BUILDING THE FOUNDATION OF PROGRAM ASSESSMENT OF STUDENT LEARNING

An Assessment Committee document prepared for the faculty of Dominican University

In order to ensure continuous improvement of student learning, it is important that each program undergoes formal, systematized, and continual assessment of student learning. While, for the most part, continual assessment is already happening in virtually every program, the lack of a systematized and formal assessment process, limits the extent to which faculty can reflect on and discuss ways to improve student learning. Essentially, this means that what is needed for each program is an assessment plan that possesses a set of articulated goals from which are derived program outcomes. By aligning specific program outcomes with specific courses within a program, a more holistic perspective of the assessment process emerges.

Overview of Goals and Outcomes of Student Learning

Program Goal	A general statement of what a program intends to accomplish with respect to student learning.
Program Outcome	A measurable statement of student learning that is derived from and an indicator of a specific program goal.

Once program outcomes are formally aligned with specific courses in a program, members of the program can use this information to develop an actual program assessment plan. In the plan, members of the program will systematize when and in what courses specific program outcomes will be assessed. Generally, you do not want to assess every outcome every semester. Rather, it is preferable to assess only one or two program outcomes each semester and to use only those courses that will provide a representative sample of the student population in the program. The outcomes you decide to assess each semester are up to you and the members of your program. However, it is usually the case that within a 3-5 year time period all program outcomes will have been formally assessed. This will all be articulated in a program assessment plan.

However, we are getting ahead of ourselves. At this point, we are merely concerned with building the foundation of a program assessment plan. This includes a set of goals, program outcomes, and a matrix in which program outcomes are aligned with specific courses within the program.

Where to Begin:

Everyone who teaches has a reason for teaching. This reason for teaching relates to the person's mission and/or philosophy behind teaching. Just as every person has a reason for teaching, every instructional program has a reason and basis for existing. That is, whether articulated or not, there are program philosophies, visions, and/or missions.

Once we know why a program exists, we can begin to think about the things that we want our students to achieve after having taken courses in or completing the program. These are what we refer to as program goals. Once our program goals are articulated, we can then begin to discuss

what we would construe as evidence that the students are achieving the goals; in other words, we can develop program outcomes.

Let's examine program goals and outcomes in more detail.

Program Goals:

A program goal is a general statement of what a program intends to accomplish. It answers the question "*what impact do I want this program of study to have on students, that is valued, and will still be there years after the program has been completed?*"

What Attributes do Program Goals Possess?

Broad -- program goals are broad in scope and often use somewhat vague language (but not so vague that one cannot understand what it is you're striving for). This allows people to interpret differently how the same goal may be achieved.

Long-range -- the focus of the goal is after the program is completed. The student may develop the knowledge or skill while in the program, but it is something that will stay with them for years.

Demonstrable -- you may not be able to measure (assess) if a student is achieving the goal, but the goal in some manner is capable of being demonstrated.

For example, you may want to instill in your students an appreciation for opera. That is not something easily measured. However, if you notice that after they've completed the program you are encountering more of your students at opera performances more frequently than you did before they completed the program, then you can infer that they have developed a greater appreciation for opera.

Realistic -- the goal should be something that is realistically achievable through your program.

What is the Structure of a Goal Statement?

A formal goal statement has the following structure:

> *"Having completed or taken courses in [program], (object) will (verb) (modifier)."*

Consider the following example from a Classics program:

> Having completed or taken courses in the Classics program, students will be able to read and analyze historical documents within their social contexts and evaluate the role of the individual in ancient cultures.

However, if you have more than one goal statement, this structure quickly becomes tedious. There really is no reason to repeat the first phrase of the goal statement. Oftentimes, the first phrase which includes the program and object is written once. The different verbs with their respective modifiers are then listed separately. This is illustrated by the following example from

the Political Science Department at the University of Southern Indiana (http://www.usi.edu/libarts/polsci/goals.asp):

Having completed or taken courses in Political Science, students will . . .

1. be knowledgeable of the normative political theories that are the basis of the American political system.

2. be knowledgeable of the most significant empirical theories in each of the major areas of political science.

3. be able to articulate the strengths and weaknesses of contemporary political systems.

