FROM VALUING TO VISUALIZATION: DATA INTERPRETATION & REPORTING

March 20, 2013

EvaluATE
EVALUATION RESOURCE CENTER for advanced technological education

This material is based upon work supported by the National Science Foundation under grant number 1204683. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the presenters and do not necessarily reflect the views of NSF.

INTRODUCTIONS

Jason Burkhardt

Lori Wingate

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EvaluATE

NETWORKS

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MATERIALS

- Handout
- Slides
- Recording

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Webinar Handout

FROM VALUING TO VISUALIZATION: DATA INTERPRETATION & REPORTING

by Krystin Martens and Lori Wingate

March 20, 2013

The recording, slides, and handout for this webinar are available from evalu-ate.org/events/march_2013/

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EVALUATION QUESTIONS

Evaluation questions are overarching questions about the project's merit, worth, or significance that the evaluation seeks to answer based on evidence. When it comes to asking and answering evaluation, there are three common pitfalls: (1) Failing to define the boundaries of the evaluation with questions or other expressions of purpose, (2) Making conclusions without explicitly linking them to evidence; and (3) Conveying results from a data perspective rather than an interpretive or use-oriented perspective.

VALUING

Asking evaluative questions calls for providing evaluative answers, which requires valuing. Rubrics are interpretive tools to aid evaluators and stakeholders to determine the merit, worth, or significance of a project's processes and outcomes. Rubrics can be developed for specific indicators, indicating what specific ranges of results would represent, poor, fair, good, and excellent performance (The evaluative terminology used should be tailored to context. Alternative terms could be used, such as below target—on target—above target.

To learn more about using rubrics to facilitate interpretation in evaluation, see Jane Davidson's AEA365 Tip-a-Day blog entry at aea365.org/blog/?p=1307 — be sure to also check out the other resource links she recommends.

VISUALIZATION

Data visualizations such as graphs, charts, and maps should enhance and expedite understanding of evaluation results. Visualizations should not necessarily be develop for every data point; they should be used judiciously to convey and reinforce key findings relevant to the overall purpose of the evaluation.

Tips

- Visualizations should be able to be interpretable on their own, without supporting narrative.
- Truncating the scale used in a chart (e.g., showing 50 to 100 instead of 0 to 100) can influence interpretation. If you must truncate, do so consistently throughout a report.
- Avoid pie charts and other visualization that require viewers to judge differences in area.
- Avoid gratuitous embellishments like 3-D effects.

To learn more about data visualization visit Stephen Few's website at www.perceptualedge.com—see especially the "Examples" (www.perceptualedge.com/examples.php) and the Graphic Design IQ Test (www.perceptualedge.com/files/GraphDesignIQ.html)

RECOMMENDED READING

Fitzpatrick, J. L., Sanders, J. R., & Worthen, B. R. (2011). Identifying and selecting the evaluation questions and criteria (Chapter 11). In *Program evaluation: Alternative approaches and practical guidelines* (4th ed.). Indianapolis, IN: Pearson.

Davidson, E. J. (2005). *Evaluation methodology basics: The nuts and bolts of sound evaluation*. Thousand Oaks, CA: Sage.

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OBJECTIVES

By the end of the webinar, you will

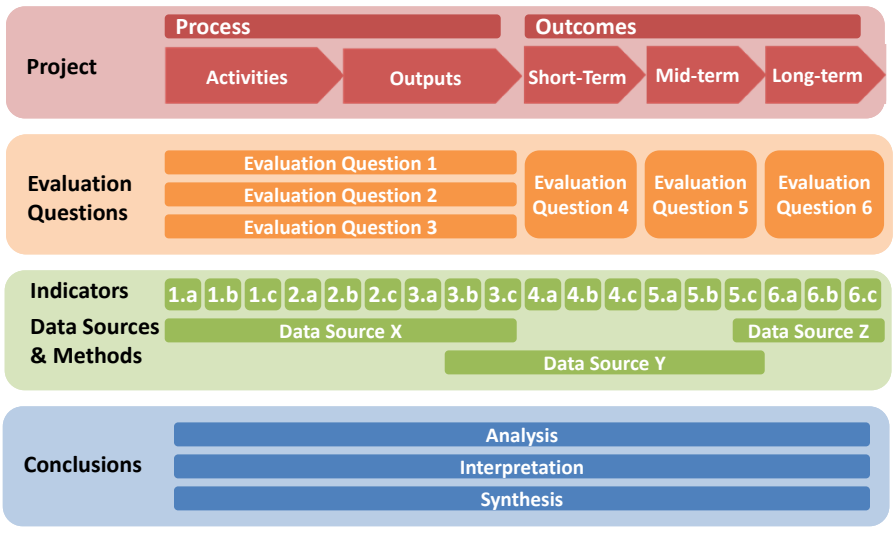
1. Understand the role of evaluation questions as a basis for interpretation and visualization
2. Be aware of strategies for strengthening the linkages between evaluation data and conclusions
3. Be able to apply data visualization techniques to enhance reporting
4. Be inspired to learn more on your own about valuing and visualization

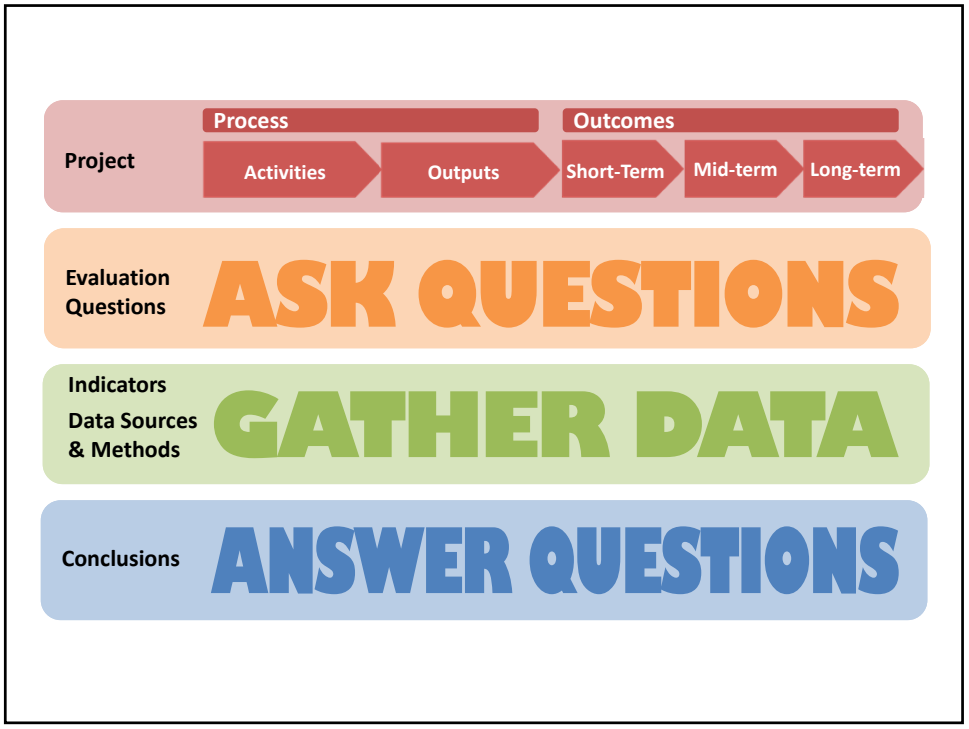
EVALUATION QUESTIONS

LORI

EVALUATION QUESTIONS

Overarching questions about the project's merit, worth, or significance that the evaluation seeks to answer based on evidence.





COMMON PITFALLS

Failing to define the boundaries of the evaluation with evaluation questions or objectives

Making judgments without explicitly linking them to evidence

Conveying results from a data perspective rather than an interpretive or use-oriented perspective

EVALUATION QUESTIONS

Overarching questions about the project's merit, worth, or significance that the evaluation seeks to answer based on evidence.

