An individual with a self-assessment mindset is motivated to consistently work to improve his or her own performance by using performance criteria. Self-assessment, like assessment, depends upon criteria that describe what constitutes quality in a performance, and strives to identify strengths (and how to replicate them) and areas for improvement (and how to make those improvements). Self-assessment is the most productive practice for triggering and maintaining growth; conversely, self-evaluation makes growth nearly impossible.

When Pacific Crest was Pacific Crest Software and it came to marketing technology, Pacific Crest employees conducted demonstrations in which teams of students used the software (see the **Role of Technology** section). Dan Apple shares his recollection of how that process led to an understanding of the critical nature of assessment and especially self-assessment:

> *In order to help faculty better understand what they were seeing when they viewed these demonstrations, the student participants were asked to reflect on their experience and for each team to share the three most important things they had learned. Almost without exception, their lists of what they had learned were in areas such as improved communication, teamwork, problem solving, critical thinking, risk-taking, self-confidence, and leadership, rather than anything about the software. By the late 1980s, student participants started asking the workshop facilitators to help them to continue to improve in the future. This led to the addition of the role of reflector in the team structures. It also led to the facilitator tasking each individual student with performing a self-assessment of their performance. Because there was no standard offered, students could not easily evaluate their performance; they were simply asked to reflect on their performance and consider how it might be improved.*

Though not appreciated as such at the time, students were simultaneously looking back (reflecting) and looking forward (assessing); individuals determined their own areas for improvement and teams shared a synthesized list of individual team member strengths. Though the collaborative nature of these teams and the reporting structure they worked with may have made it difficult to observe at first, individual students were already engaging in informal self-assessment, identifying strengths and areas for improvement (see the section **Assessment vs. Evaluation**).

Defining and Describing Self-Assessment

The articulation and definition of self-assessment evolved between 1991 and 1997. The deep fundamental relationship between improvement and self-assessment was noted in the first *Teaching Institute Handbook*, in which self-assessment was identified as a key to improving the rate of learning (Apple, 1991).

Self-assessment was an integral part of *Learning Through Problem Solving* (Apple, Beyerlein & Schlesinger, 1992), and was identified as a way to build the ability to think critically about one's own learning process: "Self-assessing is about assessing your progress not only when you think you have an answer, but also as you are working toward the answer…This book challenges you to assess your progress through a series of critical thinking questions." Part of the power of self-assessment and the reason why it can lead to improved performance is this combination of focus on the process of performance (rather than end product) and metacognitive awareness. To use a simple example, if we want to make a better pizza, we don't start with a pizza; we start with the process of making the pizza…and the more aware we are of that process, the more carefully we can work to make things better.

But self-assessment was not and is not an activity that can be simply added to the traditional classroom; self-assessment is an essential aspect of a learning environment which seeks the empowerment of the student. As Apple and Lawrence explain,

> *Self-assessment permeates each activity and is an essential aspect of the empowerment of the student. One of the components of accepting responsibility for one's own learning (and therefore buying into lifelong learning) is the ability and desire to assess oneself. To encourage self-assessment, the facilitator needs to establish an environment where self-assessment is achievable, encouraged and valued. — Education as a Process (1994).*

At this point, we have a thumbnail sketch of self-assessment that includes the following qualities:

Self-assessment

> …improves performance
>
> …is focused on process
>
> …builds critical thinking
>
> …increases metacognitive awareness
>
> …should be part of the educational environment

In 1995 Hanson and Apple synthesized existing scholarship focused on self-assessment and shared a stronger formulation, adding the idea of using a target or model performance to compare with their own ("If we are trying to improve process skills, we must ask students to examine and compare how others perform and to examine their own performance"). By comparing one's performance against a model one benefits from the utility of performance descriptions or criteria, without explicitly using them. This is the beginning of an appreciation of levels of performance, rubrics, and how much more fully they can support self-assessment.

Hanson and Apple also clarified the parallel nature of self-assessment and critical thinking. "Individuals need to recognize what they know, need to know, how well they can do something, and what they need to do to improve" (1995). We're still focused on strengths and areas for improvement, but instead of being focused **only** on performance, there is a dual focus that includes knowledge as well (see Figure 1).

