Generating, Deepening, and Documenting Learning: The Power of Critical Reflection in Applied Learning

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Applied learning pedagogies—including service-learning, internships/practica, study abroad, and undergraduate research—have in common both the potential for significant student learning and the challenges of facilitating and assessing that learning, often in non-traditional ways that involve experiential strategies outside the classroom as well as individualized outcomes. Critical reflection oriented toward well-articulated learning outcomes is key to generating, deepening, and documenting student learning in applied learning. This article will consider the meaning of critical reflection and principles of good practice for designing it effectively and will present a research-grounded, flexible model for integrating critical reflection and assessment.

Applied learning pedagogies share a design fundamental: the nurturing of learning and growth through a reflective, experiential process that takes students out of traditional classroom settings. The approach is grounded in the conviction that learning is maximized when it is active, engaged, and collaborative. Each applied learning pedagogy provides students with opportunities to connect theory and practice, to learn in unfamiliar contexts, to interact with others unlike themselves, and to practice using knowledge and skills.

Despite the oft-cited maxim that "experience is the best teacher," we know that experience alone can, in fact, be a problematic teacher

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(Dewey, 1910; Conrad & Hedin, 1990; Hondagneu-Sotelo & Raskoff, 1994; Stanton, 1990; Strand, 1999). Experiential learning can all too easily allow students to reinforce stereotypes about difference, to develop simplistic solutions to complex problems, and to generalize inaccurately based on limited data. The service-learning student, for example, may think that all food assistance programs function exactly like the one at which he is working, causing him to make sweeping generalizations about the effectiveness of such programs despite widespread variations in size, structure, and sources of food and funding.

In addition, students may not derive the most important or significant learning from their experiences. The undergraduate researcher in the physiology lab may be frustrated by the tediousness of the research and not appreciate that scientific inquiry is intentionally a slow process of trial and error. She may not fully understand why the research questions she is investigating are important or how the data she is collecting fit into previous findings.

Students may leave applied learning experiences with little capacity to turn learning into improved action. The study abroad student may believe he has developed a greater sensitivity to cultures different from his own but six months later find himself jumping to conclusions about others based on their background or ethnicity. The intern who finds her collaborative project frustrating may end up repeating patterns of poor teamwork in her next group project.

Finally, students in applied learning pedagogies may have a vague sense of the impact their experiences have had on them but not be fully aware of the nature of their own learning, its sources, or its significance. They may only be able to describe outcomes vaguely, with phrases such as "I learned a lot from working with community members" or "I got so much out of living abroad." The service-learning student may fail to understand the different ways in which the classroom and the community present her with learning challenges. The study abroad student may be unable to identify specific changes in her attitudes toward others or

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to articulate what led to the changes. Students may, in other words, miss the opportunity to learn about their own learning processes—to develop the meta-cognitive skills required for lifelong, self-directed learning that applied learning is so well suited to cultivate.

The students in these examples would all benefit from a process of strong reflection, to help them avoid what T.S. Eliot (1943) once described as having the experience but missing the meaning. Learning—and understanding learning processes—does not happen maximally through experience alone but rather as a result of thinking about—reflecting on—it. As noted by Stanton (1990), when reflection on experience is weak, students' "learning" may be "haphazard, accidental, and superficial" (p. 185). When it is well designed, reflection promotes significant learning, including problem-solving skills, higher order reasoning, integrative thinking, goal clarification, openness to new ideas, ability to adopt new perspectives, and systemic thinking (Eyler & Giles, 1999; Conrad & Hedin, 1987).

However, reflection and its central role in applied learning are often misunderstood or seen as unnecessary. The word itself frequently connotes stream-of-consciousness writing, keeping a diary, or producing a summary of activities. It can easily be associated with "touchy-feely" introspection, too subjective to evaluate in a meaningful way and lacking in the rigor required for substantive academic work. Dewey (1910), one of the early champions of experiential learning, provides a strong foundation for re-conceptualizing reflection, defining it as the "active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends" (p. 6). Schön (1983) emphasizes the link between reflection and action; he defines reflection as "a continual interweaving of thinking and doing" and suggests that what he calls the reflective practitioner is one who "reflects on the understandings which have been implicit in [one's] action, which [one] surfaces, criticizes, restructures, and embodies in further action" (p. 281). The reflection required if applied learning pedagogies are to be maximized as learning opportunities is best understood in these terms, as a process of meta-cognition that functions to improve the quality of thought and of action and the relationship between them.

When understood in this light and designed accordingly, reflection becomes "critical reflection." It *generates* learning (articulating questions, confronting bias, examining causality, contrasting theory with practice, pointing to systemic issues), *deepens* learning (challenging simplistic conclusions, inviting alternative perspectives, asking "why" iteratively), and *documents* learning (producing tangible expressions of new understandings for evaluation) (Ash & Clayton, 2009a and 2009b; Whitney & Clayton, in press). As we understand it, critical reflection

is an evidence-based examination of the sources of and gaps in knowledge and practice, with the intent to improve both. Designing reflection effectively so as to make applied learning educationally meaningful first requires that we make clear its meaning as an integrative, analytical, capacity-building process rather than as a superficial exercise in navel-gazing (Ash & Clayton, 2009b; Whitney & Clayton, in press; Zlotkowski & Clayton, 2005).

A critical reflection process that generates, deepens, and documents learning does not occur automatically—rather, it must be carefully and intentionally designed. Welch (1999) points out that it is not enough to tell students "it is now time to reflect" (p. 1). Eyler, Giles, and Schmiede (1996) note that reflection "need not be a difficult process, but it does need to be a purposeful and strategic process" (p. 16). Especially given how unfamiliar most students are with learning through reflection on experience (Clayton & Ash, 2004), they need a structure and guidance to help them derive meaningful learning when they are outside the traditional classroom setting, otherwise reflection tends to be little more than descriptive accounts of experiences or venting of personal feelings.

