MEASURING OUTCOMES OF EDUCATIONAL INTERVENTIONS

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SESSION GOALS

1. Describe a general framework for evaluating the effectiveness of educational interventions including:
   A. Curricular Innovations
   B. A Course
   C. A Curriculum
   D. A Program

2. Determine the best metrics to evaluate your educational intervention:
   A. Select “Outcome” metrics (e.g., data, measures) that measure the intended outcome of an educational intervention.
   B. Select “Process” metrics that measure what happened during the educational intervention.
   C. Select “Input” metrics that measure the learners, faculty, and other resources before the educational intervention started.

SESSION GOALS

3. Discuss how to analyze and interpret the data so that you successfully evaluate the effectiveness of your educational intervention.

4. Outline “tips” for successful use of surveys since they are used to measure inputs, processes, and outcomes.
INTRODUCTION
1. When we evaluate an educational intervention, curriculum or program: We want to determine whether “overall” the intended goals were achieved.
   A. This involves analyzing what happened to the cohort of learners rather than the performance of individual students.
      1) Example: The performance data of all individual students is combined and evaluated together rather than just looking at individual student performance.
   B. In education, such evaluations are called “program evaluation” or “outcomes assessment.”
2. Before starting an educational intervention, curriculum, or program, answer the following question:
   A. “I know this intervention will be successful when the following is evident:……..”

DEFINITIONS
Outcome. Something that follows as a result or consequence.
Learning Outcome. A statement that defines what a student should learn by the end of the learning period. (A new term is “Student Learning Outcome” or SLO.)
Outcomes Assessment. An inquiry or research with an aim/goal of determining the effectiveness of the intervention that was established to achieve a given outcome.
   • Outcomes assessment can occur after each group of cohort completes the intervention.
   • Note: Outcomes assessment can occur in healthcare, education, and other areas where an intervention is made.

DEFINITIONS (Continued)
Program Evaluation. A detailed evaluation to make a decision about whether a program (intervention, curriculum, project) achieved the intended outcomes/goals.
   • Program evaluation is often used interchangeably with the term “outcomes assessment.”
   • However, program evaluation usually infers making a decision after a longer interval. For example: After a program has been in existence for 5 years. (Outcomes assessments could have been done after each cohort completed the program during this 5 year period.)
FRAMEWORKS FOR EVALUATING THE EFFECTIVENESS OF EDUCATIONAL INTERVENTIONS

1. There are many frameworks to use in designing a plan to evaluate an educational intervention.
   A. Most all frameworks consider what happens “Before,” “During,” and “After” the intervention.

2. The following are names of frameworks that you may see used to evaluate “outcomes” or for “program evaluation:”
   A. Donabedian’s Tripartite Model of Quality: Structure, Process, Outcomes
   B. CIPP: Context, Input, Process, and Product
   C. Outcomes Logic Model: Inputs, Activities, Outputs/Outcomes
   D. Durning’s Framework: Before, During, & After

A FRAMEWORK

• Inputs
  • Resources (people, funding, facilities, etc.)

Before

• Process Learning Activities

During

• Outputs (number of graduates, completion rate)
• Outcomes (Performance data, attitudes)

After

Determine “After” by answering “I know the intervention will be a success when the following occur”... I know the intervention will be a success when the following occur...

FRAMEWORK:
HOW TO ANALYZE THE DATA

1. Apriori - establish “benchmarks” for your outputs/outcomes so you can determine if your intervention was a success.

2. Compare your outputs/outcomes to their benchmarks. Answer “Yes or No” as to whether each benchmark was achieved.

3. To explain “why” you did or did not achieve your benchmark, analyze the metrics that define “before” and “during.”
MEASURING PERFORMANCE OUTCOMES

Select an assessment method that measures the “level” of learning that your learning outcome defines.

