Developing & Validating Survey Instruments
May 18, 2011

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Introductions

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www.evalu-ate.org
Available from www.evalu-ate.org/resources

Keyword search: validating

Objectives

1. Take concrete steps to turn your evaluation question into survey questions
2. Strengthen weak survey questions
3. Establish a procedure for validating those survey questions
Validity

...is the degree to which a data collection instrument measures what it is intended to measure.

...is context-dependent, e.g., a questionnaire that yields valid results with college students may not work with adult learners.

...can be increased through pilot testing with the intended audience.

Candiya

Designing Surveys
The Big Picture

Proposal → Evaluation Questions → Results → Survey Design

Case Study

Marine Advanced Technology Education Center
ATE funded since 1997
NSF ITEST grant 2009
Remotely Operated Vehicles competitions

www.evalu-ate.org
ROV Competition

Underwater missions, reports, presentations, & posters
20 regional competitions lead to 1 international
3 competition classes
Participation: more than...
• 9,000 students, grades 5-16
• 1,200 faculty
• 1,000 working professionals

Surveys

At Start Students & Faculty
• Regional = “scannable” paper
• International = online
• Incentives

2010 Parents
2011 Judges & Volunteers
2012 Translations
MATE Proposal

Overarching Project Goal
Use the MATE ROV competition as an engaging platform to prepare middle and high school students for careers in the ocean STEM workforce

Project Strategy 2
Support the development of the SCOUT (entry-level) ROV Class

Evaluation Questions
To what extent did participating in the ROV program lead to an increase in the students’...
- Awareness of STEM careers
- Intention to pursue a STEM career
- Interest in studying STEM topics
- STEM knowledge and skills
- SCANS skills
### Project Strategy

2. Support the development of the SCOUT (entry-level) ROV Class

### Evaluation Questions

To what extent did participating in the ROV program lead to an increase in the students’...

<table>
<thead>
<tr>
<th>Evaluation Questions</th>
<th>Data Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness of STEM careers</td>
<td>Student: Q4, 5</td>
</tr>
<tr>
<td>Faculty: None</td>
<td></td>
</tr>
<tr>
<td>Parent: None</td>
<td></td>
</tr>
<tr>
<td>Intention to pursue a STEM career</td>
<td>Student: Q7, 8, 9</td>
</tr>
<tr>
<td>Faculty: Q4a</td>
<td></td>
</tr>
<tr>
<td>Parent: None</td>
<td></td>
</tr>
<tr>
<td>Interest in studying STEM topics</td>
<td>Student: Q10, 11, 16</td>
</tr>
<tr>
<td>Faculty: Q4b</td>
<td></td>
</tr>
<tr>
<td>Parent: Q2</td>
<td></td>
</tr>
<tr>
<td>STEM knowledge and skills</td>
<td>Student: Q14, 15</td>
</tr>
<tr>
<td>Faculty: Q4c</td>
<td></td>
</tr>
<tr>
<td>Parent: Q4a-e</td>
<td></td>
</tr>
<tr>
<td>SCANS skills</td>
<td>Student: None</td>
</tr>
<tr>
<td>Faculty: Q4d</td>
<td></td>
</tr>
<tr>
<td>Parent: Q5</td>
<td></td>
</tr>
</tbody>
</table>

### Student Survey

Q11. Has your ROV project increased your desire to take any of these courses? (Mark ALL that apply.)

- Math
- Computer science
- Engineering
- Science (i.e., physics, chemistry, biology, earth science, etc.)
- Hands-on classes or club activities like robotics, electronics, shop courses
- None
2010 Competitions: Percentage of Students Reporting Increased Desire to Take Courses in STEM Subjects

- International Competition (High Schools, Colleges, Universities)
- Scout Class Regional Competitions (Elementary Schools, Middle Schools, Junior Highs)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Engineering</th>
<th>Science</th>
<th>Computer science</th>
<th>Math</th>
<th>Other hands-on clubs/courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010 International</td>
<td>74%</td>
<td>62%</td>
<td>51%</td>
<td>45%</td>
<td>79%</td>
</tr>
<tr>
<td>2010 Scout Class Regional</td>
<td>19%</td>
<td>72%</td>
<td>48%</td>
<td>38%</td>
<td>65%</td>
</tr>
</tbody>
</table>

Candiya

Question Development
First Determine...

<table>
<thead>
<tr>
<th>What is the survey mode? (mail, web, phone, multi-mode)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the question repeated from another survey/compared to another data source?</td>
</tr>
<tr>
<td>Will respondents answer accurately?</td>
</tr>
<tr>
<td>- Be aware of sensitive questions like financial, embarrassing topics</td>
</tr>
</tbody>
</table>

Open-Ended Items

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range of responses</td>
<td>Percentages difficult</td>
</tr>
<tr>
<td>Rich responses</td>
<td>Time-consuming</td>
</tr>
<tr>
<td>Quotations</td>
<td>Burdensome</td>
</tr>
</tbody>
</table>

Q9. What career would you like to have when you finish school? (Please print.)
Closed-Ended Items

**Strengths**
- Percentages
- Fast data entry
- Quick for respondents

**Weaknesses**
- Influence and/or limit responses

Q7. Are you interested in having a career in marine science, technology, or engineering?

- Yes
- No
- Not sure

Partially Closed Items

Q12. Have you or your school received an award or honor as a result of your ROV project?

