An Approach to developing Student=s skill in Self Assessment

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Abstract: Self and peer assessment can be vital parts to any team assessment. The assessment can be of the overall team or of the performance of team members. Assessment is a judgment as to the degree to which a goal has been achieved. In student self assessment, the judgment is made by the student. In this paper the five principles of assessment are summarized. Assessment is about performance not worth; is based on evidence not intuition; is done in a defined situation and for a purpose; is done in the context of published goals, measurable criteria and agreed-upon forms of evidence; and is based on multiple forms of evidence.

A rationale is given for why this skill is important. Self assessment is an important skill because it provides an element of ownership of the learning, is needed in professional life, helps to develop self confidence and provides a way to give prompt feedback. Self assessment is a valued skill because it seems to be related to self image and self confidence which, in turn, are related to exam anxiety, and propensity to procrastinate.

We used five components to develop and apply skill in self assessment: a 4 to 6 hour workshop, resume writing, reflective journal writing, a personal enrichment project and a personal interview to determine the final grade in courses. Details are given. We have used this approach since 1982 as part of the McMaster Problem Solving program. Marks from self assessment agree within ∀ 5% with marks from faculty based on term work and exam performance for over 3/4 of the students. This compares with data from other researchers who found that marks from self assessment agree within ∀ 10% with the teacher=s marks for over 3/4 of the students. Anecdotal testimonies from our alumni identify the importance of this skill development.
Beginnings

Teamwork. Over a hundred papers have been published over the past couple of years about the assessment of the performance of teams. A commonly-expressed challenge is How to assess the performance of individual team members? An approach is to use self and peer assessment. Self and peer assessment? Is that giving students the licence to give themselves 100%? No. This is one of the misconceptions about self assessment. Our experience has been that self assessment of performance, based on well-designed assessment forms, is an extremely valid and reliable measure of performance.

In this paper we broaden our view and consider self assessment, not just in the context of teamwork but rather, in the general context of improving learning, developing self confidence and developing skills needed in professional life. In the context of learning, Graham Gibbs [1] says whoever owns the assessment, owns the learning. To improve student learning, Alverno College[2,3] and Boud[4] have used self assessment as an integral part of learning.

First, we define assessment and summarize the principles of assessment. Then we provide further rationale as to why the development of student self assessment is important. We describe an approach we used in the McMaster Problem Solving program[5] to develop skill in self assessment. Finally we summarize the results. Consider each in turn.

The Five Principles of Assessment

We define assessment as a judgment based on the degree to which the goals have been achieved using measurable criteria and pertinent evidence. We have found that breaking this definition into five principles assists in applying this definition. The five principles are: [2-4, 6]

Principle 1: Assessment is a judgment based on performance - not personalities. We need to help a student realize that a poor mark does not mean he/she is a bad person. The judgment is made about performance in completing a task. It has nothing to do with his/her value as an individual. This is an issue, especially for students with attitudes characterized by Perry’s level 2. More details about Perry’s levels and their implications to teaching and learning are given elsewhere. [6-8]

Principle 2: Assessment is a judgment based on evidence - not feelings. We might intuitively feel that a student is skilled at team work. However, we need to replace that intuitive feeling with physical written evidence.

Principle 3: Assessment should be done for a purpose with clearly-defined performance conditions.
Principle 4: Assessment is a judgment done in the context of published goals, measurable criteria and pertinent, agreed-upon forms of evidence.
Principle 5: Assessment should be based on multidimensional evidence: static and dynamic situations; small assignments and lengthy projects; academic, social and personal contexts; under a variety of performance conditions (exams and homework, written and oral, performance as an individual and as a member of a group), formative and summative data and with different persons being the assessors (self, peer, teacher and trained external observers).

