroponte (2003), for example, argues that the narrow focus of some

discipline-based research reduces the creativity and efficiency of the innovation process. Educators and researchers value the originality that results from the use of multiple perspectives.

### **Arguments for Increased Use of Methodologies**

For each of the four reasons or barriers to the use of methodologies presented in the preceding section, there are equally compelling counter arguments to consider.

First, although learners often do use the prescribed steps in methodologies as a crutch, this is a learning facilitation issue rather than an inherent flaw of these tools. When a methodology is used to introduce novices to a complex process, it serves as a conceptual “bridge” for a complex process. Novices need to realize that skilled performers use an essential set of steps that includes some that the novices do not use yet.

Second, although a methodology is less rich than an expert’s approach, it is essential to have a way to lead novices through the initial learning in a reliable way so that they can proceed to learn the more subtle aspects. This suggests the significance of the differences in perspective and learning needs of experts versus novices. The educational process will produce stronger knowledge and performance outcomes if novices are guided through the details that experts have long ago internalized.

Third, although it is common to create methodologies to fit specific tasks, a stronger approach is to create them for generalizable processes such as problem solving. Many educators believe that methodologies cannot cross boundaries such as those between humanities and the sciences. Woods (2000), however, identified 150 ways that the basic problem-solving methodology is used across disciplines.

Fourth, although methodologies can inhibit creativity and innovation, it is easy to underestimate the significance of establishing correct patterns. Schön (1987) provides a series of detailed professional teaching/learning examples (e.g., from architectural design, musical performance, counseling) that demonstrate the importance of starting with a disciplined method, protocol, recipe, algorithm, procedure, or technique to ensure proper attention to main principles before trying to resolve the special or detailed problems related to a current context. Architecture students described by Schön hit barriers in their designs when they paid attention too soon to a later stage in their methodology, e.g., by trying to design the shape of a building to fit the landscape before ascertaining all the needs, functions, and features.

In producing curriculum and associated learning resources, all disciplines use methodologies as educational tools to help novices become more practiced and professional. An essential purpose of methodologies is to direct learners’ attention to the criteria and assessment steps that help to define useful outcomes from a process. With a sound foundation, they can progress to internalize metacognitive uses of methodologies.

### **Internalization of Methodologies**

Internalization is the psychological process of moving one’s ability to perform from reliance on external cues or guidance (e.g., from a parent or teacher) to reliance on a “mindful” personal representation of a process that can be used flexibly across contexts.

The internalized process skills of individuals need little mental attention unless a challenging situation arises. This type of knowledge is also known as “implicit” or “procedural” knowledge. “Natural genius” is a higher level use of internalized process knowledge, but the natural genius may not be metacognitively aware of the learning history that has produced his or her effortless performance. Both novices and experts can increase their growth in process knowledge through cycles of assessment and reflection. Until such conscious efforts are made, individuals’ flexibility will be restricted and their metacognitive understanding limited.

Table 2 presents five pairs of factors related to internalizing methodologies as well as techniques or assignments that facilitate learning for each of the factors.

### Levels of Development in Internalizing a Methodology

Five levels describe growth and development in learning and internalizing a methodology. Descriptively, the five levels are rule-governed users, who are able to perform step-by-step; task-focused users, who are able to perform in easy contexts; explorers, who are able to self-assess use of a methodology and to affect others' performance; generalizers, who are able to internalize a methodology and capable of mentoring others; and developers, who are able to engage in creative development of new methodologies to fit new needs or contexts. These five levels are incorporated into the Rubric for Internalization of Methodologies.

### Concluding Thoughts

This module introduces methodologies as essential Process Education tools. Educators who avoid methodologies as too rigid or simplistic overlook their considerable benefits. The Rubric for Internalization of Methodologies provides a succinct model of the main factors and levels of competency involved in learning a methodology. Using the tips provided, educators can work toward new levels of learning both in themselves and in their students.