Figure 1 Self-Assessment Step in the Learning Process Methodology

Critical Thinking (Level of Learning)	
Focused on:	Knowledge
Strengths:	What is known
Areas for Improvement:	What should be known
Strategies:	How to gain the knowledge

Self-Assessment (Growth in Learner Performance)	
Focused on:	Performance
Strengths:	How well one can do something
Areas for Improvement:	What must be done to improve
Strategies:	How to make the improvements

The authors continue: "Such assessment can be implemented very simply by asking students to identify strategies, strengths, and improvements at various stages of an activity" (Hanson & Apple, 1995). This addition of strategies (see Figure 1) to the previous formulation or structure is the nascent form for action plans that will later be subsumed under the Areas for Improvement.

The final aspect of the synthesis of self-assessment offered by Hanson & Apple is that of the relationship of self-assessment not only to lifelong learning but to growth: "Self-assessment is one step in accepting responsibility for one's own learning and is essential for lifelong learning and growth."

In *Taking the Helm: Targeting Student Learning* (1996), Klopp speaks directly to all of these aspects of self-assessment:

> *Student empowerment, however, requires the ability of the student to self-monitor, to be able to look at oneself with as little distortion as possible. Once students have integrated the skills necessary to active learning and assessment they can move to the independent level of planning their own strategies for learning based on their self-identified preferences and goals. The more involved the learner is mentally, the more internal dialogue occurs in the student's personal reflection time. The more students examine their own learning, the more likely they are to take control of that learning. Opportunities for self-reflection and self-assessment must be provided within the class itself so that students may be habituated to self-reflection outside of class.*

Each of these pieces is still present in the current performance definition for self-assessors, with the roles of expectations, criteria, action plans, insights, and growth now explicitly acknowledged:

> *Self-Assessors know performance expectations and set criteria, perform critical self-examination, and then analyze their data to understand the strengths of their performances, develop transformational action plans, and articulate new discoveries and insights. They can step back and reflect critically on where they are now and where they want to be, and constantly update their goals relating to self-growth in order to become that person* (Pacific Crest, 2013).

Self-Assessment and Reflection

From the beginning, the process of reflection has been used in conjunction with self-assessment. According to Desjarlais and Smith (2011), self-assessment and reflection are similar processes that have much in common. Both are:

- Structured
- Sequential

Figure 2
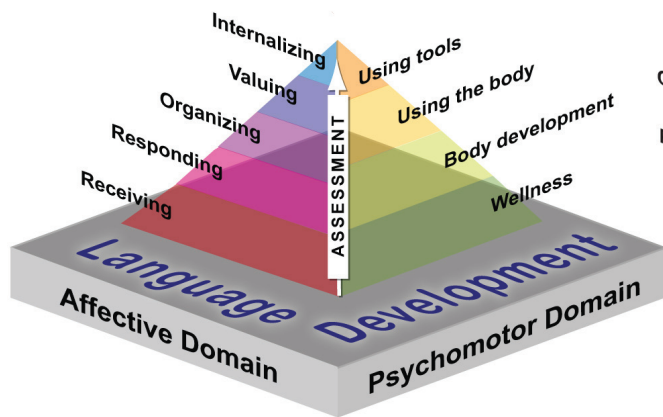
- Targeted
- Based on an earlier experience or performance
- Improved through analysis
- Internal
- Meaningful
- Important in improving quality
- Conducive to learning (about self or content)

But there are important differences between the two processes. Even as reflection can play a role in self-assessment and can support self-assessment as an ongoing practice, it tends to be backward-looking (we reflect on past performance) while self-assessment is forward-looking (strengths and areas for improvement are used to improve future performance). It is because of this difference that the goal of reflection is "knowing" whereas the goal of self-assessment is "growing" (Desjarlais & Smith, 2011).