To remove ambiguity from the assessment, the following six issues in practice should be addressed.\cite{2-4, 6}

1. Goals: What is being assessed? Knowledge in chemical engineering? Skills? Attitudes? Have the goals been expressed unambiguously in observable terms? Who creates the goals? Are the goals explicit and published?
2. Criteria: Do the criteria relate to the goals? Can each criterion be measured? Who creates the criteria? Are the criteria explicit and published?
3. Form of evidence: Is evidence consistent with the criteria? Do both the assessor and the student know that this form of evidence is acceptable?
4. Resources: Are the goals and the collection of the evidence possible to achieve in the time provided and with the resources available?
5. Assessment process: What is the purpose of the assessment? Under what conditions is the student’s performance assessed? Who assesses? What type of feedback is given by the assessor? (For example, Pass/ fail? A grade? A list of the five strengths and two areas to work on?) What is the form of feedback? Verbal? Written? What is the timing of feedback? Who delivers the feedback?
6. Training in the assessment process: Have both the student and the assessor received training in assessment?

Failures of assessments to accomplish their purpose can usually be traced to violations of any one of these five principles or to the incorrect application of the six issues in practice. The major challenges students have seem to be:

M Students can understand goals and objectives for subject knowledge. \(\text{\textcopyright}\) or \(\text{\textcopyright}\) is Chapter 3 in the text. \(\text{\textcopyright}\) or \(\text{\textcopyright}\) is like the assignments we’ve had, only changed a little (at least we hope it is changed only a little). \(\text{\textcopyright}\) But how do you assess self assessment skill? An answer is that we need to create easy-to-understand and demonstratable goals with measurable criteria.

M Students underestimate the importance of evidence. Furthermore, they have trouble seeing the types of evidence that might be useful.

**Why skill in self assessment is important.**

For teamwork, self assessment is important measure of personal performance and of the performance of peers because, if done well, this provides probably one of the best measures of performance. Research by Swanson et al.\cite{9} and De Stephen\cite{10} illustrate how difficult it is to obtain a valid rating of more than two or three people at one time.
Thus, expecting the teacher to observe and rate the individual contributions to teams of more than three is challenging. Self and peer assessment provide one approach to overcome this difficulty. Self assessment provides an element of ownership of the learning that should, according to Gibbs, promote learning. Skill in self assessment is needed in professional life: to receive performance reviews and to give performance reviews of others.

Chickering and Gamson[11], in their summary paper of seven principles to improve learning, include providing prompt feedback to the learners. This becomes challenging as our class sizes increase or if we use teams. However, the use of self and peer assessment gives a way to give prompt feedback to learners and team members. Skill in self assessment seems to be related to self image and self confidence which, in turn, are related to exam anxiety[12], and propensity to procrastinate[13, 14].

**An example approach to developing student=s skill in self assessment**

In our four-year undergraduate Chemical Engineering program, we have four required courses in which the focus is primarily on the development of higher order skills. These skills include problem solving; communication; creativity; time, stress, change and anger management, interpersonal skills, self assessment, self confidence, team skills, conflict resolution and lifelong learning. More specifically, in the required sophomore course (Problem Solving) the emphasis is on self assessment, problem solving, creativity and self confidence. In the two junior courses (Process model formulation and solution and Simulation, modeling and problem solving) the emphasis is on problem solving, team skills, conflict resolution and lifelong learning. In the senior course (Engineering economics and problem solving) the focus is on chairperson, lifelong learning, trouble shooting and defining and solving open-ended problems. Self assessment is an integral part of all of these courses. Workshops are used in these courses to develop the target skills, although small group, self directed, self assessed problem-based learning, PBL, is used to develop lifelong learning skills. We refer to these four required courses as the McMaster Problem Solving (MPS) program[5].

Skill in self assessment is developed first through a 4 to 6 hour workshop, held about week three, in the sophomore course. Self assessment is applied in four other elements in our curriculum: reflective journal writing, resume writing, personal enrichment projects and as part of the grade in courses.