This article explores principles of good practice across three steps in the design of critical reflection in applied learning:

1) determining the desired outcomes: learning goals and associated objecives,
2) designing reflection so as to achieve those outcomes, and
3) integrating formative and summative assessment into the reflection process.

It then presents a model for critical reflection—the DEAL model—that has been explicitly designed to embody these principles and refined through several years of research.

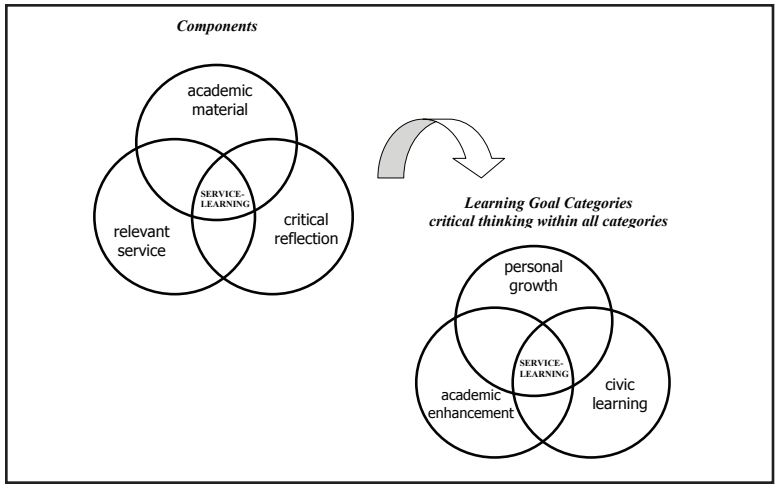
The discussion here is grounded in the conviction that facilitators of student learning in applied learning pedagogies are instructional *designers*; they make choices throughout the design process that are influenced by their goals and constraints and by their students' abilities as well as their own. Designing reflection proceeds best when framed in scholarly terms: as a process of experimentation, of continual assessment and refinement, of learning with and alongside the students. In other words, the designer of applied learning opportunities is best understood as a reflective practitioner herself—one who engages in the same critical reflection that she expects from her students— thereby improving her thinking and action relative to the work of generating, deepening, and documenting student learning in applied learning.

DETERMINING DESIRED LEARNING OUTCOMES

Just as with any other intentional design process, designing critical reflection requires beginning with the end in mind (Covey, 1989; Wiggins & McTighe, 1998). Specifically, it begins with the identification of desired learning outcomes. It then proceeds with the expression of learning goals in terms of assessable learning objectives and continues to the design and implementation of teaching and learning strategies (such as reflection) aligned with those objectives, all the while developing assessment strategies that are well-matched to the objectives and to the teaching and learning strategies and that can be used to inform future revisions of either or both.

Instructors, as well as the programs that support them, have a range of desired learning outcomes that underlie their use of any particular applied learning pedagogy (or combination of them). Figure 1 provides a conceptual framework for articulating a categorization of these outcomes and the role of critical reflection in advancing them, using service-learning as an example. Most instructors use service-learning to help their students engage more effectively with the content of the course or the perspective of the discipline while also learning about citizenship and about themselves as individuals. In other words, they use service-learning to help students learn at least in the general categories of *academic enhancement*, *civic learning*, and *personal growth*. These categories can apply to other applied learning pedagogies as well, along with additional ones such as *intercultural learning* (particularly relevant

Figure 1: Conceptual Framework for the Role of Reflection in Achieving Categories of Learning Goals (service-learning example)



in study abroad), *professional development* (especially for internships), and *research skill development* (in undergraduate research). *Critical thinking* might be seen as its own category of outcomes or as a dimension of other categories; additional meta-level outcomes related to learning processes might include *emotional intelligence* or the ability to make *connections* between ideas.

Given the public purposes of higher education (Boyer, 1996; Saltmarsh, Hartley, & Clayton, 2009; O'Meara & Rice, 2005; Saltmarsh, 2005), designers of any applied learning pedagogy might well consider *civic learning* as a relevant category of learning. Battistoni (2002) offers thirteen conceptual frameworks for understanding "civic" that are linked to various disciplines and thereby suggests a wide variety of ways it can be defined, such as in terms of participatory democracy, social justice, or an ethic of care. Specific learning goals in this category might relate to such issues as change agency, power, privilege, leadership, economic and political systems, governmental processes, community organizing, and public problem-solving. In light of the multi-faceted nature of this category, applied learning opportunities of all types can be designed to include it. For example, students involved in undergraduate research can consider the social drivers for and implications of both their research questions and their process of inquiry; those studying abroad can focus attention on the interconnections between local and global issues and on the ways culture shapes notions of citizenship; interns can explore the roles of corporations as citizens and the range of opportunities to integrate their professional and civic lives.

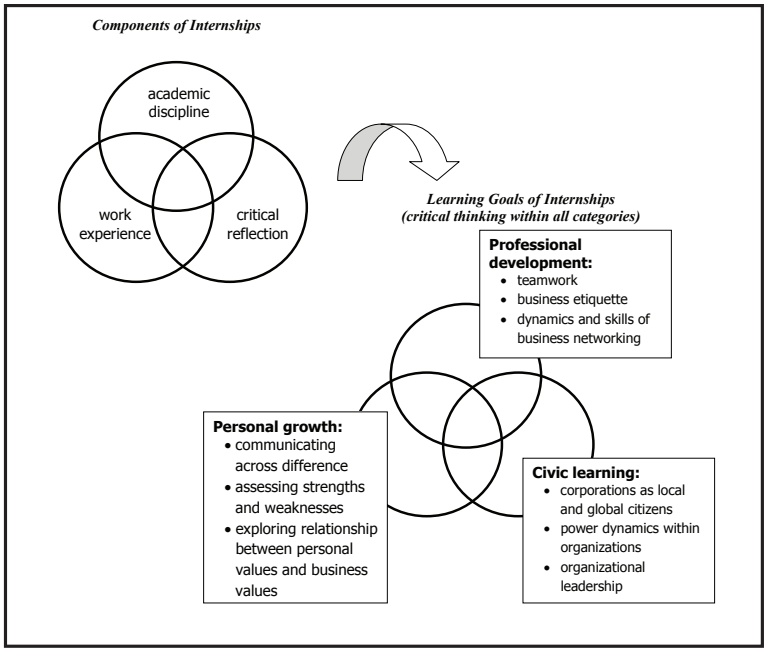
Similarly, applied learning pedagogies often involve interactions with others—classmates, mentors, community members, lab partners, officemates—and therefore lend themselves readily to learning in the general category of *collaboration*. Associated learning goals might include developing students' abilities to communicate with diverse others, make decisions as a group, assess group members' strengths and weaknesses and allocate responsibility accordingly, handle interpersonal conflict effectively, hold themselves and others accountable to group norms, develop shared visions, and monitor progress toward collective objectives and reach consensus on appropriate changes in their approach.