How to Write a Goal Statement

There is no set algorithm for generating goal statements. Basically, what you want to do is answer the question presented at the beginning of this section (what impact . . . ?). This, however, is much easier said than done. Here are a few suggestions that might make the goal writing process go more smoothly:

- Examine the college's mission/vision/philosophy statements.

- Examine your program's mission/vision/philosophy statements.

- Reflect on what you would consider to be the "perfect" student who has completed your program. What abilities will this student have developed as a direct result of your program?

- Reflect on your beliefs about your program. What is its role at your college? What is its role in the community?

- Talk with someone outside of your program. Try to explain to them just exactly what it is you are trying to accomplish with respect to student learning. Chances are that after listening to you, they will be able to articulate back to you your three most important goals.

If you are truly stuck, here are a set of generic goals that can be modified to suit almost any program (Fink, L. D. (2003). *Creating significant learning experiences*. San Francisco: Jossey-Bass):

Having completed or taken courses in this program, students will . . .

1. understand and remember key concepts.

2. know how to use learned content.

3. be able to relate topics in this program to other programs.

4. understand the personal and social implication of learning through this program.

5. care about the subject material in this program.

6. know how to keep on learning about the subjects in this program.

What to do after the Program Goals are Written
Now that your program goals are written, you will want to review them. For each goal statement, you should be able to answer 'yes' to the following questions:

- Are your program goals consistent with your program mission/vision/philosophy?

- Do your program goals describe the desired performance?

- Are the program goals realistically achievable through your program?

- Can your goal statements be understood by someone outside your program?

Some Words of Advice
The goals you write will serve as the basis of your future program assessments. Therefore, you want to keep things manageable. For this reason, it is best to focus on 2 - 5 things that you feel are most important. If you are uncomfortable with this whole assessment process, you may want to articulate only 2 goals; more can be written later when you have become more familiar with the assessment process. If you already have experience with program assessments, you might be more comfortable with 4 or 5 (or possibly more) goals. Again, the bottom line is **keep things manageable.**

An Example
The following are a set of program goals developed for a fictitious chemistry program. Although many goals could have been articulated, the members of this program felt that 4 was a manageable number on which to base their future program assessments. These 4 are what the members of this chemistry program felt to be the most important to them. A different chemistry program might articulate a completely different set of program goals; they may also come up with a different number of goals as well.

Chemistry Goals:
Having completed or taken courses in Chemistry, students will . . .

1. have developed an understanding of the fundamental concepts of chemistry in order to be prepared for higher-level courses and/or employment in a chemistry career.

2. have developed problem-solving and critical-thinking skills.

3. be knowledgeable of and capable of using laboratory instruments, equipment, and techniques.

4. value chemistry as a means of improving the human condition.

Program Outcomes

By far, the most confusing aspect of program assessment is program outcomes. Before discussing them in detail, it is probably beneficial to discuss outcomes in general and compare and contrast program outcomes with other outcomes such as course outcomes and general education outcomes.

What is an Outcome?

DISCLAIMER: To keep things simple, I am going to assume that outcomes and objectives are synonymous and only use the term 'outcome.' Other people will treat objectives as different from outcomes, but the difference is not very significant and for our purposes can be ignored.

An outcome is essentially evidence that the student has achieved a particular goal. For example, if one of your goals is that students will leave your program being capable of playing basketball, then what would you consider as evidence that the student is capable of playing basketball?

One thing that immediately pops into mind is to put the student in a basketball game and see if he/she can play. Although this situation would demonstrate achieving the goal, it does not satisfy within assessment circles what is generally regarded as evidence.

To be regarded as evidence of achieving a goal and thus to be considered an outcome, the student's behavior must be measurable (assessable). It is difficult to measure someone playing basketball and consequently actually playing basketball would not be considered an outcome.

What then would be considered evidence that a student is capable of playing basketball? To answer this, one must take a step back and ask "*what are measurable behaviors that can be regarded as evidence that someone is capable of playing basketball?*"

Here is a list of possibilities:

1. The student can list all five positions on a basketball team.
2. The student can describe the function of all five positions on a basketball team.
3. The student can state the ten most common rule violations.
4. The student can demonstrate the ten most common rule violations.
5. The student can diagram a basketball court.
6. The student can dribble a basketball.
7. The student can demonstrate the following shots: lay-up, free throw, & 3-pointer.
8. The student can explain particular basketball plays: pick-and-roll, full-court press, & fast-break.
9. The student can evaluate if a particular play is suitable for a given situation.