Consistent with the principles of assessment, our first task is to publish goals and criteria for the skill. For self assessment, Table 1 gives example goals, criteria and illustrates assessment activities. This Table first defines the skill, then provides a general description of the components and provides a simple self test. Specific learning goals and criteria are then provided. These are coded using Bloom’s taxonomy. For example, learning objective 1.1 is “knowledge-definition”. Finally, some example assessment questions are given. This table provides the context for all activities related to self assessment and is used 1) at the start of the skill-development workshop; 2) at the close of the workshop, 3) as the metrics for the assessment of the resume, the reflective journal, the personal enrichment project and for the self grading of knowledge acquired.
Table 1: Example Learning objectives and criteria for self assessment

**MPS 3: Self assessment Objectives** (copyright, Donald R. Woods, 1998)

**Self assessment**: is the ability to decide on the degree to which a performance has achieved the target goal. This is based on published goals, measurable criteria and on submitted evidence. Although this unit focuses on self assessment, this is based on the general principles of an evaluation, decision, judgement or assessment.

**Skill development:**
1. Accepting that assessment is about performance; it is not about personal worth.
2. Accepting that assessment is based on evidence; it is not based on wishful thinking or gut feelings.
3. Acknowledging that assessment is not possible without goals and criteria.
4. Realizing that if a judgment is to be made, incorrectly, without published goals or published measurable criteria, then judgments will be based on gut feelings, politics and intuitive criteria. This results in unfair decisions and judgments. Unfortunately, many organizations, agencies and people fail to understand this.
5. Ability to identify and create observable and unambiguous goals.
6. Realization that #5 is difficult, boring and tedious - but necessary.
7. Ability to identify and create measurable criteria related to the goals.
8. Realization that #7 is often neglected or expressed in unmeasurable terms. This task is difficult, boring and tedious - but necessary.
9. Ability to write out, gather and evaluate evidence as it relates to the goals.
10. Ownership in a task: setting personal goals, criteria and gathering evidence and making a judgment about the achievement of that task. Affects your self confidence and self esteem.
11. Acquire some skill in giving and receiving feedback.
12. Through self awareness, begin to improve self confidence.
13. Continue the development of an environment of trust where risking is OK.
15. Acquire skill in writing a resume.
16. Acquire skill and confidence in writing effective reflections, gathering evidence and documenting a case for a performance review.
17. Acquire skill in participating in a personal interview.
18. Acquire skill and confidence in self assessment that is needed in lifetime learning and in life.

**Pretest:**

**Awareness**: how aware are you of what you do when you use this ability? Rate with an A

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<th>4</th>
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<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
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</thead>
<tbody>
<tr>
<td>Unaware</td>
<td>I just do it</td>
<td>Aware of</td>
<td>Some</td>
<td>I can describe</td>
<td>The details of how I do it</td>
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**Skill**: how skilled are you in doing this activity? Rate with an A

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<td>Poor</td>
<td>Fair</td>
<td>Good</td>
<td>Very good</td>
<td>Excellent</td>
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Learning objectives:

**MPS 3** Self-assessment

1.1 given a term listed under "concepts introduced", you should be able to give a word definition, list pertinent characteristics and cite an example.

1.2 given an evaluation or appraisal situation, you will be able to state the components necessary to do the assessment.

3.1 given an evaluation or appraisal situation, you will be able to write out in observable terms the goals and expectations. Your results should agree to within 90% of that of the tutor.

3.2 given an evaluation or appraisal situation and an observable goal, you will be able to write out measurable criteria that are consistent with that goal. Your results should agree to within 90% of that of the tutor.

4.1 given your written evidence, you will be able to objectively discuss your self assessment with another person and reach agreement as to the assessment.

4.2 given a workshop activity related to problem solving, you will be able to write down what you did before and what you can do after the unit, to provide evidence and interpret that evidence in terms of the goals and the degree to which you can achieve the goals. Your reflections will be judged to be consistent and objective by the tutor.