- Use “Miller’s Pyramid” to determine the level of learning and best assessment method

<table>
<thead>
<tr>
<th>Level</th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knows</td>
<td>MCQs, Extended Matching Items, Short answer questions</td>
</tr>
<tr>
<td>Knows How</td>
<td>Case-based exams &amp; written simulations that requires application of knowledge</td>
</tr>
<tr>
<td>Shows How</td>
<td>OSCEs, other simulations (Requires integration of knowledge, skills, and attitudes)</td>
</tr>
<tr>
<td>Does</td>
<td>Rotation evaluations, 360 degree assessments, portfolios</td>
</tr>
</tbody>
</table>

EXAMPLES OF METRICS

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Before (Input)</th>
<th>During (Process)</th>
<th>After (Outcomes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New learning module</td>
<td>Baseline knowledge (pre-quiz)</td>
<td>Amount of time spent completing the module, Student evaluation of the module/learning experience, Amount of faculty time required</td>
<td>Knowledge (via quiz)</td>
</tr>
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<td>New Curriculum</td>
<td>Student: MCAT scores, GPA, Age, Gender, Faculty: Rank, Years of experience teaching</td>
<td>Course Evaluations, Focus Group/Debriefing with Students, Performance on formative assessments (OSCEs, NBME Shelf exams, Step Exams)</td>
<td>Licensure Exam Scores, Licensure Pass Rate, Percent of graduates entering Primary Care vs Specialty</td>
</tr>
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### EXAMPLES OF METRICS

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<td>Educational Intervention to Improve Professionalism (Tracking system to document professional and unprofessional behavior)</td>
<td>Student knowledge/attitudes about professionalism before the intervention</td>
<td>Ongoing assessment of compliance with requirements Tracking of professional behaviors and intervention with students when there is good or bad behavior Clerkship assessments of professionalism</td>
<td>Assessment of professionalism during the final 2 months of the program Actions by the Medical Licensure Board during the first 5 years post graduation.</td>
</tr>
<tr>
<td>New simulation to teach a skill</td>
<td>OSCE or simulation to measure ability to perform the skill before the simulation exercise</td>
<td>Amount of time spent by learner using the simulator Performance during practice with the simulator</td>
<td>Post-intervention assessment using OSCE or simulation Observation-based ratings in the practice setting as the learner performs the task with real patients.</td>
</tr>
</tbody>
</table>

### MEASUREMENT OF ATTITUDES IS OFTEN USED AS EITHER AN INPUT, PROCESS, OR OUTCOME MEASURE

### SURVEY METHODOLOGY
TERMINOLOGY

Survey
- The research method by which a questionnaire or survey instrument is administered as the data collection tool.

Questionnaire
- The instrument or data collection tool that is used during a survey.

TIPS FOR CONDUCTING SUCCESSFUL SURVEYS TO ASSESS EDUCATIONAL INTERVENTIONS

Tip 1:
Establish clearly defined research questions that you want the survey to answer.
A. Write down your research questions before you start constructing the survey.
B. What do you need to measure in order to answer your research question?? (These are often called “constructs”)

Tip 2:
Define the target population that the intervention is intended to impact and use a sampling technique that will accurately make inference back to your target population.
A. Write down your target population before you start constructing the survey.
B. Is the sample of learners who will complete the survey representative of your target population?
C. Consider sample size: If your sample is very small, consider using multiple cohorts of learners or multiple institutions.
TIPS FOR CONDUCTING SUCCESSFUL SURVEYS TO ASSESS EDUCATIONAL INTERVENTIONS

Tip 3:
Develop a questionnaire that has evidence of validity and reliability.

A. Definitions:
1. Reliability – the instrument measures the constructs/variables in a reproducible manner. (If we were to have the learner take the survey the following day, the results would be similar)
2. Validity – the instrument measures what it is intended to measure.

B. When possible, use a questionnaire/instrument that is published and has documented validity/reliability.
1. If there is not one published, you can develop a questionnaire and document its validity and reliability. (This can be a publication itself)

C. Use an appropriate scale.
1. Likert scales (attitudes) are often used (5 anchors ranging from Strongly Agree to Strongly Disagree)
2. Self-efficacy (confidence) scales usually are 7-10 anchors

Tip 4:
If you develop your own questionnaire, take time to do it well!