**Table 2** Methodology Internalization Factors and Related Tips for Educators

| Factors Related to the Internalization of Methodologies                     | Examples and Tips for Educators                                                                                                                                                               |
|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Understanding the methodology</b>                                        |                                                                                                                                                                                               |
| Awareness of learning factors and issues                                    | <i>Use team activities to support learning how to apply a methodology to a specific assignment.</i>                                                                                           |
| Fluency of process area language                                            | <i>Assign an oral presentation of how a methodology was used and why each step was essential.</i>                                                                                             |
| <b>Translating into practice</b>                                            |                                                                                                                                                                                               |
| Fluency in translating instructions into effective actions; versatility     | <i>Put learners into a competition for speed and versatility in applying a methodology to a challenging task.</i>                                                                             |
| Discipline in use to obtain a planned outcome                               | <i>Request self-assessment of the validity of the reasoning related to each step in application of the tool to a task.</i>                                                                    |
| <b>Valuing the process for which the methodology is a tool</b>              |                                                                                                                                                                                               |
| Belief in the tool as a valid representation of a process                   | <i>Put learners into a performance arena that is too challenging in order to increase their reliance on the tool.</i>                                                                         |
| Belief in personal ability to gain effectiveness in application of the tool | <i>Challenge the accuracy of a learner's self-efficacy as part of the performance process.</i>                                                                                                |
| <b>Metacognitive abilities</b>                                              |                                                                                                                                                                                               |
| Awareness of the whole; ability to proactively assess "fit" to purpose      | <i>Ask learners to predict (and later assess) which steps will be most critical for a specific context. Request journal descriptions of using a process at a level above current ability.</i> |
| Ability to communicate purposes and benefits for multiple contexts          | <i>Request journal reflections addressing the purpose and benefits of recent uses of methodologies.</i>                                                                                       |
| <b>Creative adaptation</b>                                                  |                                                                                                                                                                                               |
| Creative customization and adaptation                                       | <i>Challenge to develop several valid outcomes for the same learning task or problem.</i>                                                                                                     |
| Willingness to take to new challenge levels                                 | <i>Challenge to use a process at a higher level on the Internalization Rubric.</i>                                                                                                            |

## Performance Levels for Internalization of Methodologies

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Level 5—Developer</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <ol style="list-style-type: none"> <li>1. Has high level of “knowledge skill” that can be applied universally</li> <li>2. Is able to facilitate growth in the use of methodologies with skilled individuals</li> <li>3. Demonstrates strong self-efficacy in influencing increased educator competence with methodologies</li> <li>4. Is aware of issues and principles related to the way learners achieve metacognitive awareness of whole methodologies</li> <li>5. Can facilitate growth in experts to improve their creative customization and adaptation of methodologies in any context</li> </ol>                                              |
| <b>Level 4—Generalizer</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <ol style="list-style-type: none"> <li>1. Flexibly uses “knowledge skill” to deepen learner insights</li> <li>2. Diagnoses misdirection or irrelevancies when observing others using any methodology</li> <li>3. Has strong self-efficacy in facilitating any use of methodologies</li> <li>4. Is metacognitively aware of the whole; is able to identify learning issues on the basis of the “flow” across all steps for any learner</li> <li>5. Is able to facilitate self-assessment in any learner in order to enhance his or her creativity in adapting methodologies</li> </ol>                                                                  |
| <b>Level 3—Explorer</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <ol style="list-style-type: none"> <li>1. Is conceptually comfortable with methodologies; growing in knowledge skills</li> <li>2. Fluently translates the steps into effective actions that result in planned outcomes</li> <li>3. Starts in a disciplined way because of strong self-efficacy beliefs regarding benefits</li> <li>4. Is aware of the need to assess and integrate results from previous steps when moving to a new step</li> <li>5. Notices the potential to creatively customize known methodologies and often achieves valid results</li> </ol>                                                                                     |
| <b>Level 2—Task-focused</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <ol style="list-style-type: none"> <li>1. Understands the purpose and benefits of methodologies for himself or herself but is unable to communicate them to others</li> <li>2. Demonstrates some independence of use for simple tasks; i.e., is easily distracted from disciplined sequence</li> <li>3. Shows some self-efficacy beliefs about the future ability to use specific methodologies for familiar problem contexts</li> <li>4. Is aware that the best results will occur if all steps are attended to</li> <li>5. Notices some variations in benefits from using methodologies but is unable to take advantage of this knowledge</li> </ol> |
| <b>Level 1—Rule-governed</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <ol style="list-style-type: none"> <li>1. Has limited awareness of the purpose or features of methodologies</li> <li>2. Follows steps accurately only if directly guided</li> <li>3. Has no sense that using a disciplined approach will improve performance</li> <li>4. Is aware only of his or her own efforts to learn how to handle a current step</li> <li>5. Is unable to adapt a methodology; may randomly attempt to do so</li> </ol>                                                                                                                                                                                                          |

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