5.1 given situations encountered in other courses, at work or in your everyday life, you will be able to evaluate how well you can apply your problem solving skills to solve those problems. The goals, criteria and evidence and your interpretation will be assessed by the tutor to be consistent, complete and objective.

5.2 given a personal goal, you will write that in observable terms, create measurable criteria, select evidence and write a reflective journal such that an independent assessor will agree that you have achieved your personal goals.

**Concepts introduced**

Self-assessment, assessment, criteria, decisions or assessments are made based on measurable criteria, pertinent evidence, performance, observable and unambiguous goals, resume, reflections, journal.

**MPS 3**: Self-assessment: Example assessments.

1. A friend says that he wants to "reduce his weight" and asks your advice on how to do it. For this goal "to reduce weight"
   (a) If pertinent, break this into further subgoals.
   (b) Rewrite the subgoal in "observable terms."
   (c) Create at least one measurable criterion that you be used to measure success in achieving the subgoal.
   (d) Write out one type of evidence you would collect to show progress toward your subgoal.

2. My subgoal is "to develop confidence in statistical testing." Write two observable, measurable criteria to be used to measure progress.
3. For the goal "______________" and the criteria "______________", list three different types of evidence that could be used to show progress and achievement.

4. From the in-class activity, you have the following evidence:
   - your reflections that you wrote three times during the activity.
   - your worksheets and the statement of the exercises.
   - the DISCOVERY sheet.
   - your awareness and skill checklist before and after the activity.

Write up a reflective assessment of the degree to which you have achieved the objectives. Refer to the evidence by number and relate your evidence and claims to the objectives by number.

5. Given the following objectives and criteria and given the following evidence, assess the degree to which the objectives have been achieved.

Target skills, based on research, are given in Table 2 for the skill “self-assessment”.

Table 2: Target skills for self assessment

<table>
<thead>
<tr>
<th>Evidence-based targets</th>
<th>Progress toward internalizing these targets</th>
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<tbody>
<tr>
<td></td>
<td>20%</td>
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<tr>
<td>M Performance improves if you have clear goals.</td>
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<tr>
<td>M Goals need to be described as results, not actions; in observable and unambiguous words.</td>
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<tr>
<td>M Measurable criteria are needed to tell us when a goal has been achieved.</td>
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<tr>
<td>M Evidence needs to be collected that relates to the goals and the criteria.</td>
<td></td>
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<tr>
<td>M Assessment is about performance and not about you as a person</td>
<td></td>
</tr>
<tr>
<td>M Assessment is based on evidence and not on gut feelings or wishful thinking</td>
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</table>

Table 2 is given to the students to help them monitor progress in the development of the skill. (Similar tables of target skills have been developed for the other skills in the MPS program.)

Now consider more details of the four to six hour workshop used in the sophomore course to develop the skill. The workshop has the following set of activities: define, provide rationale, pretest awareness and skill (using the test in Table 1), read over objectives and target skills (using the material in Tables 1 and 2), consider where self assessment fits in with other career, or higher order skills, address misconceptions, demonstrate teacher-student assessment, reflect and summarize, present fundamental principles, give the Aroute ahead®, provide activities related to analysis and synthesis of measurable goals; analysis and synthesis of measurable criteria; reflect on activities.
relative to the goals (using the test and learning objectives given in Table 1), summarize by completing discovery and application. After the workshop, each student submits, a reflective journal in which he/she self-assesses the degree to which the skill has been built, bridged and extended. Details are given next.

