Approaches Supporting Advanced Competency Development in the Workplace

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When most people think about the learning process the first picture that comes to mind is that of a school building or a classroom. After all, our formal education is certainly a universal and important part of our learning experience. It is perhaps only natural therefore that when corporate managers recognize a need to ensure continuous employee learning they too immediately think of classrooms, learning centers, and ultimately "corporate universities." In some cases this may well be the appropriate response. However, this is often not the case, as the following example illustrates:

> *A critical aspect of our company's product durability is ensuring against fatigue failure under particular operating conditions. There is a small group of engineers dedicated to this problem, and they have developed some very effective techniques. However, they have recently seen the retirement of one of their top people, and another will retire in two years. At the same time, in an effort to reduce product development time and better meet local customer needs, more and more of the development work is occurring at plant sites around the world. There have recently been product failures attributed to the fact that these development groups have not applied the appropriate techniques.*

The scenario just described will sound familiar to anyone working in engineering or management roles in a wide variety of industries. Most engineering organizations are continually faced with this challenge – to develop very high proficiencies in a small number of people. The challenge is often repeated with similar needs in a large number of subjects. This is clearly an employee development problem, yet one that few if any corporate training centers are equipped to handle. This is further illustrated with reference to Figure 1. While most corporate training programs are well equipped to address the upper left quadrant in the figure, the development need is most pressing for the situation of the lower right quadrant.

Two important questions must be asked if thinking is to shift to support these development needs – a relatively small number of people gaining very high proficiencies. The first question is that of how these higher proficiencies are gained. The second is whether anything can be done within an organization to provide or support such development. Bloom's Taxonomy of Learning [1] is widely recognized for defining a classification system of the progression of learning. The six stages he identified are *Knowledge*, *Comprehension*, *Application*, *Analysis*, *Synthesis*, and *Evaluation.* Knox, [2] in

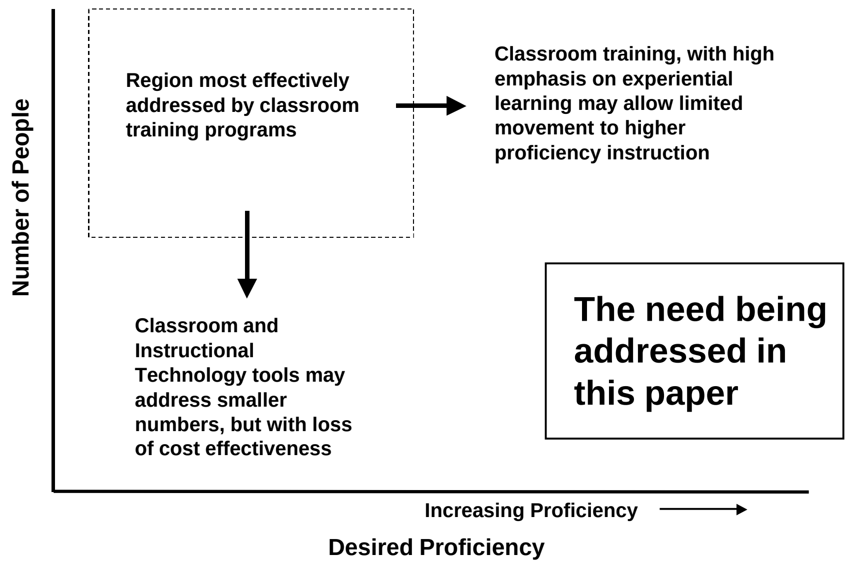

Figure 1 Training tool usage versus audience size and proficiency requirements

specifically addressing adult learning identified four stages that correspond closely with Bloom. His stages were identified as *Fragmentary understanding, Comprehension, Understanding of relationships, and Inclusive understanding.* The learning continuum shown in Figure 2 was created to be consistent with these well-accepted models of the stages of learning. Also identified in Figure 2 are the mechanisms most frequently used to develop the described proficiencies.

It should be emphasized that as an individual gains increased proficiency in a given subject the methods by which this is done become less explicitly defined as educational methods or tools. Herein lies the first challenge of advanced skill development? Is there anything that can be done within a professional engineering organization to ensure that these advanced development tools are in place? As identified in Figure 2, the activities to be fostered include project assignments that encourage the application of new concepts; the opportunity to ask questions of, and learn from others; and the opportunity to stretch the dialogue and experience through interaction with experts – within and more often outside of the organization. These activities are most often referred to as "experiential learning," and while such learning is often counted upon to occur on its own there are in fact a number of approaches that can be taken to foster it. A discussion of specific techniques is presented by Lee and Caffarella. [3] A more detailed discussion is available (Hoag [4]).