As the previous example suggests, learning goals within any one category of learning can often cross into another category—collaboration could also be understood as an element of diversity learning, professional development, personal growth, or civic learning. It is therefore up to instructors, program administrators, and/or students to decide how best to express the categories of learning and the associated learning goals for their particular situation. Because these categories are likely going to become headings in, for example, assessment reports, particular attention should be paid to what best represents the key arenas of learning that are

to be cultivated through the pedagogy. Toward that end, it may be helpful to begin by listing more specific goals (such as the ones given above for collaboration) and then determining how best to organize them into more general categories. Such an activity may be particularly important when a group of instructors undertakes instructional design together as part of a program or curriculum, so as to make sure that everyone is in agreement with and working towards the same desired outcomes.

Figure 2 provides an example of the use of Venn diagrams to express the learning goals associated with various categories of learning that might be developed for internships. As the use of the Venn diagrams suggests, learning outcomes are often conceptualized as the intersection of two or more categories. A Nonprofit Studies curriculum at North Carolina State University that is designed with threaded service-learning, for example, articulates learning outcomes at the intersection of academic enhancement and civic learning in terms of learning goals including: aligning mission, methods, and resources; balancing individual interests and the common good; moving beyond charity to systemic change; capitalizing on opportunities associated with diversity; and earning the public trust (Jameson, Clayton, & Bringle, 2008).

Figure 2: Conceptual Framework for the Role of Reflection in Achieving Learning Goals (internship example)



Whether starting with the general categories and working down to more specific learning goals within them or starting with learning goals and then determining the most useful way to categorize them, developing this broad structure to express and organize desired learning outcomes is key to undertaking an intentional instructional design process, to communicating the rationales for applied learning to students and colleagues, and to structuring assessment strategies and sharing resultant data. This structure for thinking about learning outcomes provides an important foundation for developing strong approaches to critical reflection.

FROM LEARNING GOALS TO LEARNING OBJECTIVES

Once the general categories of learning and their associated learning goals have been determined, the instructional designer's next task is to express the learning goals as assessable learning objectives. Goals such as "students will learn about project management" (internship), "students will understand the challenges facing schools in their attempts to implement state and federal education policies" (service-learning), "students will appreciate the similarities as well as the differences between their home and host cultures" (study abroad), or "students will understand the differences between quantitative and qualitative research methods" (undergraduate research) are difficult to translate into effective pedagogical practice.

Bloom's Taxonomy of Educational Objectives (1956) provides a foundation for turning learning goals into assessable learning objectives, which then drive the rest of the design process. The taxonomy includes learning in three domains: cognitive, affective, and psychomotor; this discussion refers to the Taxonomy of Educational Objectives in the Cognitive Domain. Although modified and re-ordered by some scholars in recent years, Bloom et al. originally identified six levels, each with associated—and assessable— learning behaviors, as summarized in Table 1. A central and widely shared, although not universal, tenet of our reading of the taxonomy is its hierarchical nature—each level builds toward

Table 1: Bloom's Taxonomy and Associated Learning Behaviors

Bloom's Classification	Examples of Learning-Related Behaviors
Knowledge	Identify, define, order
Comprehension	Explain describe, restate
Application	Apply, solve, choose
Analysis	Analyze, compare, contrast
Synthesis	Synthesize, develop, propose
Evaluation	Evaluate, assess, judge, critique

the next, from simpler to more complex dimensions of reasoning. For example, applying an academic concept effectively requires having a good understanding of it, which itself involves having basic knowledge of the underlying facts or theories.

Table 2 provides an example, drawn from service-learning, of the use of Bloom's Taxonomy to move from general categories of learning to specific learning goals and then to assessable learning objectives.

Table 2: Using Bloom's Taxonomy to Move from General Categories of Learning to Specific Learning Goals to Assessable Learning Objectives (service-learning example)

	Category: Personal Growth	Category: Civic Learning	Category: Academic Enhancement
Learning Objective Level	**Learning Goal: Students will consider ways to refine their skills**	**Learning Goal: Students will become more effective change agents**	**Learning Goal: Students will understand the Stages of Change model**
LO 1: Identify	Identify a particular skill of yours that you need to develop further.	Identify the collective objectives at stake and the approach you or others took toward meeting them.	Identify the Stages of Change model.
LO 2: Explain	Explain the skill so that someone who does not know you can understand it.	Explain the objectives and the approach you and / or others took toward meeting them so that someone not involved can understand.	Explain the Stages of Change model so that someone not in the course can understand it.
LO 3: Apply	Apply your understanding of this skill in the context of your service-learning experience and (as applicable) in other areas of your life.	Apply your understanding of the approach in the context of the objectives at stake.	Apply your understanding of the Stages of Change model in the context of the experience.
LO 4: Analyze	Analyze the sources of this skill in your life.	Analyze the approach in light of alternatives.	Analyze the similarities and differences between the Stages of Change model as presented in the text and as it emerged in the community.
LO 5: Synthesize	Develop the steps necessary to improve upon this skill in the short term, in your service-learning activities and (as applicable) in other areas of your life.	Develop the steps necessary to make any needed improvements in your / their approaches (and/or in the objectives) in the short term.	Develop an enhanced understanding of the Stages of Change model in light of the experience.
LO 6: Evaluate	Evaluate your strategies for refining your skills over the long term.	Evaluate your / their approaches in terms of the prospects for long-term, sustainable, and/or systemic change.	Evaluate the completeness of your understanding of the Stages of Change model and of its use in the community.