Self-Assessment and Improving Learning: Learning Skills

How does self-assessment improve learning? An obvious method is to use and implement strategies or action plans targeted in the areas for improvement identified in a self-assessment. Yet there is another way to use self-assessment to improve learning by making use of the *Classification of Learning Skills for Education Enrichment and Assessment* (Apple, 1997). When learning skills are improved, the ability to learn and the performance of learning is improved; performance with a learning skill can be the focus of self-assessment, leading to improved learning. Not only was assessment identified as essential for developing and improving proficiency with skills in all domains, self-assessment is a universal process for improving learning skills (Desjarlais & Smith, 2011). The importance of assessment (or self-assessment) in improving these skills is seen by the placement of the assessment process arrows in Figure 2. Beyond assessment as a tool to improve
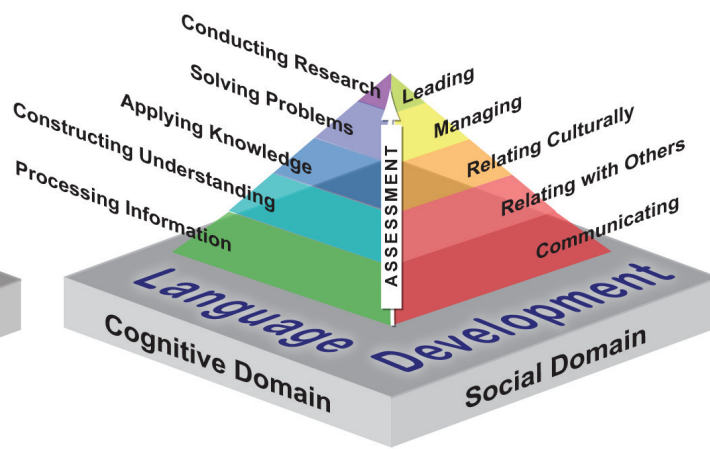
learning skills, the Classification itself is also useful for improving self-assessment skills, many of which are listed in the Classification; see Figure 3 for a sampling (Apple, Beyerlein, Leise, & Baehr, 2007).

Figure 3 Self-Assessment Learning Skills [from *Foundations of Learning*, 4th edition (Redfield & Hurley Lawrence, 2009)]

Developing an Assessment	setting criteria
	ensuring validity
	ensuring completeness
	creating a measurement system

Conducting an Assessment	introspecting
	reflecting
	applying criteria
	measuring against a standard

Reporting an Assessment	presenting feedback
	complimenting
	accepting feedback

Self-Assessment and Self-Growth (see the section Self-Growth / Growth Mindset)

Remember, learning is about increasing knowledge; growth is about improving performance. If self-assessment is how we improve performance, then, most simply, self-assessment causes growth. A *self-grower* has an enduring interest in and proficiency with self-assessment which enables him or her to continually grow and improve future performances (Apple, 1997; Myrvaagnes, 2007).

A Methodology and Performance Measure for Self-Assessment

As comprehensive as self-assessment is in the scholarship, we did not have a methodology for conducting self-assessment until 2011 when Desjarlais and Smith

adapted content from the *Faculty Guidebook* to create the Methodology for Self-Assessment (see Figure 4). This methodology is relatively strict and can be used to produce a formal self-assessment report, but even if a more casual self-assessment is sought, the Methodology's steps provide a kind of perception check so that casual self-assessment does not devolve into unproductive reflection or, worse, self-evaluation.

During a Developmental Math Institute, participants collaborated on the creation of a performance measure for self-assessment. The measure has been edited and is available in the *Book of Measures* (Pacific Crest, 2013).

Tools to Improve Self-Assessment

A self-assessment form was included in *Learning Assessment Journal* (Carroll & Apple, 1995), to help students analyze their strengths, produce improvements with action plans, clarify insights, determine how they helped others and were helped in turn, and to identify concepts learned, knowledge integrated, and any new discoveries. This SII model (Strengths, Areas for Improvement, Insights) builds metacognitive skills by tasking students with producing insights — discoveries made from performing the assessment — and increasing their awareness of their own experiences, a kind of reflective practice (see the **Reflection** section). The 3ʳᵈ edition of the *Learning Assessment Journal* (Apple, 2000) offered a revised self-assessment form which included space for faculty to assess the student's self-assessment. This innovation was the product of much thinking and many conversations about obtaining student buy-in, creating an assessment culture, the importance of assessing self-assessments, why and how to provide criteria, and the role of peer assessment in the student development of self-assessment (Dan Apple, personal recollection). The tools available for increasing the practice and quality of self-assessment have proliferated and while many stand alone in the *Student Success Toolbox* (such as the SII Self-Assessment form; Pacific Crest, 2011), many more have been integrated into student learning curricula (see **Self-Assessment in Student Curricula** which follows).