EVALUATION QUESTIONS ≠ GOALS

Ideally, project goals statements are about intended project **outcomes.**

(i.e., what is going to be different in the context of advanced technological education because of the project)

- **Typically**, they are stated in terms of **activities.**

EVALUATION QUESTIONS ≠ GOALS

Project ATE-3D Goals:

1. **Establish** a process to solicit and implement 3-D printing projects from the community
2. **Develop and implement** an interdisciplinary 2-course sequence on the application of 3-D printing technology
3. **Provide** students with support for continued professional growth

OPTIONS FOR FRAMING EVALUATION QUESTIONS

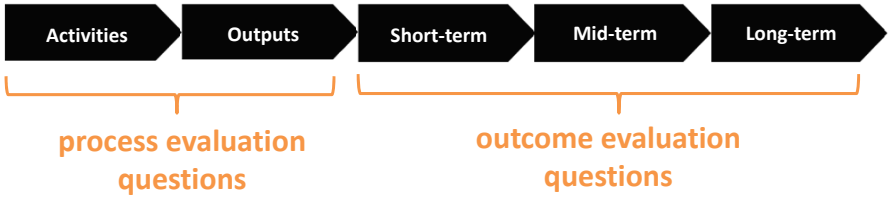
"Develop and implement an interdisciplinary 2-course sequence on application of 3-D printing technology"

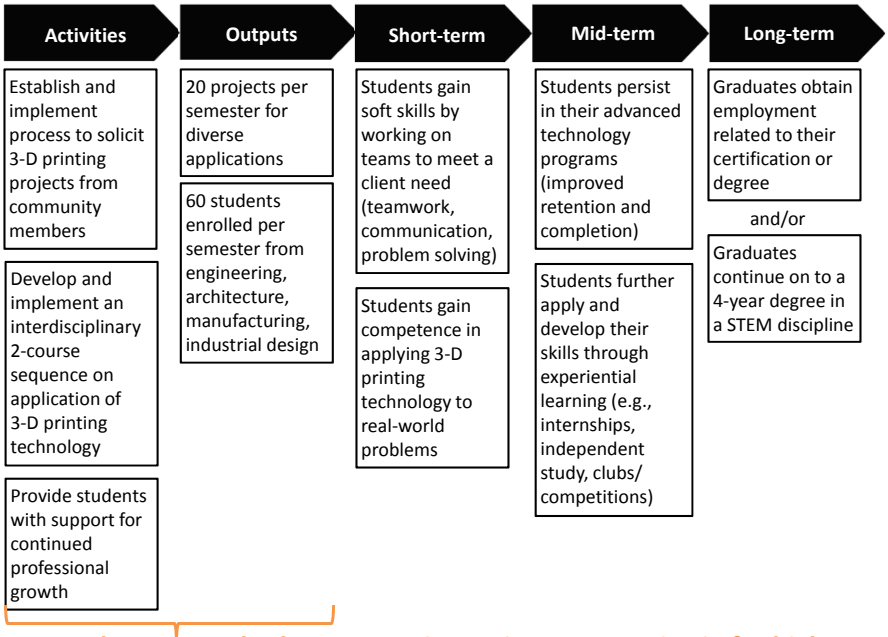
What are some evaluative questions we might ask about this aspect of the project?

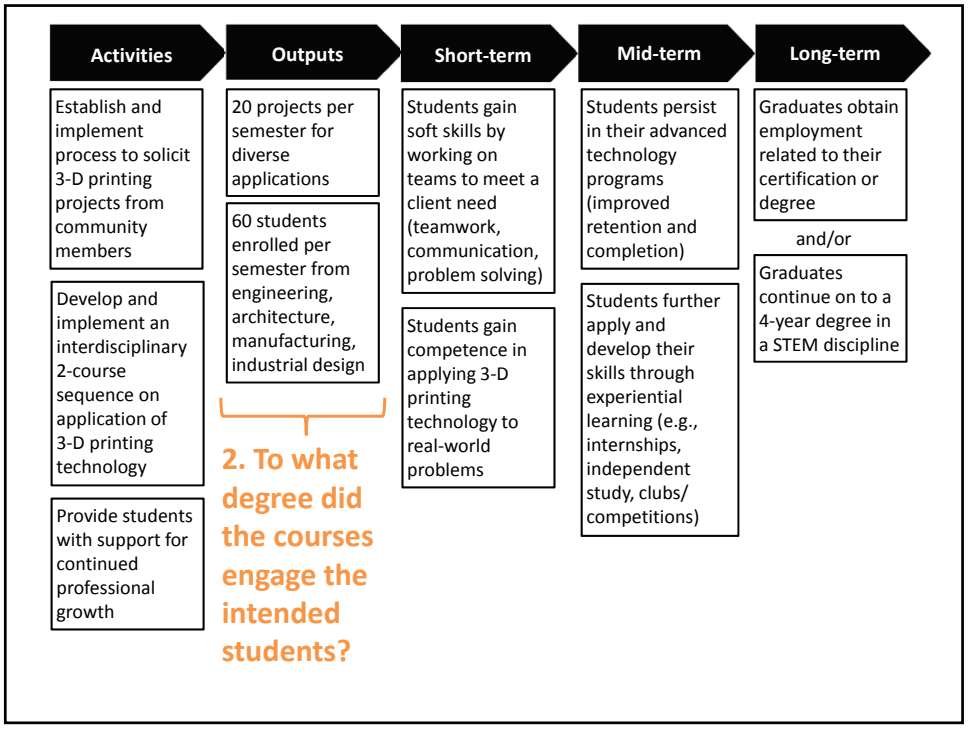
(type your suggestions in the chat box)

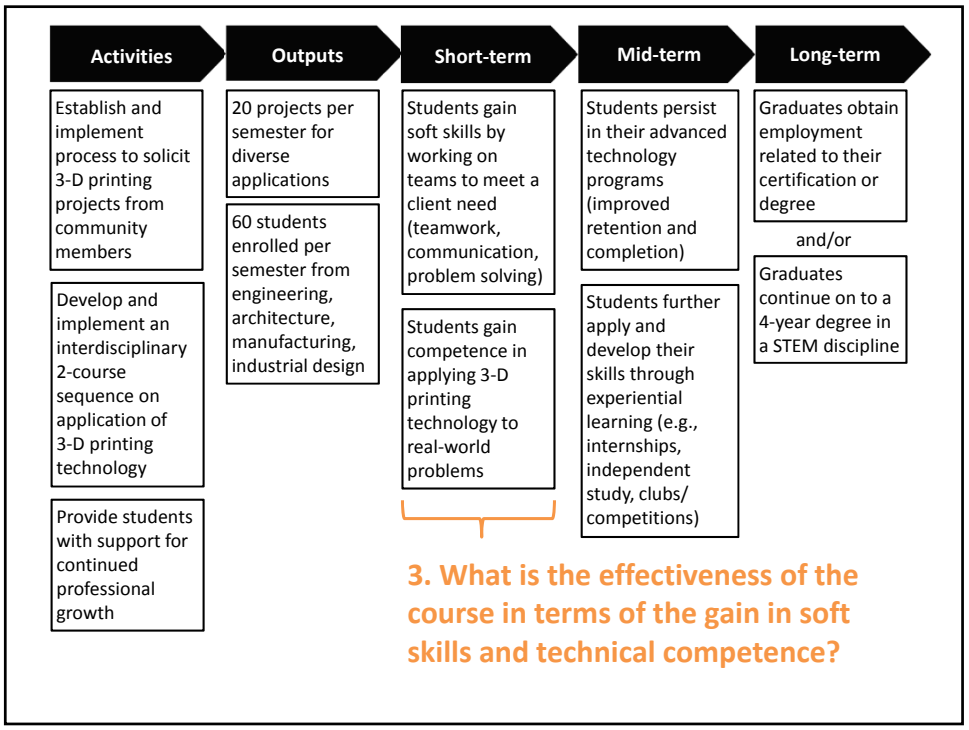
OPTIONS FOR FRAMING EVALUATION QUESTIONS