Using Bloom's Taxonomy in this way, to achieve a high level of clarity regarding desired learning outcomes and to express them in assessable language, enables instructors to design reflection that targets learning objectives in developmentally-appropriate ways, building toward the highest level of learning deemed appropriate in any given instance. The learning objectives thus become both the road map that guides the design of reflection activities and the basis for determining whether the intended destination has been reached and adequately expressed in the products of reflection.

DESIGNING REFLECTION TO ACHIEVE DESIRED LEARNING

Effectively designing critical reflection involves making a series of choices that are informed by the desired learning outcomes as well as by the opportunities and constraints that come with the specific context in which applied learning is being implemented and by the abilities of the participants. These choices produce an overall reflection *strategy* or over-arching structure that may combine various reflection activities or *mechanisms*—such as journal entries, online chat sessions, poster presentations, worksheets, or discussion sessions. Questions such as those in Table 3 can help guide the design of reflection strategies and mechanisms.

The result of such intentional design work is a customized plan that integrates critical reflection into the core of applied learning experiences. This plan may be maximized by designing the reflection strategy such that individual reflection mechanisms build on one another cumulatively, so that students learn how to learn through reflection as well as improve the quality of their learning and their practice over time. Table 4 summarizes a body of principles of good practice that has emerged to support the instructional designer in making the choices that produce high quality reflection strategies and mechanisms.

Table 3: Questions to Guide the Design of Reflection Strategies and Mechanisms

Reflection Strategies
When and how often will reflection occur? Before, during, and after the experience? Will students reflect iteratively such that reflection builds on itself over time?
Where will reflection occur? In or outside the classroom? *Who will facilitate and/or particpate in reflection?* Instructors, members of the community or workplace, peers?
How will feedback be provided and/or reflection products graded? What is the relationship between amount of feedback and level of expected outcomes? What is the relationship between the reflection products and the overall grade?
Reflection Mechanisms
Toward what *specific learning goals and objectives* will the particular activity be guided?
What *medium* will be used for the activity: written assignments, worksheets, spectrum activities, photographs, videos, games, drawings, online forums, in-class discussion, out-of-class reflection sessions, concept maps, etc.? What *prompts* will be used to guide the activity?
What *products* will demonstrate the learning the activity generates: essays, PowerPoint or poster presentations, oral exams, etc.? Note that in a critical reflection process, the products used to demonstrate learning are in many cases the same as the medium used to generate it
What *criteria* will be used to assess the learning so demonstrated ?

Table 4: Characteristics of High Quality Reflection

	High Quality Reflection …
Eyler et al. (1996)	is continuous (ongoing)
	is connected (with assignments and activities related to and building on one another and including explicit integration with learning goals and academic material)
	is challenging (including in terms of the expectation that students take responsibility for their own learning)
	is contextualized (to the community setting and broader public issues and to the students' own particular roles)
Bringle & Hatcher (1999)	links experience to learning
	is guided
	occurs regularly
	involves feedback to the learner to enhance the learning
	helps clarify values
Zlotkowski & Clayton (2005)	is oriented toward specific learning objectives
	is integrative
	is assessed in terms of critical thinking
	includes goal setting
	generates change in the learner's life

Each of these sets of characteristics of high quality critical reflection includes explicit linkage to desired learning outcomes, and Bloom's Taxonomy provides a structure to facilitate the design of reflection accordingly. The example reflection activity provided in Figure 3 demonstrates the design of reflection prompts—for the learning goal of understanding strengths and weaknesses, in the category of personal growth—that guide students step-by-step to ever-higher levels of reasoning through prompts that are explicitly structured in accordance with the levels of the taxonomy.

A focus on critical thinking is a key characteristic of critical reflection. The reflection guided by the prompts in Figure 3 can progress to ever-higher levels of reasoning but do so poorly, in an illogical, unclear way that is uninformed by consideration of multiple perspectives and that fails to engage with the true complexity of the issues. Critical thinking, as outlined by Paul and Elder (2002), is based on universal intellectual standards that include accuracy, clarity, relevance, depth, breadth, logic, significance, and fairness. Many of the potential shortcomings of reflection described in the introduction—reinforcing stereotypes, generalizing inappropriately on the basis of limited data, missing the most significant learning in an experience—are indicative of and result from poorly developed critical thinking abilities. Providing guidance in this area is, therefore, a necessary corollary to the use of hierarchical learning objectives in the design of critical reflection (Ash, Clayton, & Atkinson, 2005). Table 5 provides an overview of the standards of

Figure 3: Sample Bloom-based Reflection Mechanism (undergraduate research example)

According to Parker Palmer (2000), "limitations and liabilities are the flip side of our gifts … a particular weakness is the inevitable trade-off for a particular strength." There is nothing "wrong" with us that we need to "fix," he suggests. Rather, we are who we are; sometimes our personal characteristics serve us well (and we think of them as strengths), and sometimes they serve us ill (and we think of them as weaknesses) The attempt to "fix" our liabilities will inevitably alter their "flip side" gifts as well. (pp. 52-53).

Individually and in writing …

Identify and explain a personal characteristic that you tend to think of as a weakness in your role as a researcher

Apply Palmer's distinction to this characteristic: What gift or strength could be the "flip side" of this "weakness"?

Discuss with a partner …

Compare and contrast a research-related situation in which the "weakness" emerged and one in which its "flip side" strength emerged. Why do you think each emerged as it did and what were the consequences?

If Palmer is correct regarding the relationship between our gifts or strengths and our limitations or liabilities, what do you think are the implications for your approach to personal and professional development as a researcher?