A second activity in the MPS program is writing reflective-journals about career skills being developed. In our program, about 35 reflective journals are submitted, one for each skill developed. Consider more details about a reflective journal. Pausing to reflect has been shown to be important for skill development[15, 16]. Because, the focus in our MPS program is the development of many high level skills we want students to reflect about their development of each skill. The students write a reflective journal for each skill. In the journal, they reflect on the workshop activities they experienced, and they self assess the degree to which they have built the skill, bridged the use of the skill to their school work and extended the use of the skill to their everyday life. All journals are written in the context of published goals and criteria and agreed-upon forms of evidence. Each is marked by the instructor for the skill in self assessment and the quality of the skill development. While the students are writing the journals, they complain about the amount of work involved. Informal discussions with alumni reveals that journal writing as a crucial part of the skill development. Journal writing is a requirement in three courses.

A third activity used in the MPS program is the application of the skill to writing a resume. The activities include: 1) recording experience or evidence of accomplishments: at work, play or school activity and learning how to make descriptions quantitative, illustrating initiative shown, commendations, consequences of error, and amount of supervision; 2) extracting skill sets from a range of past experience; 3) identifying prioritized skills and the evidence supporting that development. 4) critique of an example resume; 5) the creation of your resume. The students apply this self assessment and preparation of a resume as two formal requirements in the program: once in the fall semester of both the sophomore and senior years.

The fourth activity is the personal enrichment project. Here the students identify a personal project that they wish to achieve in a ten-week period. Some of the projects selected have been to lose weight, stop smoking, learn to cook, learn a simple conversation in a foreign language, manage stress, manage time, learn to dance and so on. Each creates goals, measurable criteria and forms of evidence related to his/her project. A project report is written assessing the degree to which the goals have been achieved. The marks from this project counted about 1/4 toward the final grade in the course. This personal enrichment activity was used in one sophomore, one junior and one senior course[5].
The fifth activity is to use student’s self assessment grade as part of the final grade in several courses in the program, including courses outside the MPS stream. Usually the self assessment is confirmed in a private teacher-students interview.

**The results**

We have used this approach since 1982 as part of the McMaster Problem Solving program. The skill is built in a sophomore course; self assessment marks contribute to the final grade in three of the courses in the program: a sophomore, junior and senior course. We used self and peer assessment in all of the team activities, especially the junior and senior projects [17]. Details of the assessment form and its use are given elsewhere [17,18].

In this paper, our evaluation of the effectiveness of this approach focused on comparisons between the student=s self assessment of their grade and the teacher=s grade. A previously-reported comparison was given by Brown and Pendelbury [19]. They report that 76% of the student=s self assessment grades were within ∀ 10% of the teacher=s grade; 23% underestimate with marks more than 10% lower than the teacher=s grade; 1% overestimate by > 10%. In the MPS program, we found that 78% of the student=s self assessment grades were within ∀ 5% of the final grade; 7% underestimate with marks between 5 and 10% lower and 2% have self assessment marks that are more than 10% lower than the final grade; 13% overestimate by 5 to 10% and none overestimate by > 10%. These data are for two successive, required courses with N= 50 and N = 49.

Anecdotal testimonies from our alumni identify the importance of this skill development.

**Summary**

Assessment is about performance not worth; is based on evidence not intuition; is done in a defined situation and for a purpose; is done in the context of published goals, measurable criteria and agreed-upon forms of evidence; and is based on multiple forms of evidence.

Self assessment is an important skill because it provides an element of ownership of the learning, is needed in professional life, helps to develop self confidence and provides a way to give prompt feedback. Self assessment is a valued skill because it seems to be related to self image and self confidence which, in turn, are related to exam anxiety, and propensity to procrastinate.

The four components used to develop skill in self assessment were described: a 4 to 6 hour workshop, resume writing, reflective journal writing and a personal enrichment project.

We have used this approach since 1982 as part of the McMaster Problem Solving program. Marks from self assessment agree within ∀ 5% with marks from faculty based
on term work and exam performance for over 3/4 of the students. This compares with data from other researchers who found that marks from self assessment agree within ∀ 10% with the teacher’s marks for over 3/4 of the students. Anecdotal testimonies from our alumni identify the importance of this skill development.

References


Biographical information

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