Although individually each outcome may not convince you that the student is capable of playing basketball, collectively they seem convincing. In other words, if a student successfully completed all 9 outcomes, I would be confident that he/she is capable of playing basketball (of

course, the possibility does exist that a single outcome is capable of providing ample evidence that a goal is being achieved).

Notice, just one goal generated 9 outcomes (and I'm sure much more than 9 could have been generated). We are very quickly losing the manageability issue. If you had nine outcomes for every goal that is articulated and you articulate 3 goals, that's 27 outcomes that you would be using to assess the quality of your program with respect to student learning.

It would be better if only 2-5 outcomes were selected for each goal, ones that are good indicators that the goal is being achieved. Then, overall, anywhere from 6-15 outcomes need to be addressed instead of 27. A situation that is certainly more manageable (again, if you are uncomfortable with this process, start with just two outcomes per goal, you can always add more later). In the above example, outcomes 2, 4, 7, & 8 are probably a suitable set. If a student can describe the functions of all five positions, demonstrate common rule violations, demonstrate the most common shots, and explain the most common basketball plays, then I would be confident that he/she can play basketball.

What about the other outcomes, don't they matter? Yes and no. The other outcomes are important and they should be assessed. However, **they will not be used in the formal assessment of the program as *indicators* of students learning**. At the program level, I am making the assumption that if the outcomes that I am assessing are successfully performed by the students, then, as a group, the students are probably capable of performing the non-assessed outcomes as well and they are achieving the desired goals. [That said, it should be understood that any outcome that is assessed, whether it is part of the formal program assessment or not, should be documented. The documentation should include when the assessment occurred, the target of the assessment, and the assessment technique used.]

For example, if a student can describe the function of all five positions on a basketball team, it is reasonable to assume that they can also list the names of the positions as well. Therefore, at the program level, assessing only one of these two is adequate. Of course, it is better to select the one associated with a more sophisticated performance (describing is more sophisticated than listing) unless you have a specific reason for desiring to assess the less sophisticated outcome (maybe it is an outcome dictated by an external agent).

Comparing and Contrasting Program Outcomes with Course and General Education Outcomes

In the assessment literature there seems to be a number of different types of outcomes. Again, in the spirit of keeping things simple, we will only distinguish between three: program, course, and general education.

Other people may define these differently, but I think the following operational definitions will allow us to use and communicate about these outcomes most effectively.

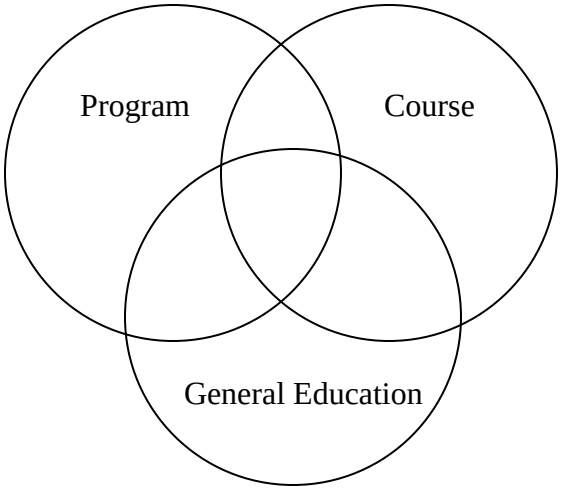
Program Outcomes: measurable student performances that serve as evidence that a particular program goal is being achieved. Program outcomes are the assessment vehicle through which information is gathered to improve student learning in a particular program. It is through

assessment of program outcomes that the strength and weaknesses of student learning in a program as a whole are documented.

Course Outcomes: measurable student performances associated with a particular course. Course outcomes are the assessment vehicle through which information is gathered to improve student learning in a particular course.

General Education Outcomes: measurable student performances associated with what a particular institution has decided will be incumbent upon all students.

It is important to understand that there really is no definitive relationship between these different types of outcomes. In other words, it is entirely possible that an outcome is simultaneously a program outcome, a course outcome, and a general education outcome. It is also possible that an outcome can be a program outcome, but not a course nor a general education outcome. The possible relationships between the three outcomes are illustrated in the figure below.