Individually and in writing …

Critique Palmer's distinction: Do you agree with him? Why or why not? What, if anything, would you change in his thinking?

critical thinking (with the addition of integration and writing quality), along with prompting questions that can be used by students themselves to improve the quality of their reasoning and by peers and/or instructors as feedback on reflection products.

Using these tools together—designing reflection mechanisms through the use of hierarchical learning objectives and improving the quality of thinking at each of the levels of reasoning through the use of critical thinking standards—will help to *generate* and *deepen* learning in an applied learning environment. The products of such intentionally designed reflection, in turn, *document* learning for purposes of grading or research as well as for student use in guiding future thinking and action.

INTEGRATING FORMATIVE AND SUMMATIVE ASSESSMENT INTO THE REFLECTION PROCESS

Designing an intentional approach to critical reflection in applied learning also involves the development of an assessment strategy. Just as reflection is much more effectively implemented not only at the end of an applied learning course or project but throughout, so too is assessment more valuable when it is designed from the beginning and is itself evaluated and modified as needed throughout.

Table 5: Critical Thinking Standards

Critical Thinking Standard	Description	Associated Questions to Check your Thinking
Integration	Service experience clearly related to the learning.	▪ Have I clearly shown the connection between my experience and my learning?
Clarity	Expands on ideas, express ideas in another way, provides examples or illustrations where appropriate.	▪ Did I give an example? ▪ Is it clear what I mean by this? ▪ Could I elaborate further?
Accuracy	All statements are factually correct and/or supported with evidence.	▪ How do I know this? ▪ Is this true? ▪ How could I check on this or verify it?
Precision	Statements contain specific information.	▪ Can I be more specific? ▪ Have I provided sufficient detail?
Relevance	All statements are relevant to the question at hand; all statements connect to the central point.	▪ How does this relate to the issue being discussed? ▪ How does this help us/me deal with the issue being discussed?
Depth	Explains the reasons behind conclusions and anticipates and answers the questions that the reasoning raises and/or acknowledges the complexity of the issue.	▪ Why is this so? ▪ What are some of the complexities here? ▪ What would it take for this to happen? ▪ Would this be easy to do?
Breadth	Considers alternative points of view or how someone else might have interpreted the situation.	▪ Would this look the same from the perspective of…? ▪ Is there another way to interpret what this means?
Logic	The line of reasoning makes sense and follows from the facts and/or what has been said.	▪ Does what I said at the beginning fit with what I concluded at the end? ▪ Do my conclusions match the evidence that I have presented?
Significance	The conclusions or goals represent a (the) major issue raised by the reflection on experience.	▪ Is this the most important issue to focus on? ▪ Is this most significant problem to consider?
Fairness	Other points of view are represented with integrity (without bias or distortion).	▪ Have I represented this viewpoint in such a way that the person who holds it would agree with my characterization?

Modified source: Paul, R.P. & Elder, L. 2001. The Miniature Guide to Critical Thinking. The Foundation for Critical Thinking. Santa Rosa, CA. www.criticalthinking.org

Assessment can be designed for *summative* purposes and used at the end of a process to measure and document outcomes, and it can be designed for *formative* purposes and used during a process as a way to continuously improve both the process and the outcomes. A summative assessment process that is grounded in well-articulated learning objectives can be used both to grade student products and to report outcomes at program or curriculum levels. Summative assessment in the form of grading generally involves judging the degree to which students have met the learning objectives. Such assessment can be standards based and therefore measure the ultimate attainment of an objective at the end of the experience, or it can be based on improvement and therefore measure change over time. A related design choice that often emerges at the program or curriculum level is whether the ultimate attainment or the change over time is to be assessed within a single course or applied learning project, across a sequence of courses or projects, or both. Instructors and/or administrators need to decide on the form summative assessment reports should take, in light of the uses to which they will be put and the audiences for whom they are intended. For example, will the assessment be expressed quantitatively, such as the percentage of students whose reflection on experience demonstrates fulfillment of the desired outcomes, or will the report provide qualitative information with examples of student learning outcomes, or both?

Faculty and students using applied learning pedagogies will find value in formatively assessing both learning and the teaching and learning process and programs that generate it. Formative assessment is increasingly recognized as key to effectively designing teaching and learning. As noted by the National Research Council (2001), "Students will learn more if instruction [in this case, reflection in applied learning] and assessment are integrally related. [P]roviding students with information about particular qualities of their work and what they can do to improve it is crucial for maximizing learning" (p. 258). Feedback combined with opportunities to apply it (e.g. through revision of their work) is an approach to formative assessment that helps students learn not only content, but meta-cognitive skills as well—in this case, learning how to learn through the often unfamiliar process of critical reflection.

Formative assessment can also be used to check the reflection process against the learning outcomes it generates so as to refine both the learning goals and objectives and the reflection strategies and mechanisms designed to meet them. Instructors might review student products critically not only in order to provide helpful feedback to improve students' thinking but also to gauge the effectiveness of their own design (e.g., the clarity of the reflection prompts) and to provide themselves with feedback to improve it. Such formative assessment also provides valuable feedback to instructors regarding, for example, concepts or skills that prove difficult for students to grasp; such information can inform discussion of how these concepts or skills are taught in the courses or programs associated with or prerequisite to the applied learning activity.

Having sorted through the various purposes of assessment, the designer of applied learning pedagogies faces additional choice points related to how assessment is implemented, including the nature of the products or evidence that will be examined. Will assessment involve extra activities that are not related to the learning process (for example, pre and post questionnaires) or assignments and products that are already part of the course or project (for example, reflection products or essays)? In a questionnaire, students might be asked to what degree they think they have met the learning objectives of their applied learning experience; in a course-embedded assignment, students would be asked to respond to a prompt or prompts, and the resultant product would be evaluated against the objectives. Practitioner-scholars such as Eyler (2000) suggest that the former often confuses student satisfaction with student learning and therefore call for the development of approaches that support students in doing the latter. In addition, a course-embedded process is generally less time-consuming, for both students and instructors, than the interview, focus group, or portfolio methods often used (Eyler & Giles, 1999; Gelmon, Holland, Driscoll, Spring, & Kerrigan, 2001) and requires more intentional integration of assessment with the teaching and learning process.