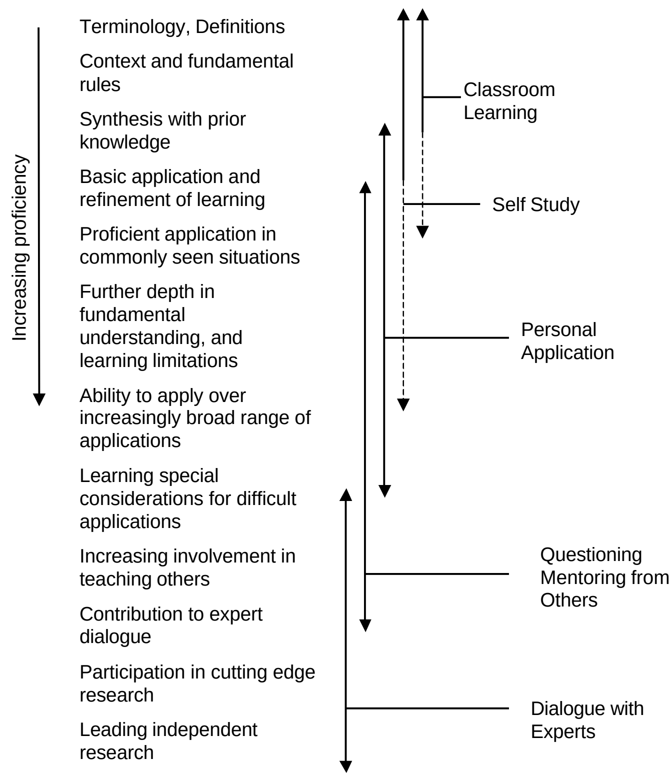

Figure 2 The learning progression, with examples of appropriate learning tools

A few examples are cited here, with descriptions of how they might be applied in an engineering organization.

Critical incidents – in the context of an engineering problem this technique would involve having class participants present specific problems they have faced, and using these practical problems to discuss solution techniques. It may be appropriate in some situations, but is limited by the fact that most engineering problems must be addressed immediately, and cannot be put off until the next class session.

Coaching – the learner performs a new analytical or experimental technique while being observed by, and receiving feedback from, an expert in the application of the technique. This approach allows direct, hands-on learning to occur in an environment where the risk of error is minimized, and the individual can obtain immediate answers to questions. The learning occurs very rapidly with a minimal investment of resources. If such opportunities are formalized, the inefficiencies of individually seeking out guidance are minimized.

Clinics – an opportunity is arranged for learners to present their application of what they learned to a panel of experts, in a non-threatening critique and discussion forum. While this technique is seldom used in industrial settings, it can be very effective. One approach might be to use the clinic in conjunction with a classroom training program. Individuals or teams within the class are given an assignment to complete a project. A team of experts is brought into the classroom to then review the projects, hear from the learners, and provide feedback to them. Using the technique in a classroom setting makes it far less intimidating than if the same technique were applied in the review of someone's day-to-day work.

The examples just cited are intended to demonstrate that a variety of specific approaches can be taken to explicitly support advanced proficiency development in the workplace. Returning to the challenge presented in Figure 1, we now have the tools with which we can support the development of advanced proficiencies in small numbers of people. The remaining steps are summarized in the paragraphs that follow.

In any given technical department or group it is desirable to always have a small number of expert practitioners to whom others can go for guidance and mentoring, and who can be called upon to lead the most complex and challenging assignments. The majority of the department will then be made up of technically competent people at various levels of experience, including a few engineers new to the profession. One of they key steps in professional development is that of succession planning. This involves looking to the majority group of engineers to develop the proficiencies required as the expert practitioners retire or make career moves.

The technical leadership of the department, perhaps working with a training director, must identify the combination of subject matter and proficiencies required of the expert practitioner. A *learning matrix* can then be defined for the particular area of expertise. This matrix sets the expectations… In what topics or subjects must the engineer develop proficiency? What level of proficiency is expected?

The next step in supporting technical development is to provide guidance for the engineer and supervisor to aid in achieving the desired proficiencies. For each subject of learning a variety of recommendations is provided. The recommendations may include work assignments that require the particular subject, mentoring, or approaches such as the examples listed earlier (Critical Incidents, Coaching, Clinics).

In large organizations the items just described can be made available to the entire technical workforce. The learning matrices of expected subject areas and proficiencies for a variety of positions can be made accessible. For each subject area recommendations of ways to develop the needed proficiency can also be supplied. This combination provides a foundation from which employees and their supervisors can create skill development plans that take into consideration both short-term needs and long-term career interests.

References:
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Kevin Hoag was awarded both BS and MS degrees in mechanical engineering from the University of Wisconsin-Madison. He spent 16 years at Cummins Inc., Columbus, Indiana where his most recent role was as senior technical advisor for continuing engineering education. Under his leadership Cummins was awarded the Glenn L. Martin Award for Corporate Leadership in Continuing Education in 1998, presented by the International Association for Continuing Engineering Education. He is currently the associate director of the Engine Research Center at the University of Wisconsin-Madison, and a program director in the Department of Engineering Professional Development.