Align evaluation questions to a logic model






Activities
Outputs
Short-term
Mid-term
Long-term
Establish and implement process to solicit 3-D printing projects from community members
Develop and implement an interdisciplinary 2-course sequence on application of 3-D printing technology
Provide students with support for continued professional growth
20 projects per semester for diverse applications
60 students enrolled per semester from engineering, architecture, manufacturing, industrial design
Students gain soft skills by working on teams to meet a client need (teamwork, communication, problem solving)
Students gain competence in applying 3-D printing technology to real-world problems
Students persist in their advanced technology programs (improved retention and completion)
Students further apply and develop their skills through experiential learning (e.g., internships, independent study, clubs/ competitions)
Graduates obtain employment related to their certification or degree
and/or
Graduates continue on to a 4-year degree in a STEM discipline
2. To what degree did the courses engage the intended students?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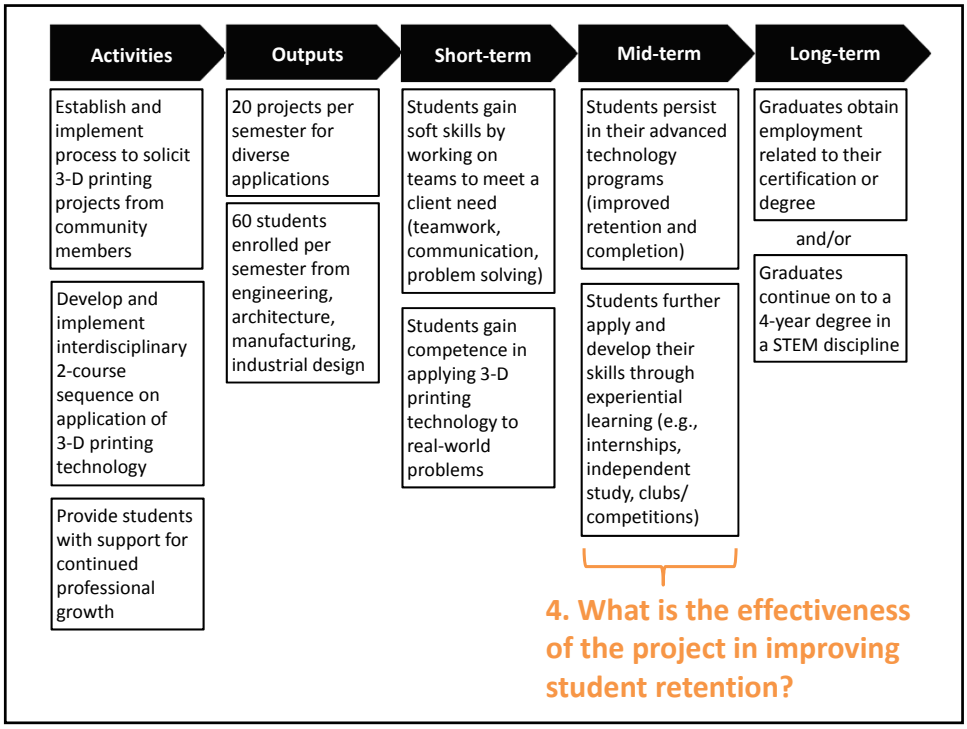
3. What is the effectiveness of the course in terms of the gain in soft skills and technical competence?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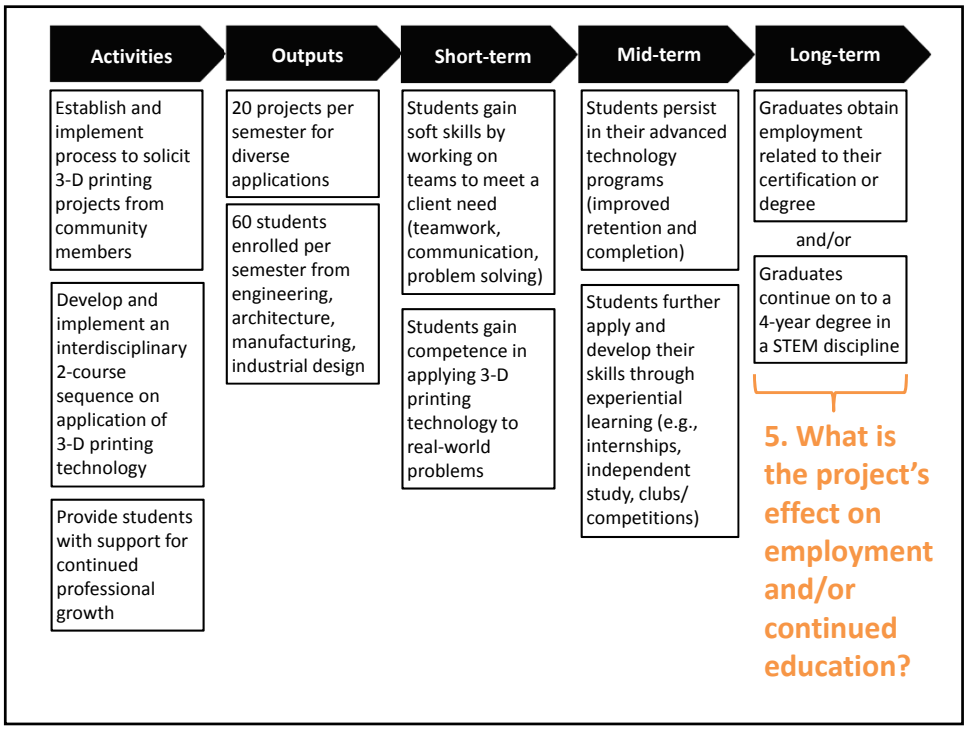
4. What is the effectiveness of the project in improving student retention?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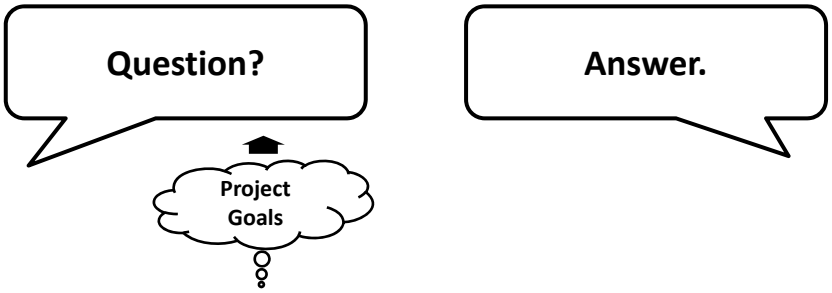
5. What is the project's effect on employment and/or continued education?

SUMMING UP

A prerequisite to reaching **evaluative conclusions (valuing)** is asking **evaluation questions**.



Evaluation questions should align with **project goals**, but are not the same as project goals.

VALUING

Lori

COMMON PITFALLS

Failing to define the boundaries of the evaluation with evaluation questions or objectives

Making judgments without explicitly linking them to evidence

Conveying results from a data perspective rather than an interpretive or use-oriented perspective

"Divine judgment"

—Jane Davidson, 2010

DIVINE JUDGMENT-TYPE CONCLUSIONS

DATA

observations
interviews
documents
institutional data
surveys

CONCLUSIONS

"The project seems to be making good progress."

"The project has developed an effective problem-based learning."

COMMON PITFALLS

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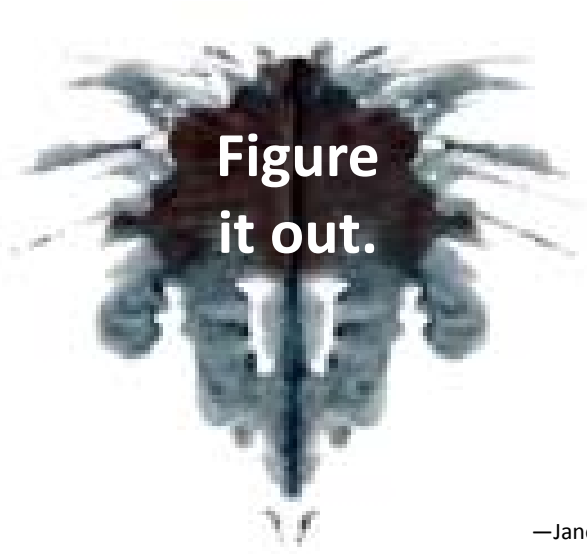
"Rorschach inkblot"

—Jane Davidson, 2010

RORSCHACH INKBLOT-TYPE RESULTS



—Jane Davidson, 2010

RORSCHACH INKBLOT-TYPE RESULTS

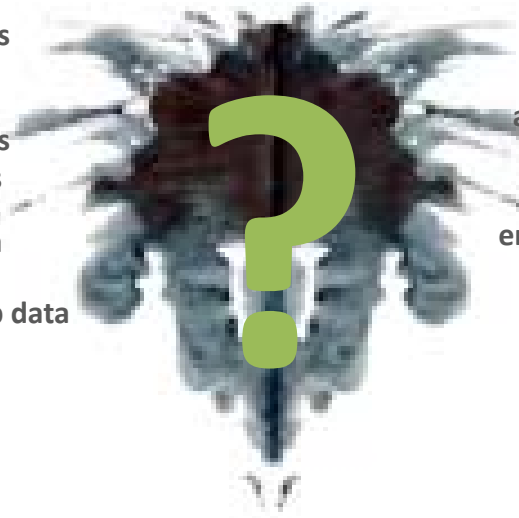
"Data dump" with little or no interpretation or conclusions

descriptions of context

descriptions of activities

survey data

focus group data



interview data

advisory board feedback

enrollment data

GPA


Is the Data Café a good restaurant?