Another issue is the determination of criteria that will be used to evaluate the products that demonstrate learning. In other words, what will be the indicators of the degree to which the student has met the learning objectives or of the quality of learning outcomes? The creation of a rubric that expresses varying levels of quality or mastery, from novice to expert or from under-developed to excellent, can be extremely helpful in guiding this process. For example, if the objective is for interns to be able to determine the appropriate approach to a particular workplace situation (e.g., a team member not pulling her weight), a rubric in which responses are categorized by degree of sophistication and/or efficacy could be used for assessment. If an objective is meta-cognitive and/or is unique to the students as individuals and their particular experiences (for example, that students are able to evaluate a personal strength or weakness in light of their professional goals), then a rubric based on Bloom's Taxonomy that expresses levels of reasoning may be in order. The Standards of Critical Thinking described earlier can also be turned into a rubric (see Table 6, for example) that can be used to assess quality of reasoning.

An integrated approach to assessment and reflection includes using the same set of objectives and standards and tools to generate learning (through reflection prompts), to deepen learning (through formative assessment or feedback), and to document learning (through summative

Table 6: Critical Thinking Rubric [excerpts]

	completely lacking (1)	under-developed (2)	good (3)	excellent (4)
Accuracy	Consistently makes inaccurate statements and/or fails to provide supporting evidence for claims	Makes several inaccurate statements and/or supports few statements with evidence	Usually but not always makes statements that are accurate and well-supported with evidence	Consistently makes statements that are accurate and well-supported with evidence
Clarity	Consistently fails to provide examples, to illustrate points, to define terms, and/or to express ideas in other ways	Only occasionally provides examples, illustrates points, defines terms, and/or expresses ideas in other ways	Usually but not always provides examples, illustrates points, defines terms, and/or expresses ideas in other ways	Consistently provides examples, illustrates points, defines terms, and/or expresses ideas in other ways
Depth	Fails to address salient questions that arise from statements being made; consistently over-simplifies when making connections; fails to consider any of the complexities of the issue	Addresses few of the salient questions that arise from statements being made; often over-simplifies when making connections; considers little of the complexity of the issue	Addresses some but not all of the salient questions that arise from statements being made; rarely over-simplifies when making connections; considers some but not all of the full complexity of the issue	Thoroughly addresses salient questions that arise from statements being made; avoids over-simplifying when making connections; considers the full complexity of the issue
Breadth	Ignores or superficially considers alternative points of view and/or interpretations	Gives minimal consideration to alternative points of view and/or interpretations and makes very limited use of them in shaping the learning being articulated	Gives some consideration to alternative points of view and/or interpretations and makes some use of them in shaping the learning being articulated	Gives meaningful consideration to alternative points of view and/or interpretations and makes very good use of them in shaping the learning being articulated
Fairness	Consistently represents others' perspectives in a biased or distorted way	Occasionally represents others' perspectives in a biased or distorted way	Often but not always represents others' perspectives with integrity	Consistently represents others' perspectives with integrity (without bias or distortion)

[Modified source: Paul, R.P. & Elder, L. 2001. *The Miniature Guide to Critical Thinking*. The Foundation for Critical Thinking. Santa Rosa, CA. www.criticalthinking.org]

assessment or grading and reporting outcomes). Reflection prompts based on Bloom's Taxonomy can both guide students to desired levels of reasoning and determine the level of reasoning they have attained. Critical thinking standards can be used as both a formative guide to improve student reasoning and a summative tool to evaluate its quality in the end. Making visible such integration of reflection and assessment is key in helping students become increasingly aware of and responsible for their own learning processes.

The creation of an assessment strategy is as important as the articulation of the learning goals and associated objectives, and all should be developed in parallel during the design of the reflection activities. Trying to assess a learning goal that has not been articulated as an assessable objective (e.g., "students will understand …," "students will appreciate …," "students will learn about …") is usually an exercise in frustration. A reflection mechanism that is not mapped to learning objectives is often a missed opportunity for maximized learning as well as a hindrance to using reflection products to assess learning. And an objective that expresses desired learning that cannot be achieved through the pedagogy in question, much less assessed, should, like all of the above, send the designer back to the drawing board.

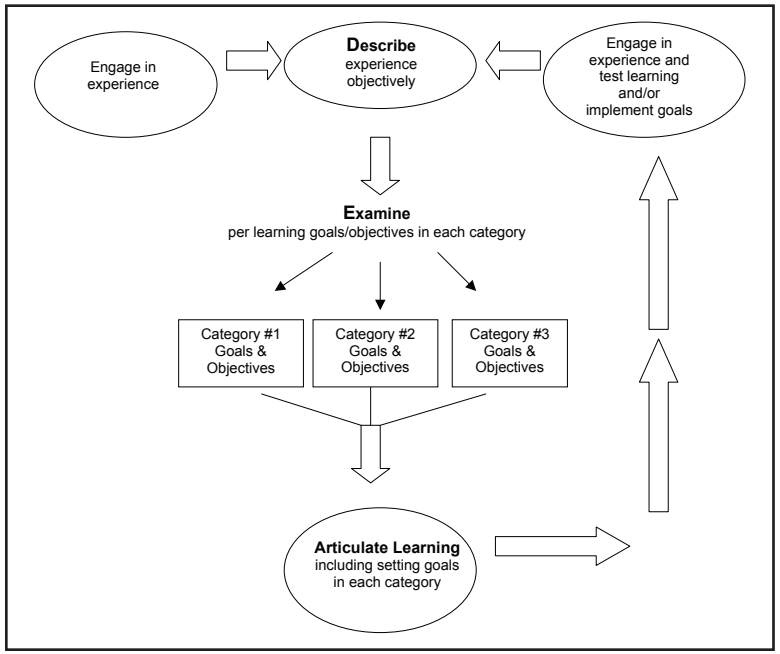
THE DEAL MODEL FOR CRITICAL REFLECTION

An example of an approach to critical reflection explicitly designed in accordance with the principles of good practice discussed above is the DEAL Model for Critical Reflection (Ash & Clayton, 2004; Ash & Clayton, 2009a, 2009b)—the product of a multi-year scholarship of teaching and learning project involving students and faculty from a variety of disciplines. Originally developed in the context of service-learning, DEAL has been used across a range of traditional and experiential pedagogies; in K-12, undergraduate, and graduate courses and curricula; and in co-curricular as well as professional training settings.