For example, if one of your program goals is to have your students think critically, then you may have the following program outcome: *"students will be able to synthesize justifications for both sides of an argument."* It may turn out that Dominican University has decided that all students, regardless of their program, should be able to do this. This outcome is both a program outcome and a general education outcome. If this outcome is assessed in a particular course within the program, then it is a course outcome as well.

Let's go back to the basketball example. When we articulated different pieces of evidence that would show that the students knew how to play basketball, we selected only four to serve as the program outcomes. These are the ones that we will use to formally assess the basketball program. If all of these are assessed within courses, then they are both program outcomes and course outcomes (it is possible that some of your program outcomes will also be course outcomes, but others won't). It is highly unlikely that these basketball outcomes are something we would want all students at Dominican to be able to do. They would not be considered general education outcomes.

There were some basketball outcomes we articulated that were not selected to be program outcomes; however, we might still want to assess them in the basketball courses. If this is the case, then these would not be considered program outcomes, but they would certainly be considered course outcomes.

Writing Outcome Statements

When writing outcomes it is important to focus on student performance because that is what will eventually be assessed. In this respect, it is also important to think about the outcome as a product -- what the student has learned, not as a process -- what instruction was conducted. In order to keep things simple and manageable, strive for one performance behavior per objective. Sometimes it will seem logical to combine certain behaviors (list and describe, for example), but this will only cause problems later on during the assessment (what if the student can list the items, but cannot describe their function?).

Essential Attributes

When writing an outcome statement, there are a couple of characteristics that must be included. One of these is the performance behavior. That is, the competency of the student must be described in measurable performance terms. The second is the criterion. This is the acceptable level of performance. Oftentimes, full mastery or 100% achievement is implicit within the performance statement, when this is not the case, then the acceptable level of performance must clearly be stated.

Other Attributes

Although not essential, it is beneficial to indicate the target of the outcome. However, the audience is usually well understood (if the outcome is a program outcome for a philosophy program, then the audience is most likely philosophy students). I would recommend only including the audience if it makes the outcome easier to understand. Another useful bit of information to include in the outcome statement, but is not essential, is the condition under which the audience will be expected to perform during the assessment. However, this is oftentimes difficult to articulate in a concise written format and may best be ignored unless one feels that it is a critical component of the outcome statement (sometimes it will be, oftentimes it won't).

Delineating the Level of Competency

Most outcomes that we write are associated with the cognitive domain. These cognitive outcomes can be written to express varying levels of competency. For example, if I want my students to be knowledgeable of the U.S. Civil War, what exactly is it that I want them to do?

Recall the secessionist states	Knowledge
Explain the Southern States rationale for secession	Comprehension
Illustrate the secessionist rationale using contemporary issues	Application
Compare the U.S. Civil War to another country's civil war	Analysis
Propose a plan that would have prevented the U.S. Civil War	Synthesis
Evaluate Lincoln's Emancipation Proclamation	Evaluation

In the list above, the items on the left are outcomes and the items on the right are the corresponding levels of Bloom's Taxonomy for that particular outcome. Every cognitive outcome that you write should correspond to a particular level of Bloom's Taxonomy. You do not always need to strive for the highest levels. Rather, the level you select should be based on what it is that you want your students to do. If simply being able to recall something is what you want them to do, then write the outcome at the Knowledge level of Bloom's Taxonomy.

Common Mistakes

When writing outcome statements, people typically make four mistakes: 1.) the outcome is too broad; 2.) more than one behavior is stated in a single outcome; 3.) the outcome describes instruction, not performance; or 4.) no measurable performance is stated.

The following are examples of each type of mistake and how the outcome should be written:

1.) Too broad

Bad:
The physical education student will list the rules for playing cricket.

Good:
The physical education student will list 5 rules for playing cricket.

2.) More than one behavior

Bad:
The kinesiology student will describe the advantages of increased muscular flexibility and explain how stretching a muscle before exercise can protect it from injury.

Good:
(a) The kinesiology student will describe the advantages of increased muscle flexibility.

(b) The kinesiology student will explain how stretching a muscle before exercise can protect it from injury.