Scholarship Focused on Self-Assessment

The thinking that led to the revised self-assessment tool as well as previous scholarship on self-assessment was formalized in several modules published in the *Faculty Guidebook* (all 2007):

- *SII Method for Assessment Reporting* (Wasserman & Beyerlein)

- *Movement Towards an Assessment Culture* (Utschig)

- *Turning Evaluation into Assessment* (Watson)

- *Practical Implementation of Self-Assessment Journals* (Miller)

- *Assessing Assessments* (Anderson & Watson)

The *International Journal of Process Education* has also featured some strong scholarship focused on self-assessment. Desjarlais and Smith's A Comparative Analysis of Reflection and Self-Assessment (2011) is especially valuable for the self-assessment methodology it offers, but also because it serves to inform the learning experience focused on self-assessment in *Learning to Learn: Becoming a Self-Grower* (Apple, Morgan, & Hintze, 2013). In What is Self-Growth? (2015), Jain, Apple, and Ellis present self-assessment as the key component of self-growth, illustrating how self-assessment relates to the other nine components of self-growth. The goal is to help faculty increase their own ability to self-assess, as well as to help their students develop this same ability. In Identifying At-Risk Factors That Affect College Student Success (2015), Horton points out that being a self-evaluator is one of the top 20 factors that put academic success at risk for learners, generally by fostering low self-esteem or depression. Students who self-evaluate rather than self-assess are "constantly self-critical, see only their mistakes and failures, and do not appreciate growth or improvement."

Self-Assessment in Student Curricula

The practice of self-assessment is part of the activity/experience design found in *Foundations of Learning* (4ᵗʰ ed.) (Redfield & Hurley Lawrence, 2009) and in *Learning to Learn: Becoming a Self-Grower* (Apple, Morgan, & Hintze, 2013). Each chapter of *Foundations of Learning* ends with a prompt for the student to complete a self-assessment. As the introduction explains,

> *This is your opportunity to compare the Learning Objectives with your actual outcomes for each chapter. This is not about a grade, but about improving your performance. As such, you will assess your performance by sharing and describing 1) a strength you exhibited, 2) an area in which you could improve your performance, and 3) an insight you experienced while working through that chapter.*

Additionally, Chapter 13, Assessment for Self-Improvement, echoes Klopp (1996) on the importance of being able to "look at oneself with as little distortion as possible," in explaining the importance of being able to objectively view one's self and to separate the performance from feelings one has about that performance.

Chapter 4 of *Learning to Learn: Becoming a Self-Grower* is titled, "Self-Assessment: The Engine of Self-Growth,"

Figure 4 Self-Assessment Methodology

Step		Description
Step 1	**Define the purpose of the performance**	This first step clarifies why the endeavor triggering the assessment is worth assessing and what the assessment hopes to accomplish. With this information the self-assessor (who is also the assessee) can better determine what is important to assess (Wiggins & McTighe, 2005).
Step 2	**Define the purpose of the self-assessment.**	Here, the assessor establishes the outcomes for the self-assessment and restricts attention to certain aspects of the performance being assessed, if appropriate. The goal should always be personal development and improved performance.
Step 3	**Develop performance criteria for the self-assessment.**	Using the outcomes identified in Step 2, the assessor identifies the criteria by which to measure the success of the self-assessment. These should be understandable, measurable, realistic, and relevant to the outcomes. These criteria will help keep the assessment process focused. In most cases, there should be no more than four criteria.
Step 4	**Determine attributes that indicate quality for each criterion.**	In this step, the assessor breaks down each criterion into attributes that can be easily measured. If the assessment is narrowly focused, one or more of the criteria may be clear and measurable enough in itself that it will not be necessary to define its attributes.
Step 5	**Determine evidence for each criterion**	For each attribute or simple criterion, determine the evidence needed to perform the assessment. Evidence is important in order to judge whether the criteria are achieved successfully. The evidence should be readily accessible from the performance being assessed.
Step 6	**Select the scale and range to be used in looking at each piece of evidence.**	Measurement requires a scale and a range. If the evidence is carefully selected, these should be self-evident. The scale may be numerical or ordinal and should be sufficient to explain all gradations within the range. If in doubt, one should make the scale simple.
Step 7	**Collect and measure the evidence.**	For this step it would be helpful to have already engaged in a reflection about the performance being assessed. The reflection or play-back will highlight evidence needed to conduct the assessment. The collected evidence should be connected directly to the performance. Each piece of evidence should be rated according to its scale.
Step 8	**Use the collected evidence to prepare a self-assessment report.**	In writing a self-assessment report, one determines and documents strengths, areas for improvement, and insights gained from conducting the assessment (Wasserman & Beyerlein, 2007). It is thus referred to as an SII report, and it is the heart of the assessment. For each area for improvement, one should develop a short-term plan of action (what can be done immediately) as well as a long-term action plan (what can be done in the future). If previous action plans have been developed, they should now be assessed.
Step 9	**Determine whether there is a need to engage in other processes.**	The self-assessment report for Step 8 may identify a need to do further reflection or to engage in learning, research, design, problem solving, or other processes in order to maximize growth or to fully implement the action plans.
Step 10	**Assess the quality of the self-assessment process.**	Identify the strengths, areas for improvement, and insights gained as a result of this process, being careful to focus both on the self-assessment process and the product that was generated (i.e., the self-assessment report).