The DEAL model consists of three sequential steps (see Figure 4):

1. *D*escription of experiences in an objective and detailed manner;
2. *E*xamination of those experiences in light of specific learning goals or objectives; and
3. *A*rticulation of *L*earning, including goals for future action that can then be taken forward into the next experience for improved practice and further refinement of learning.

Figure 4: Schematic Overview of the DEAL Model for Critical Reflection



Each step of this model requires specific prompts, which provide the guidance necessary for students to engage in the oftentimes counter-normative activity of developing their own learning rather than reproducing what their instructors have taught them (Clayton & Ash, 2004; Howard, 1998). The discussion that follows summarizes each step in the DEAL model and provides sample prompts.

DESCRIBE

Objective, detailed description of an experience provides a strong foundation for meaning-making in the critical reflection process; it is a way to make the experience present and to ensure that students have access to all relevant aspects of it as they engage in reflection. This step is not as simple as it might appear, as students often prefer to jump straight into interpretation. It is also easy to overlook or under-value the details that are often most significant, so enhanced skills of mindfulness and attentiveness are often required for—and developed by—this step. Reflection prompts associated with the Describe step ask students to address such issues as when and where the experience in question took place, who was and was not present, what they and others did and did not do, what they saw and heard, and so on.

EXAMINE

The DEAL model is explicitly designed to move students beyond summarizing their experiences, which all too often results when a reflection activity is assigned, into meaning-making. In the second step of DEAL, prompts that help students Examine their experiences are linked to the desired learning outcomes—whether expressed as learning goals or, in a more assessable fashion, as learning objectives—within each category of learning. Table 7 provides examples of prompts drawn from learning goals in the general category of *civic learning*; some instructors may prefer to develop Examine prompts from learning goals such as these rather than from assessable objectives when, for example, the intent is to stimulate questions or surface issues for further discussion rather than to evaluate students' reasoning.

ARTICULATE LEARNING

The third step of the DEAL model supports students in Articulating the Learning that the two previous steps have begun to generate, while providing further guidance in continuing to expand and deepen that learning. It helps them capture their learning in such a way as to be able to act on it and thereby improve the quality of their learning and their future actions. It consists of four prompts: (a) *What did I learn?;* (b) *How did I learn it?;* (c) *W*hy does it *matter?;* and (d) *What will I do in light of it?* The DEAL model thus does not begin but rather ends with the question "What did you learn," in accordance with the understanding of reflection as the component of applied learning that generates learning.

Table 7: DEAL Model Sample "Examine" Prompts Based on Learning Goals in the General Category of Civic Learning

Learning Goals	Sample Examine Prompts
Students will explore the dynamics of change agency	What was I / someone else trying to accomplish?
	In taking the actions I / they did, was the focus on symptoms of problems or causes of problems?
	Was the focus (symptom or cause) appropriate to the situation?
	How might I / they focus more on underlying causes in the future?
Students will learn about power and privilege	In what ways did differentials in power and privilege emerge in this experience?
	What are the sources of power and privilege in this situation?
	Who benefits and who is harmed?
Students will appreciate the tension between individual interests and the common good	What is in the interest of the common good in this situation? What is in the interest of (whose) individual interests or rights?
	In what ways is the individual good (mine / others) linked to and/or contrary to the common good?
	What trade-offs between them are involved? Who made the trade-offs? Were the trade-offs made appropriate or inappropriate and why?

The general structure provided by the DEAL model can be used to guide critical reflection online, in an oral discussion, in a written journal entry or essay, or in any combination of mechanisms. For example, Description might be done online by each student individually, Examination orally by a group of students, and Articulation of Learning as a written essay. The DEAL model can be used to structure "light" reflection, as in a 30 minute in-class activity or an online chat that produces simple (e.g., four sentence) Articulated Learnings.

A BLOOM-BASED USE OF DEAL

DEAL can also guide more in-depth critical reflection that targets higher order reasoning and critical thinking through prompts that are tied directly to hierarchical learning objectives. Such an approach might be used not merely to stimulate questions and surface issues for further discussion, as in the goal-based example in Table 7 above, but also to support students explicitly in developing reasoning abilities and to assess the quality of their reasoning.

In a particularly comprehensive version of the DEAL model (Ash & Clayton, 2009a, 2009b), designed to facilitate student reasoning all the way up to the level of evaluation in Bloom's Taxonomy, the Examine

and the Articulate Learning steps each have two parts. After students Describe an experience, they surface one or more key ideas for further thought in Examine Part I and then take one of those ideas from identification and explanation through application and to analysis in Examine Part II. In Part I of the Articulate Learning step they synthesize a new understanding of the key idea and evaluate changes in their thinking, and in Part II they evaluate the written expression of that thinking and revise it as needed.

For example, in the category of *personal growth*, Examine Part I might include some or all of the prompts in Table 8, which are oriented toward the learning goals that comprise this category and which encourage students to focus on their own particular personal characteristics.

Then Part II of the Examine step might use prompts such as those in Table 9—specifically mapped to Bloom-based learning objectives up to the level of analysis—to support students in developing their thinking about that characteristic further.