3.) Describes instruction, not performance

Bad:
Provide students with knowledge of how to use the library.

Good:
After completing the Library Orientation course, students will be able to demonstrate the use of the library by finding 10 resources encompassing 3 different media formats that address a topic of their choice.

4.) No measurable performance stated

Bad:
Students will know how molecular polarity is related to molecular structure.

Good:
Students will be able to categorize a molecular representation as either polar or non-polar.

Steps for Writing Program Outcomes
The following is a 5-step model that you may find useful for deriving program outcomes from program goals. When using this model, it is important that as many members of the program as possible participate in the outcome writing process.

Step 1: State the program goal. Or, at least have it available so that everyone can read it.

Step 2: Establish a consensus as to what the goal statement actually means.

Step 3: Brainstorm different student performances that would be construed as evidence that the goal is being achieved.

How could a student, in a measurable way, demonstrate that the goal is being achieved?

Step 4: Decide as to which performances would best serve as *useful indicators* that a particular goal is being achieved (it is possible that all of them will be selected, or only one, or some number in between).

For some programs, satisfying external constraints is extremely important.

Step 5: Write the selected performances as outcome statements.

An Example
The following are a set of program outcomes derived from the set of program goals presented earlier for a fictitious chemistry program. After each outcome statement is a reference to the particular goal from which the outcome was derived. It is important to remember that these outcome statements were generated by members of this particular chemistry program and although a number of different outcomes could have been articulated for each goal, the members of this chemistry program felt that these 10 outcomes would serve as useful indicators as to whether or not the articulated goals are being achieved. In other words, the members of this chemistry program have consciously decided that these 10 outcomes would serve as the evidence from which to gauge the improvement of student learning in their program (Refer to Appendix A, page 13, to see the direct alignment between each program outcome and its corresponding goal).

Chemistry Program Outcomes:

1. Eighty percent of all students enrolled in a particular chemistry course will score above the 60th percentile on the ACS standardized final exam appropriate for that course. Goal 1

2. All students seeking a chemistry degree will pass a program administered end-of-program test that assesses knowledge and understanding of fundamental chemistry concepts. Goal 1

3. On a quiz or exam, students will be able to solve the majority of word problems given to them. Goal 2

4. Students will be able to draw a valid conclusion about a particular topic from the provided experimental data. Goal 2

5. Students will be able to correctly identify common laboratory equipment. Goal 3

6. Student will be able to state the names of different laboratory instruments. Goal 3

7. Student will be able to demonstrate the proper use of different scientific instruments. Goal 3

8. Students will be able to execute a laboratory activity of their own design to address a novel problem. Goal 3

9. Students will write an essay in which they examine a specific positive impact that chemistry has had on the human condition. Goal 4

10. Students will be able to state at least 5 chemistry advancements that have proved significant in improving the human condition. Goal 4

CREATING A PROGRAM OUTCOME MATRIX

Once the set of program outcomes have been articulated, the next step is to map the program outcomes to particular courses in the program. Although this can be done a number of ways, I find a matrix to be both simple and useful (see Appendix B, page 14).

To create a program outcome/course matrix, simply make a grid with the program courses along one dimension and the articulated program outcomes in the other dimension. Once the grid is constructed, simply determine whether or not each program outcome is assessed in that particular course (i.e., does that program outcome also function as a course outcome for a particular course?). This could be done by simply placing an 'X' in the box that corresponds to a particular course and outcome. Some people my find that it is more useful to know the degree to which an outcome is associated with a particular course. Is it not covered at all; covered, but not really emphasized; or is it something that is a key component of the course? The matrix below demonstrates a more sophisticated analysis.

Notice in the matrix below that one of the program outcomes (# 2) is not assessed in any of the courses. This outcome is a program outcome, but not a course outcome. If it is to be used as a means of evaluating the quality of student learning in the program, it needs to be assessed in

some manner. Someone in the program, the chair perhaps, could take responsibility for administering the exam outside of any course or the members of the program might decide to incorporate it into one of the courses.