- It takes an average of 7.3 minutes to be seated
- 75% of wait staff are courteous
- 58.6% of customers are highly satisfied

COMMON PITFALLS

Failing to define the boundaries of the evaluation with evaluation questions or objectives

Making conclusions without explicitly linking them to evidence

Conveying results from a data perspective rather than an interpretive or use-oriented perspective

Need an interpretive framework

The process of cleaning, organizing, transforming, and describing data

Making sense of analyzed data so that conclusions can be made about a project's quality, progress, and/or impact

INTERPRETATION TOOLS

Criterion-based interpretation

- Holistic rubrics
- Indicator-specific rubrics

Norm-based interpretation

- Comparison with past performance
- Comparison with other sites, groups

GENERAL RUBRIC

Excellent	Clear example of exemplary performance or best practice in this domain; no weaknesses
Good	Very good or excellent performance on virtually all aspects; strong overall but not exemplary; no weaknesses of any real consequence
Adequate	Reasonably good performance overall; might have a few slight weaknesses but nothing serious
Marginal	Fair performance, some serious (but nonfatal) weaknesses on a few aspects
Poor	Clear evidence of unsatisfactory functioning; serious weaknesses across the board or on crucial aspects

Source: Table 8.2 from *Evaluation Methodology Basics* by Jane Davidson (2005)

HOLISTIC RUBRICS

Aids in reaching defensible evaluative conclusion in less-than-ideal evaluation situation, e.g.,

- evaluator brought in late in the project
- little or no data have been collected
- evaluation budget is negligible and/or client mainly wants an "external perspective"

HOLISTIC RUBRIC

	Poor	Fair	Good	Excellent
Student Impact	No set plan for how to engage students either through coursework or experiential learning under the auspices of the UP project	Students engaged at least sporadically in experiential learning activities; there is talk of a certificate or degree program	Students engaged in a systematic way in experiential learning or a degree/certificate program, but may need further development	Clear strategy for engaging students under the auspices of the UP project through both experiential learning and a degree/ certificate program
Scholarship	No established plan for obtaining external grants or contracts; no evidence of activity in this area No evidence of advancing scholarship Not clear how the project contributes to enhancing perceptions of ISU	Minimal plans for obtaining external grants or contracts; some proposals submitted Evidence of some scholarship, but may not be obviously related to project Potential to raise the institution's stature in national rankings or perceptions if successfully implemented	Clear plan for obtaining external funding; proposals have been submitted Evidence of some scholarship directly related to the project Could bring national attention to ISU through exceptional performance in its focus area	Success in obtaining external grants and contracts in focus area Strong record of substantial scholarship directly related to the project Likely to attract national attention through its distinctive focus, assets, or innovation
External Impact	No set plans for external engagement	Some ideas for external engagement, but few have been implemented yet	External engagement, either through service or collaborations, is an important part of the project	Project has a strong external focus that is central to its mission, with demonstrable impacts on the community attributable to the project/institution.
Sustainability	No clear plan for supporting the center by grants, contracts, and/or fees	Some ideas for becoming partially self-sustaining but need to be further developed	Grants or contracts may bring significant external support to the project, but it depends on forces beyond the control of the project; fees or other revenue streams are likely to provide stable income	Very likely that grants, contracts, and/or fees will be a significant and stable source of support for the project

HOLISTIC RUBRIC

	Poor	Fair	Good	Excellent
Student Impact	No set plan for how to engage students either through coursework or experiential learning under the auspices of the project	Students engaged at least sporadically in experiential learning activities; there is possibility of a certificate or degree program	Students engaged in a systematic way in experiential learning or a degree/ certificate program, but needs further development	Clear strategy for engaging students under the auspices of the project through both experiential learning and a degree/ certificate program

INDICATOR-SPECIFIC RUBRIC

What is the effectiveness of the course in improving student retention?

Indicator	Not at all effective (1)	Minimally Effective (2)	Moderately Effective (3)	Very Effective (4)	Data	Score	Weight	Weighted Score
% of students who self-report that the course positively influenced their decision to continue in their programs	≤9%	10-29%	30-49%	≥50%	55%	4	.3	1.2
Difference in retention rates between course participants and matched group	Decrease or less than 10% increase	11-20%	21-29%	≥30%	22%	3	.7	2.1

sum = 3.3 on a scale of 1-4

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Conclusion: Moderately Effective

EVALUATION QUESTION & ANSWER

Question

What is the effectiveness of the project in improving student retention?

Answer

- 25% of students said the course positively influenced their decision to continue in their program
- retention rate of course participants is 22% better than that of a matched group

EVALUATION QUESTION & ANSWER

Answer

This is a description, not an evaluative conclusion.

- 25% of students said the course positively influenced their decision to continue in their program
- retention rate of course participants is 22% better than that of a matched group

EVALUATION QUESTION & ANSWER

Question

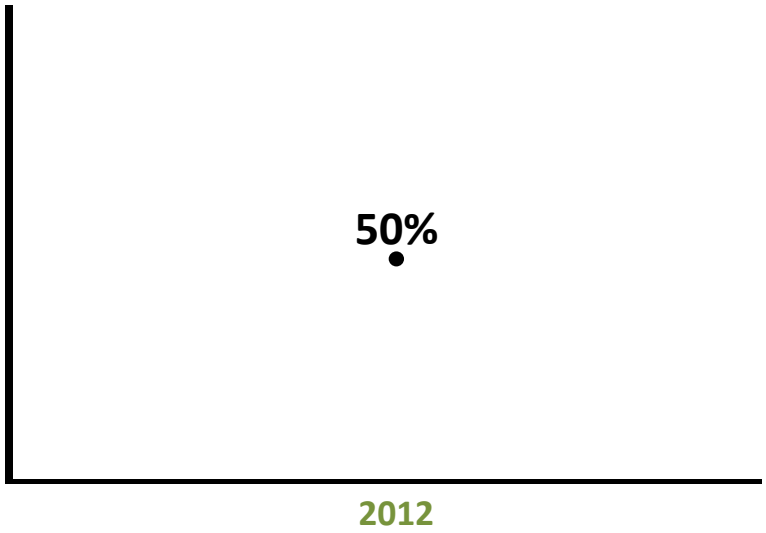
What is the effectiveness of the project in improving student retention?

Answer

The course was **moderately effective** in improving student retention, according to the criteria established for the project.*

*Criteria and specific results also provided to substantiate answer.