The Articulate Learning step then supports students in re-thinking and extending the thinking from the Examine step, to create a more meaningful and fully thought out reflective essay, moving them through Synthesis and Evaluation with additional sub-prompts and supporting them in documenting all six levels of reasoning in Bloom's Taxonomy. Continuing with the example in the category of personal growth, Part I of this step includes the expanded prompts represented in Table 10.

Table 8: Bloom-based Version of DEAL: Sample "Examine" Part I Prompts (Personal Growth Category)

Examine Part I (Personal Growth): Sample Prompts to Surface a Personal Characteristic
What *assumptions* or *expectations* did I bring to the situation? How did they affect what I did or didn't think, feel, decide, or do? To what extent did they prove true? If they did not prove true, why was there a discrepancy?
How did this experience make me *feel* (positively and/or negatively)? How did I handle my emotional reactions? Should I have felt differently? Why or why not?
How did I *interpret* the thoughts, feelings, decisions, and/or behaviors of others What evidence do I have that my interpretations were or were not accurate?
In what ways did I succeed or do well in this situation (e.g., interacting with others, accomplishing tasks, handling difficulties) and what *personal characteristics helped me to be successful* (e.g., skills, abilities, perspectives, attitudes, tendencies, knowledge)? In what ways did I experience difficulties (e.g., interacting with others, accomplishing tasks) and what *personal characteristics contributed to the difficulties* (e.g., skills, abilities, perspectives, attitudes, tendencies, knowledge)?
How did this situation challenge or reinforce my *values, beliefs, convictions* (e.g., my sense of right and wrong, my priorities, my judgments)? My sense of *personal identity* (e.g., how I think of myself in terms of gender, sexual orientation, socioeconomic status, age, education level, ethnicity, nationality, mental/physical health)?

In Part II of the Articulate Learning step, students are asked to evaluate their written products using a checklist, which includes the standards of critical thinking, and to rewrite their "I learned that" statement as needed to ensure that it expresses the highest level of learning they have achieved.

Table 9: Bloom-based Version of DEAL: Sample "Examine" Part II Prompts (Personal Growth Category)

Examine Part II (Personal Growth): Prompts to Develop Understanding of a Personal Characteristic Using Bloom's Taxonomy	
Identify	What personal characteristic are you coming to understand better as a result of reflection on your applied learning experiences?
Explain	Explain the characteristic so that someone who does not know you would understand it.
Apply	How does / might this characteristic positively and/or negatively affect your interactions with others, your decisions, and/or your actions in your applied activities and (as applicable) in other areas of your life?
Analyze	What are the possible sources of / reasons for this characteristic? How does your understanding of these sources / reasons help you to better understand what will be involved in using, improving, or changing this characteristic in the future?

Regardless of how it is implemented—written or oral, individual or collaborative, lightly or in-depth—the DEAL model offers students the opportunity to use writing or speaking as vehicles *for* learning rather than as expressions of learning *after* it has already occurred (Clayton & Ash, 2004). Generating their own learning in this way is yet another counter-normative aspect of critical reflection on experience and, as suggested in the set of characteristics of high quality reflection in Table 4, students will benefit from feedback on their thinking, with associated opportunities to revisit and revise (e.g., through application of the Standards of Critical Thinking presented in Tables 5 and 6) to maximize the quality of their learning.

In addition, the development of a critical reflection model such as DEAL facilitates scholarly work relative to teaching and learning in an applied learning pedagogy, helping instructors improve the former to enhance the latter. For example, DEAL and its associated rubrics (including the critical thinking rubric in Table 6) were used to examine changes in students' critical thinking and higher order reasoning abilities across drafts of a single reflection product and over the course of a semester, as well as across the categories of academic enhancement, civic learning, and personal growth in several service-learning enhanced classes (Ash et al., 2005). Building on this work, Jameson et al. (2008) modified the DEAL reflection prompts and rubrics for application across the course sequence of a Nonprofit Studies minor, investigating changes in students' critical thinking and reasoning abilities across the learning goals

Table 10: Bloom-based Version of DEAL: "Articulate Learning" Part I Prompts (Personal Growth Category)

1. What did I learn?
• Identify and explain (so that someone who doesn't know you can understand it) a personal characteristic that you are beginning to understand better • Express the learning in general terms, not just in the context of the experience, so that it can be applied more broadly to other areas of your life (personally or professionally) and help you in your ongoing personal growth process • Introduce a judgment regarding whether the characteristic serves you well (and thus needs to be capitalized on) or poorly (and thus needs to be changed) – or both
2. How did I learn it?
• Clearly connect the learning to your specific applied learning activities so that someone who was not involved would understand, including discussion of the positive and negative impacts of the personal characteristic
3. Why does it matter?
• Consider how the learning has value over the short and long term, both in terms of your applied learning activities and in terms of your life more generally
4. What will I do in light of it?
• Set specific goals and assessable goals (that you could come back to and check on to see if they are being met) relative to this learning over the short and long term • Consider the benefits and challenges associated with fulfilling these goals, especially in light of the sources of or reasons for the characteristic

of five leadership challenges facing the nonprofit sector. McGuire et al. (2009) examined critical thinking demonstrated in Articulated Learnings produced by students in multiple disciplines using a variety of assignment and feedback-revision formats.

The DEAL model and its associated rubrics therefore demonstrate the intentional design of critical reflection: identifying desired student learning outcomes, articulating them as specific goals and as assessable learning objectives, and then crafting an integrated reflection and assessment approach around them. In addition to providing tools needed to generate, deepen, and document student learning, DEAL facilitates investigation of the learning processes (Clayton, Ash, & Jameson, 2009).

CONCLUSION

It is our hope that our work can serve as a model for faculty, staff, and students as they seek to design reflection associated with applied learning opportunities, courses, and programs. Our individual and collective learning as practitioner-scholars across the field of applied learning can be enhanced through a scholarly approach to the instructional design process. In turn, it can contribute to advancing the academy's understanding of both how our students think and how we can support them in learning to think more deeply and with greater capacity for self-directed learning.

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