One question that might come to mind is *"are these the only outcomes that are assessed in these courses?"* The answer is no. **Remember, the outcomes listed in the matrix are program outcomes. These are the *indicators* that will be used to assess the program with respect to improving student learning.** There might be other outcomes that members of the program feel are important, but were not selected to be program outcomes. For example, the instructors for course CHM 200 feel that it is important for their students to be able to properly name organic compounds. This is not a program outcome (*it will NOT be used to make generalizations about student learning in the program*), but it is important and will be assessed -- it is a course outcome for CHM 200.

All of the courses in the matrix below will have associated with them course outcomes. Some of these will also be program outcomes, most of them will not.

CONCLUSION

The articulated program goals, the derived program outcomes, and the program outcome/course matrix together serve as the foundation of a program assessment plan. The program assessment plan allows each program to decide when a particular outcome will be assessed and where it will be assessed (the particular course if it is also a course outcome). An important point to consider is that not all courses associated with a particular program outcome need to participate in the assessment of that outcome. All that is needed is large enough samples from which valid generalizations about the quality of student learning in the program can be made. Therefore, it is better to include more than one course when collecting program assessment data, but including all courses associated with the outcome might not improve the quality of the assessment. In fact, it might even hinder future program assessments.

One thing that we have not addressed is a proper timeline for program assessments. This will be addressed separately once all the programs have reached the level of program outcomes/course matrices.

APPENDIX

A. Chemistry Program Outcomes Aligned with their Corresponding Program Goals

Having completed or taken courses in Chemistry, students will . . .

1. have developed an understanding of the fundamental concepts of chemistry in order to be prepared for higher-level courses and/or employment in a chemistry career.
    - Eighty percent of all students enrolled in a particular chemistry course will score above the 60th percentile on the ACS standardized final exam appropriate for that course.
    - All students seeking a chemistry degree will pass a program administered end-of-program test that assesses knowledge and understanding of fundamental chemistry concepts.

2. have developed problem-solving and critical-thinking skills.
    - On a quiz or exam, students will be able to solve the majority of word problems given to them.
    - Students will be able to draw valid conclusion about a particular topic from the provided experimental data.

3. be knowledgeable of and capable of using laboratory instruments, equipment, and techniques.
    - Students will be able to correctly identify common laboratory equipment.
    - Student will be able to state the names of different laboratory instruments.
    - Student will be able to demonstrate the proper use of different scientific instruments.
    - Students will be able to execute a laboratory activity of their own design to address a novel problem.

4. value chemistry as a means of improving the human condition.
    - Students will write an essay in which they examine a specific positive impact that chemistry has had on the human condition.
    - Student will be able to state at least 5 chemistry advancements that have proved significant in improving the human condition.

B. Program Outcome/Course Matrix

Chemistry

Course / Program Outcome	CHM 100	CHM 120	CHM 200	CHM 220	CHM 300	CHM 320	CHM 400
1 Eighty percent of all students enrolled in a particular chemistry course will score above the 60th percentile on the ACS standardized final exam appropriate for that course. Goal 1	0	0	0	2	2	2	2
2 All students seeking a chemistry degree will pass a program administered end-of-program test that assesses knowledge and understanding of fundamental chemistry concepts. Goal 1	0	0	0	0	0	0	0
3 On a quiz or exam, students will be able to solve the majority of word problems given to them. Goal 2	0	1	1	2	2	2	2
4 Students will be able to draw valid conclusions about a particular topic from the provided experimental data. Goal 2	1	2	2	2	2	2	2
5 Students will be able to correctly identify common laboratory equipment. Goal 3	0	0	1	2	2	2	2
6 Student will be able to state the names of different laboratory instruments. Goal 3	0	0	1	2	2	2	2
7 Student will be able to demonstrate the proper use of different scientific instruments. Goal 3	0	0	0	2	2	2	2
8 Students will be able to execute a laboratory activity of their own design to address a novel problem. Goal 3	0	0	0	2	2	2	2
9 Students will write an essay in which they examine a specific positive impact that chemistry has had on the human condition. Goal 4	2	0	0	1	1	1	1
10 Student will be able to state at least 5 chemistry advancements that have proved significant in improving the human condition. Goal 4	2	1	1	2	2	2	2

0 - outcome is not assessed.

1 - minor emphasis; outcome may be assessed, but significant course time and/or attention is not devoted to it.

2 - major emphasis; significant course time and/or attention is devoted to this outcome.