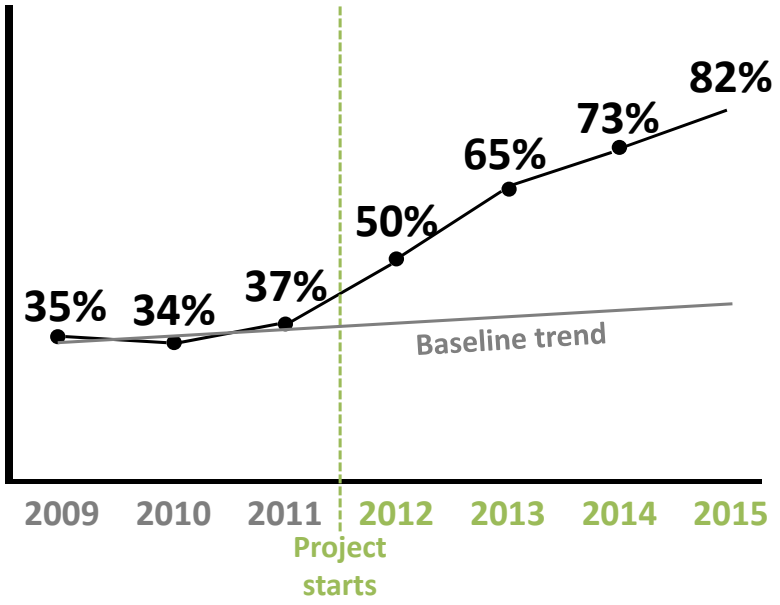
COMPARE WITH BASELINE

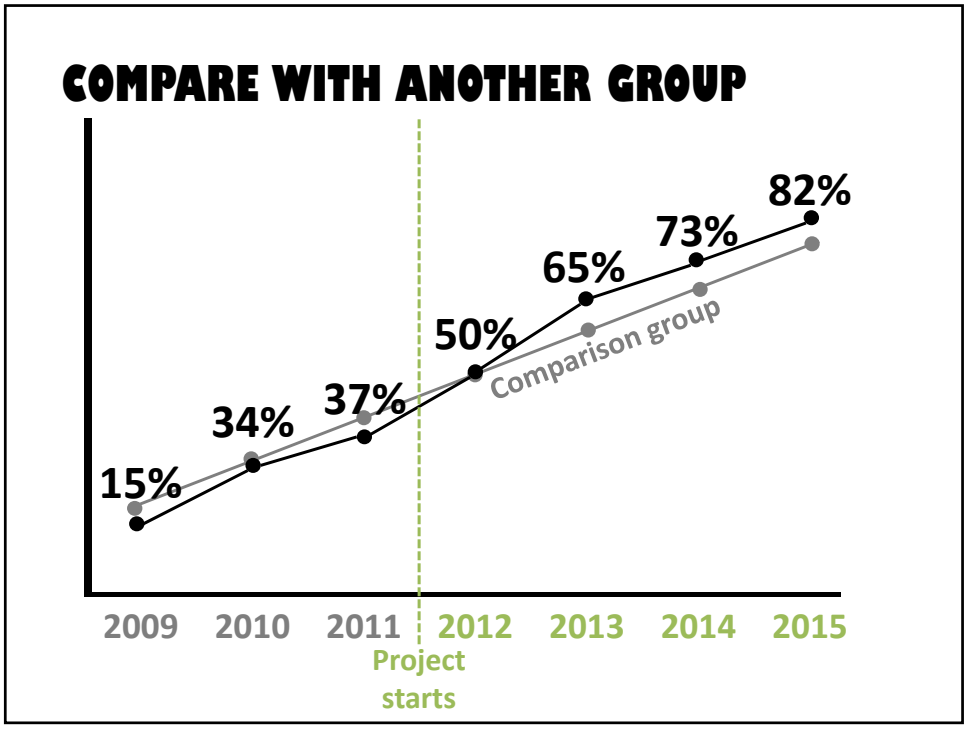


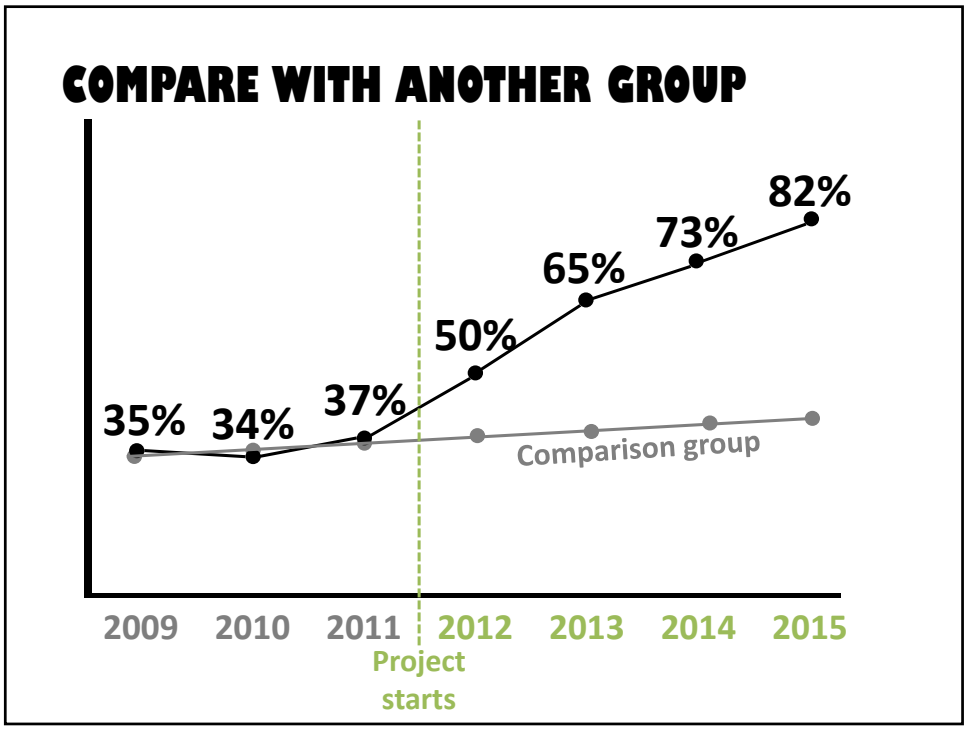
NORM-BASED INTERPRETATION

- Comparison with past performance
- Comparison other sites, standards

COMPARE WITH BASELINE




COMPARE WITH ANOTHER GROUP
82%
73%
65%
50%
37%
34%
15%
Comparison group
2009
2010
2011
2012
2013
2014
2015
Project starts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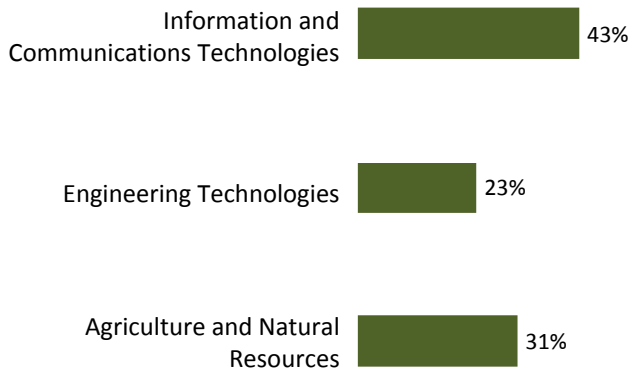
COMPARE WITH NATIONAL DATA

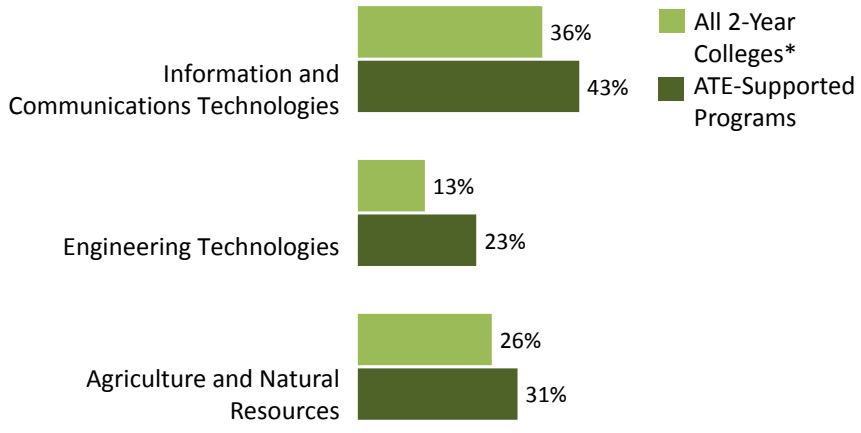
Representation of Women in 3 Disciplines



* Source: National Center for Education Statistics

COMPARE WITH NATIONAL DATA

Representation of Women in 3 Disciplines



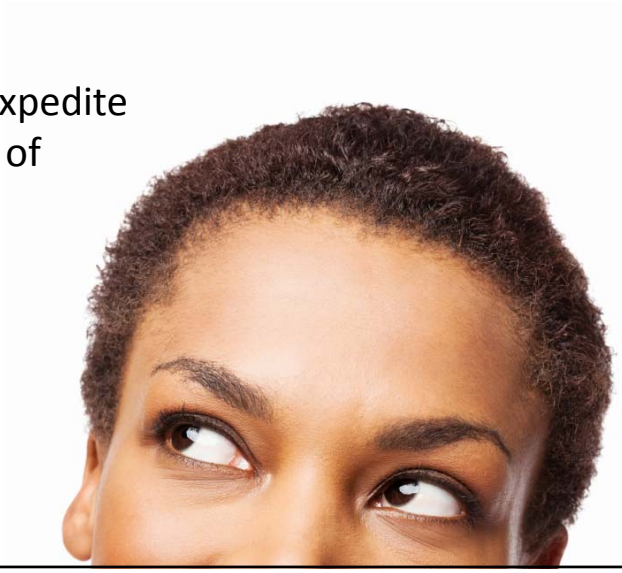
* Source: National Center for Education Statistics