Figure 5

Discovery Exercise	For some typical experiences, students must determine if that experience demonstrates evaluation or self-evaluation, self-assessment, reflection, or seeking external affirmation.
Reading	"Why Assessment?, Action Plans, A Comparative Analysis of Reflection and Self-Assessment" (excerpted from the *International Journal of Process Education*, June 2011, Vol 3, Issue 1)
Rubrics	Performance Levels for Self-Assessors, Performance Levels for Action Plans
Models of Self-Assessment Tools	Self-Growth Goals worksheet, Reading Log, Learning Journal entry, Reflector's Report
Challenge	Evaluation to Assessment worksheets (students should identify situations in which evaluation is taking place and recast the feedback as assessment-based; a minimum of 15 should focus on SELF-evaluation and SELF-assessment)
Self-Assessment	For every experience from this one forward, students are tasked with performing a self-assessment of their performance as a learner and self-grower in meeting the learning outcomes and performance criteria shared in the experience.
My Life Vision	Students are challenged to write two pages on what their world would be like if they chose to help themselves improve rather than judging themselves.

Figure 6 Performance Criteria for the Self-Growth Paper (from *Foundations of Learning*)

Criterion #1: completeness of the paper	
Attributes:	a. each component noted in the plan is included
	b. the paper should be a minimum of 5 pages in length
	c. goals for the future are included in the paper
Criterion #2: demonstrated ability to assess one's own performance	
Attributes:	a. assessment is designed appropriately (Chapter 13)
	b. SII Method of Assessment is used appropriately (Chapters 7 and 13)
Criterion #3: level of thought and analysis	
Attributes:	a. assessments are evidence-driven (they rely upon evidence), using specific examples from previous assessments, writing assignments, and the *Life Vision Portfolio*
	b. achieves at least *Level 3: Guide/Coach* on the Levels of Assessor Performance rubric (Chapter 13)
	c. demonstrate at least *Level 2: Comprehension of Key Issues* on the Levels of Assessment rubric (Chapter 7)

and offers much about self-assessment. The pertinent content is outlined in Figure 5.

Both books include the self-growth paper, which is a synthesis or portfolio of the self-assessments students completed during the course. The performance criteria for the self-growth paper (see Figure 6) are fairly stringent and demonstrate not only the degree to which students have been working with self-assessment throughout the course, but the degree to which their competence in self-assessment has been demonstrated to have grown.

In addition to the use of self-assessment in student-learning curricula, *Quantitative Reasoning and Problem Solving* (Ellis, Apple, Watts, Hintze, Teeguarden, Cappetta, & Burke, 2014) includes "A Successful Performance" in each activity. This is a presentation of the performance criteria specifically phrased to describe a successful performance (itself an interesting innovation). See Figure 7 for an example from Activity 5.1, Data Generation. At the end of each activity, students complete the section, "Assessing Your Performance." In this section, students are prompted to review the "Successful Performance" section and then

Figure 7

ℋ Successful Performance
Successful application of your learning looks like this

As you begin to apply what you've learned, you should have a good idea of what success looks like.

A SUCCESSFUL PERFORMANCE

When I am presented with the opportunity for collecting data, I...

- Decide on which data generation process I should select
- Develop or select appropriate tools to obtain the data
- Collect, validate, and store the data using appropriate technology

assess their performance against the standard offered there. They are asked how and why their performance was successful and how they can improve their performance, including the concrete steps they must take to do so.

Future research should attempt to measure the importance of using "A Successful Performance" or other models of performance in the self-assessment process (i.e., What is the impact on self-growth when clear performance criteria are available as a base for self-assessment?). One possible research project for members of the Process Education community would be to discover why star performers continuously self-assess their performance, while others, though they may have demonstrated the ability to self-assess, choose not to do so.

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