- Yes — Please describe: 
  - No

62% (N=330) received an award or honor as a result of their involvement in the ROV competition. Examples:

- *Our mayor made March 31st Immanuel Lutheran ROV Day in Alpena*
- *Our team and ROV were on the front of last year’s course catalogue*
- *Innovation and Rural Development award in Newfoundland*
Keep It Simple

Use simple, familiar words

Use simple sentence structures

Use as few words as possible

Simplified Wording

Before
13

How did your level of interest in a marine-related career change as a result of your ROV project(s) and experience with competition(s)?
- More interest
- Same interest
- Less interest

After
6

Has your ROV project made you more interested in a marine career? Less interested? No difference?
- More interested
- Less interested
- No difference
Tip: Survey questions don’t have to be a single sentence. Sometimes a “staging” sentence can help ensure clarity.

Q19. At high school graduation, you probably had plans for the next year (college, job, military or something else). Since graduation, has your life followed your original plan, or did you make changes?

- Yes, I am following my original plan
- No, I made changes to my original plan
- Not sure

"Were you required to take any courses for which you did not receive credit?"

- Yes 21%
- No 69%
- Not sure 10%
One at a Time

Are the cafeteria lunches hot and tasty?

a) Yes
b) No

Double Negatives

Tip: Make sure that “yes” means “yes” and “no” means “no”

Should the city manager not be directly responsible to the mayor?

a) Yes
b) No
Rate your personal competency in...

4. Development of new teaching units that address the economic, political, and cultural history of Africa, and incorporating that information into language training and area studies.

<table>
<thead>
<tr>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearly Evident</td>
<td>Usually Evident</td>
<td>Partially Evident</td>
<td>Rarely Evident</td>
<td>Never Evident</td>
<td>No Basis to Judge</td>
</tr>
</tbody>
</table>

Exhaustive (include all reasonable answers) &
Mutually exclusive (avoid overlapping response categories)

How long have you lived in Washington State?

a) 0-1 years
b) 1-2 years
c) 3-4 years
Tips on Scales

Choose appropriate length (4-5 categories)

Provide balance (equal positive and negative categories)

Don’t switch order (positive/negative) from question to question

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>Very Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Your Turn

11. On a scale of 1 to 10, please rate your satisfaction with the services you receive:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. How promptly does the individual provider help you?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Very poor</td>
</tr>
<tr>
<td>b. How well does the individual provider communicate with you?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Very poor</td>
</tr>
<tr>
<td>c. Does the individual provider leave before she or he is supposed to?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No, never</td>
<td></td>
<td>Yes, always</td>
<td></td>
</tr>
</tbody>
</table>

A. Too many categories
B. Switches response order
C. Options don’t match question stem
D. All of the above
Unbalanced Scale

**WIZARD OF ID** | Brant Parker and Johnny Hart

DO YOU FEEL THE KING IS DOING A BAD JOB, TERRIBLE JOB OR ROTTEN JOB?

WHAT KIND OF POLL IS THAT?

A MINORITY PARTY POLL

This "how to" guide provided by Parker and Hart at http://www.creators.com/comics/wizard-of-id.html

Wayne

Comments
Validating Questions

Steps

1. Identify what is to be measured
2. Define the elements
3. Develop measures of the elements
4. Review and pilot test the survey
5. Select an appropriate population
6. Distribute the survey & conduct follow-up
7. Process and check data for accuracy
8. Analyze the data
1. **Identify** what is to be measured

**Sustainability** of programs and activities implemented by institutions that received Advanced Technological Education grants.

2. **Define** the elements of the object

What does *sustainability* really mean?
2. Define the elements of the object

What are the elements of an apple?

Sources

- Literature Review
- Advisory Committee
- Interviews
- Survey
2. Define the elements of the object

Open-ended Survey Question

Imagine your institution in the future, perhaps 3 years after the ATE grant has ended:

What things started during the grant will be or are still in place?

2. Define the elements of the object

Revenue earned from the sale of educational materials is used to provide scholarships for students.

The new curriculum was created through the regular institutional approval process so all the new classes are in the regular college catalogue and are part of approved college degrees.

The recruitment efforts developed through the grant will be incorporated into the college’s general recruitment activities.
2. Define the elements of the object

- Analysis of survey & interview responses
- Programs
- Collaborations - Materials - Faculty
- Facilities - Students - Institutions - Revenue

3. Develop measures of the elements

- 65 items: ✓ Clarity ✓ Match elements ✓ Nonduplication
- 35 items: ✓ Relevance ✓ Understandability ✓ Effective indicators
- 28 items

Researcher review
- Expert review (3 survey experts & 3 ATE PIs)
Please indicate the extent to which you Disagree or Agree ...

“Changes made in our technological education program will continue after our ATE grant has ended.”

- Strongly Disagree
- Disagree
- Uncertain
- Agree
- Strongly Agree
- Not Applicable

3. Develop measures of the elements

4. Review & Pilot

DRAFT ATE Grant Sustainability Survey Instrument

28 items

✓ Validity
✓ Usability

FINAL ATE Grant Sustainability Survey Instrument

23 items

Review by 3 ATE PIs
Steps 5-8

5. Select an appropriate population
6. Distribute the survey and conduct follow-up
7. Process and check data for accuracy
8. Analyze the data

Alternatives

When resources are scarce...

Time
Money
Quality
Wayne

Comments

Coming Attractions

July 20
Strong Evaluation Plans = Stronger Proposals

September 21
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www.evalu-ate.org
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May 19
Effective Alternatives to a Final Report
June 2
What Story Does your Model Tell?

Annual Conference
October 31-November 5 in Anaheim

Get more information/join at www.eval.org

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