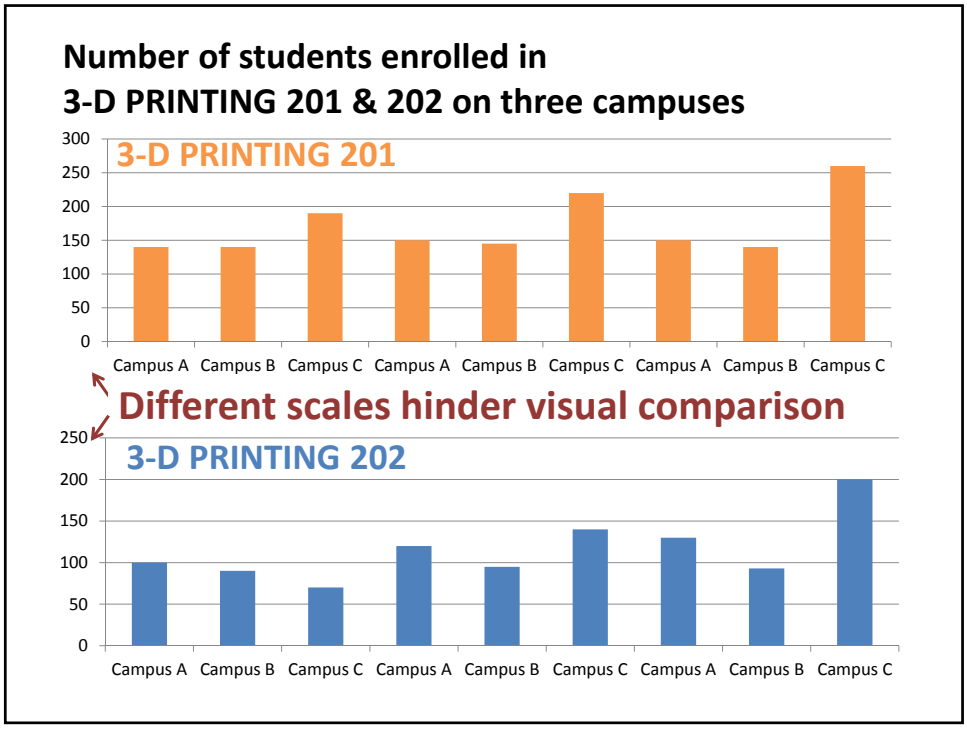
VISUALIZATION

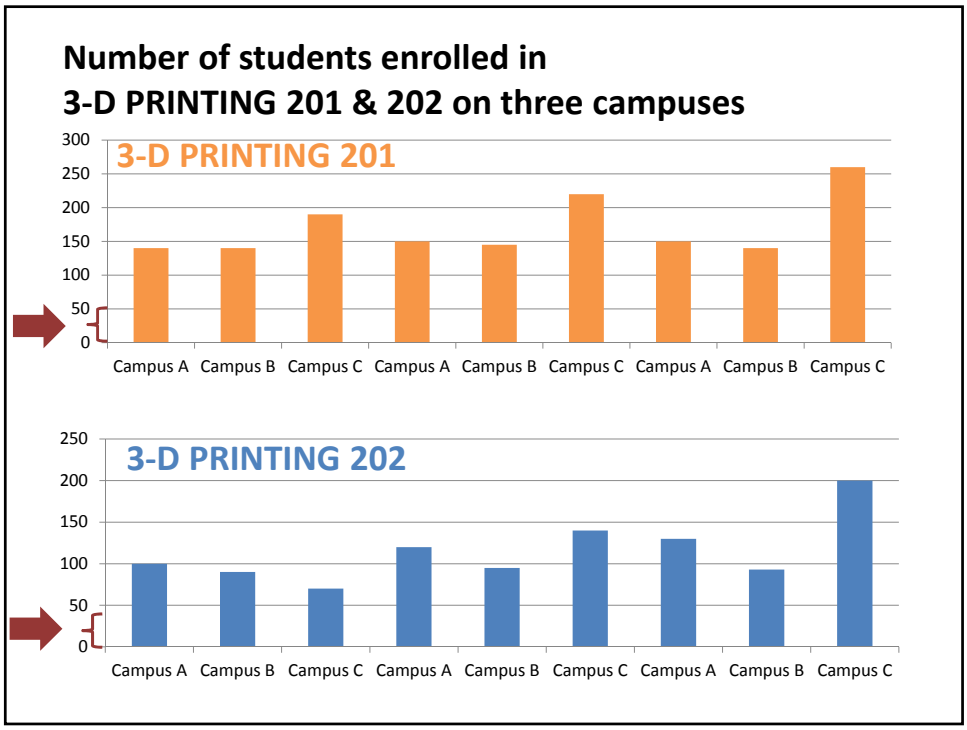
LORI

WHY VISUALIZE?

Enhance and expedite understanding of results




Number of students enrolled in
3-D PRINTING 201 & 202 on three campuses
3-D PRINTING 201
300
250
200
150
100
50
0
Campus A Campus B Campus C Campus A Campus B Campus C Campus A Campus B Campus C
Different scales hinder visual comparison
3-D PRINTING 202
250
200
150
100
50
0
Campus A Campus B Campus C Campus A Campus B Campus C Campus A Campus B Campus C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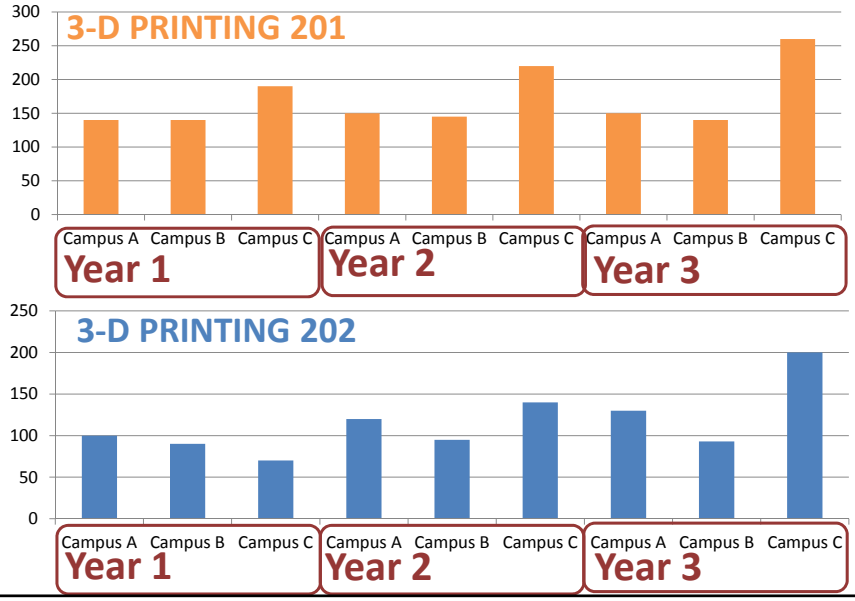
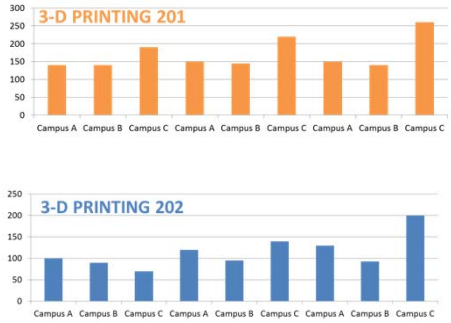
Number of students enrolled in 3-D PRINTING 201 & 202 on three campuses



Number of students enrolled in 3-D PRINTING 201 & 202 on three campuses

Information in these graphs:

- # students enrolled in 3-D PRINTING 201 & 202
- across 3 years
- and 3 campuses



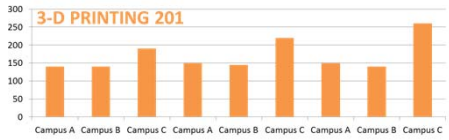
Which outcome evaluation question could these data help us answer?

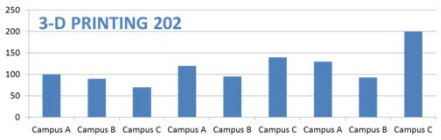
POLL: Which outcome evaluation question could these data help us answer?