A. Writing questionnaire items is harder than you think – seek input from someone with expertise.

B. Typical problems are:
A. Double-barreled statements
B. Statements that infer a different meaning to the learner/respondent
C. Statements that have terminology which the learner/respondent does not know
D. Statements that measure something which is not critical to the research question
TIPS FOR CONDUCTING SUCCESSFUL SURVEYS TO ASSESS EDUCATIONAL INTERVENTIONS

Tip 4 (Continued):
If you develop your own questionnaire, take time to do it well!
C. Items need to be clearly written.
   1. Example: How much exercise do you usually get? vs How many hours do you spend in rigorous walking?
D. Items need to be neutral.
   1. Example: During the last month, how often did you drink too much alcohol? vs During the last month, how often did you drink more than 5 drinks in 1 day?
E. Set the time frame clearly
   1. Example: How many times in the last week....

TIPS FOR CONDUCTING SUCCESSFUL SURVEYS TO ASSESS EDUCATIONAL INTERVENTIONS

Tip 5:
Arrange the survey so it is logically organized to the respondent and also aesthetically pleasing.
A. Items should be organized in a logical manner (eg., Initial items seek input about prior learning experiences, final items seek input about the intervention)
B. Pre-test the survey to make sure it is easy to read. If electronic, make sure the buttons/pull downs are easy to use. If an item requires a response, this can be aggravating to the respondent who does not want to answer it.
C. Place open-ended questions at the end of the survey or at the end of sections for which they are relevant.
D. Minimize use of open-ended questions/Use them strategically – they take more time for the respondent and for you to analyze!
E. Place demographics together (usually at the end)

TIPS FOR CONDUCTING SUCCESSFUL SURVEYS TO ASSESS EDUCATIONAL INTERVENTIONS

Tip 6:
Pre-test the questionnaire.
A. Have a few respondents/learners review the questionnaire and make sure it is understandable.
   A. A good approach is to use "think aloud" where the respondent thinks aloud as they answer the questions.
TIPS FOR CONDUCTING SUCCESSFUL SURVEYS TO ASSESS EDUCATIONAL INTERVENTIONS

Tip 7:
Use tactics that will optimize survey response.

A. Note: Some journals will not accept publications that describe surveys with low response rates.
   1. “Adequate response rate” depends on multiple variables and there are tables in references on survey methodology than can guide decisions about minimum response rate that is needed.
   A. A rule of thumb is to have at least 50% of respondents complete the entire survey.

B. How to optimize response:
   1. Keep the survey short
   2. Typically individuals are given 7-14 days to complete the survey. This can vary.
   3. Send a letter/email that the survey will be coming and the importance. (It helps if this is someone who is influential and can convince individuals about the importance.
   4. Track who has responded and use reminders/follow up.
   5. If the evaluation will not be compromised - Let individuals know the results to promote their participation in long-term projects.

ONE MORE POINT
The Outcomes Assessment process outlined during this presentation is often used for ongoing curricular CQI and program improvement.

When used for CQI or program improvement, it is essential that you “close the loop” which means that:

1. The program “acts” on the data results and makes ongoing curricular improvements. (If interventions are needed, they are implemented)
2. Faculty, learners, and others are informed of the results and what changes were made.
3. If actions are needed, follow up is done (plan, do, check and act is repeated).
SUMMARY

1. BEFORE your start your educational intervention, establish the following:
   A. Write down the following: “I know this intervention will be successful when the following is evident:……..” (This will initiate establishment of our outcomes)
   B. Identify metrics that measure:
      A. Inputs or “before” the intervention
      B. Processes or what occurs “during” the intervention
      C. Outcomes or what occurs “after” the intervention
      A. Metrics “after” may be outputs and outcomes; they may be immediate post-intervention and long-term (years after the intervention)
   C. Benchmarks for each outcome/output. Compare your outcome to its benchmark to determine whether you achieved the outcome.

SUMMARY

2. When measuring outcomes that infer performance of the individual, make sure the assessment method measures the intended level of learning as noted in Miller’s Pyramid.

3. Follow good survey methodology.
   A. If you do not have a lot of experience, seek the assistant of an individual with expertise (eg., psychometrician, individual with experience in social/behavioral sciences)

REFERENCES