A. What is the effectiveness of the course in terms of the gain in soft skills and technical competence?

B. What is the effectiveness of the course in improving student retention?

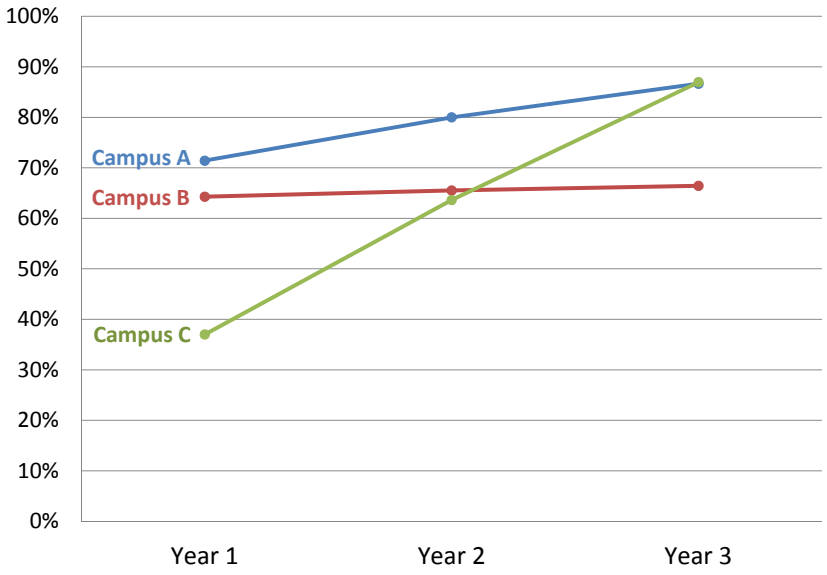
C. What is the project's effect on employment and/or continued education?

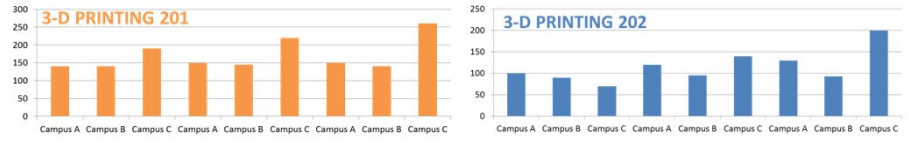




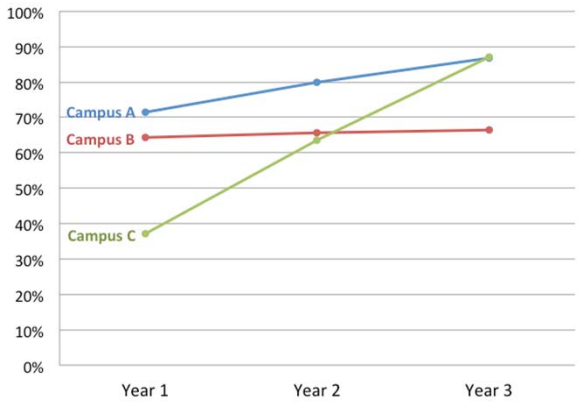
INDICATOR: Percentage of ATE 201 students who continue on to ATE 202

Percentage of ATE 201 students who continue on to ATE 202 on three campuses

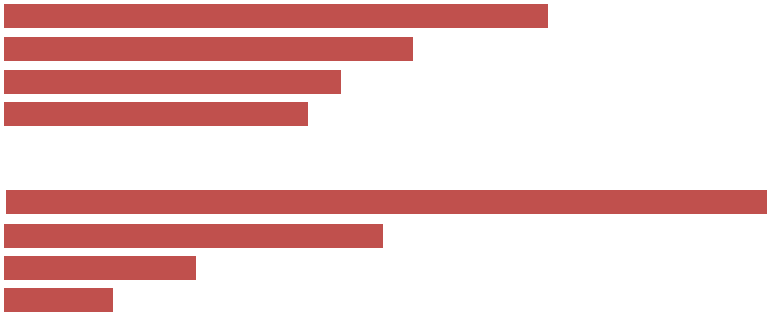




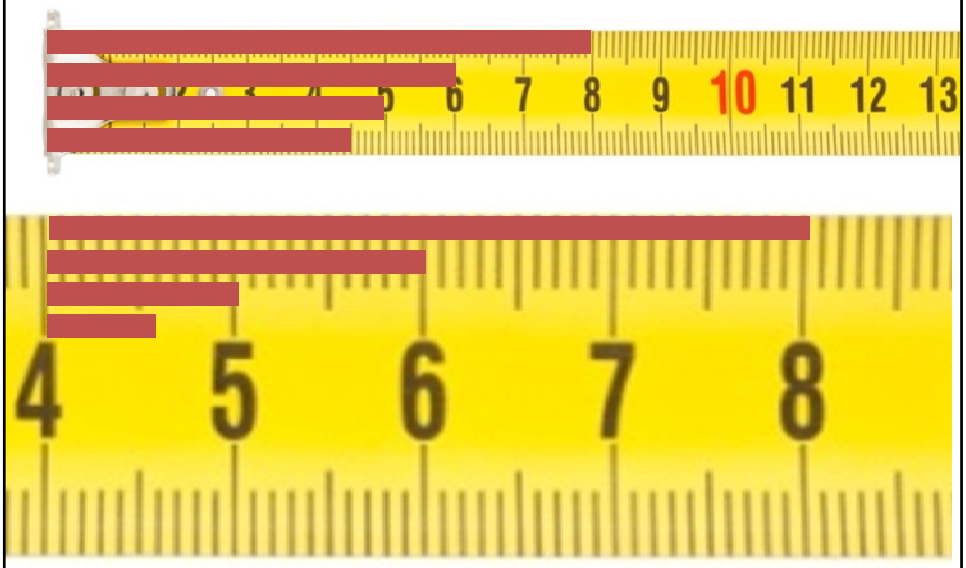
Percentage of ATE 201 students who continue on to ATE 202 on three campuses



SCALE MATTERS

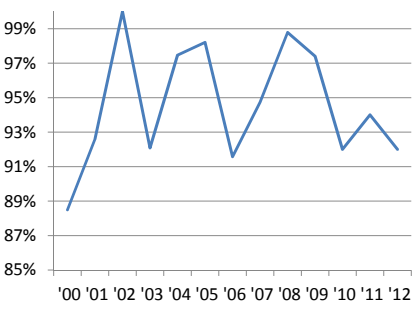


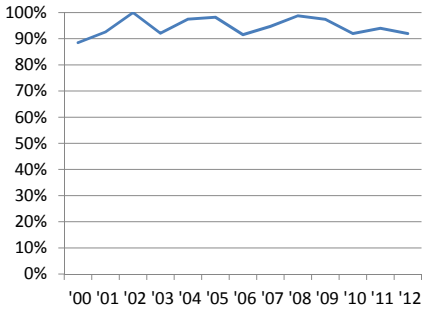
SCALE MATTERS



SCALE MATTERS

ATE Survey Response Rates: 2000-12





PIE IS HARD TO DIGEST

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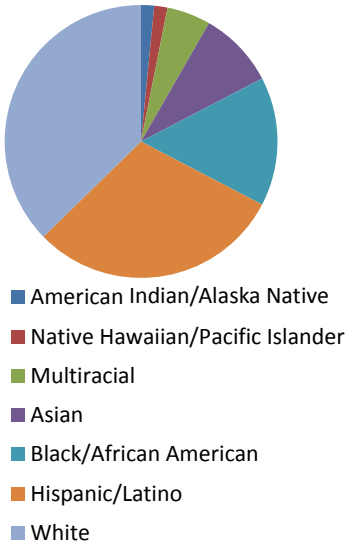

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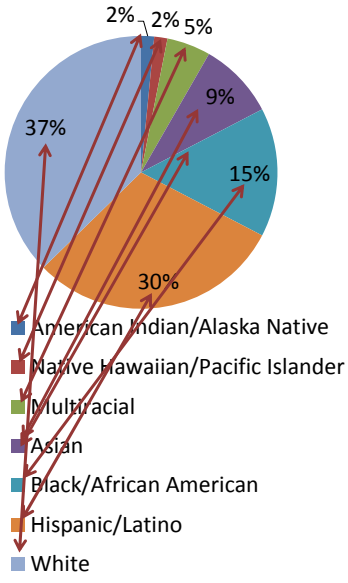
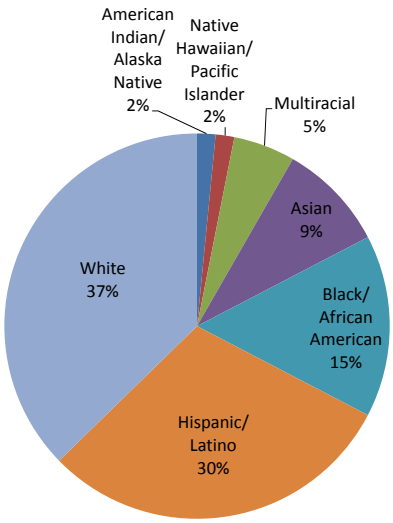


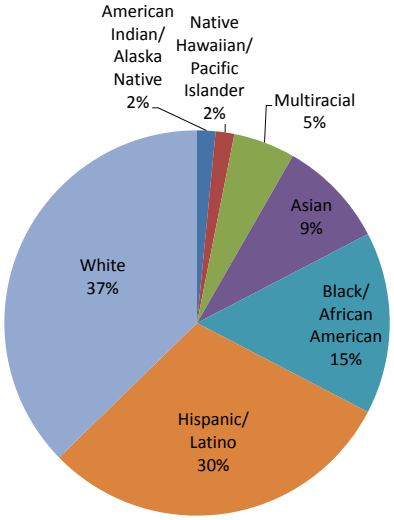
Your eyes have to move back and forth between legend and chart to link data to category

PIES IS HARD TO DIGEST



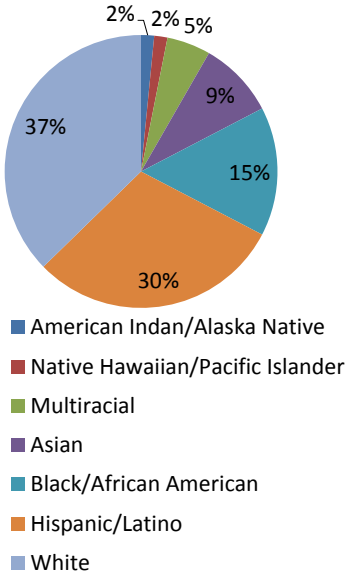
Moving labels to the chart area solves some problems, creates others

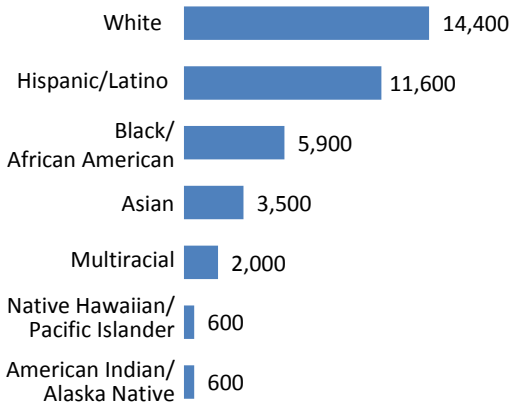
PIE IS HARD TO DIGEST



It is difficult to judge differences in area

PIE IS HARD TO DIGEST





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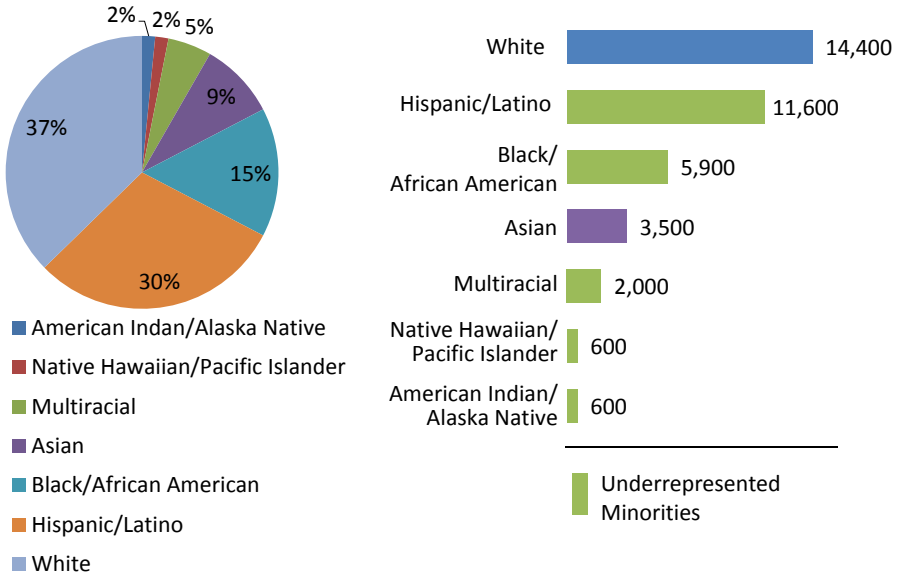
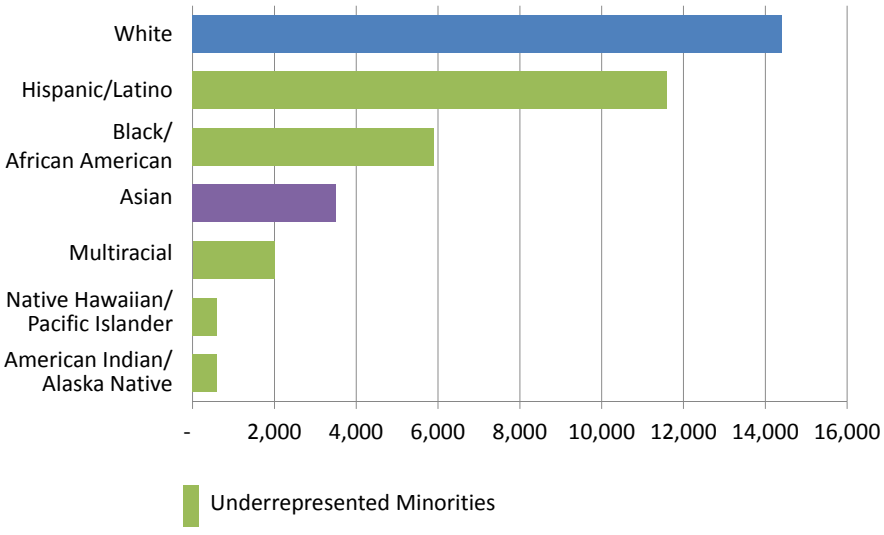


BARS ARE BETTER



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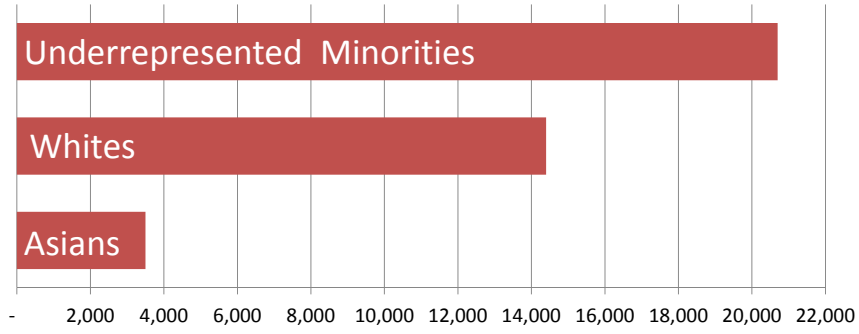
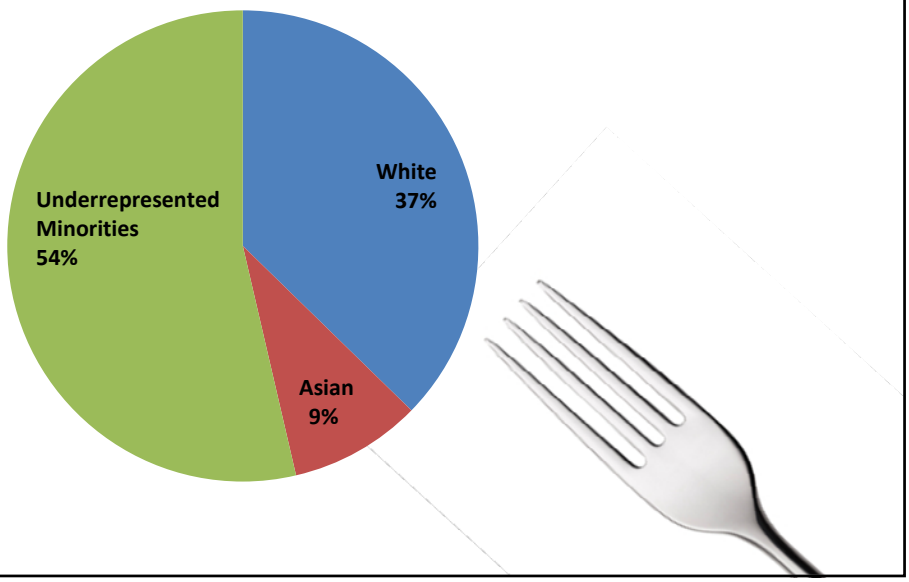


THIS PIE IS EASIER TO DIGEST



3-D IS FOR MOVIES

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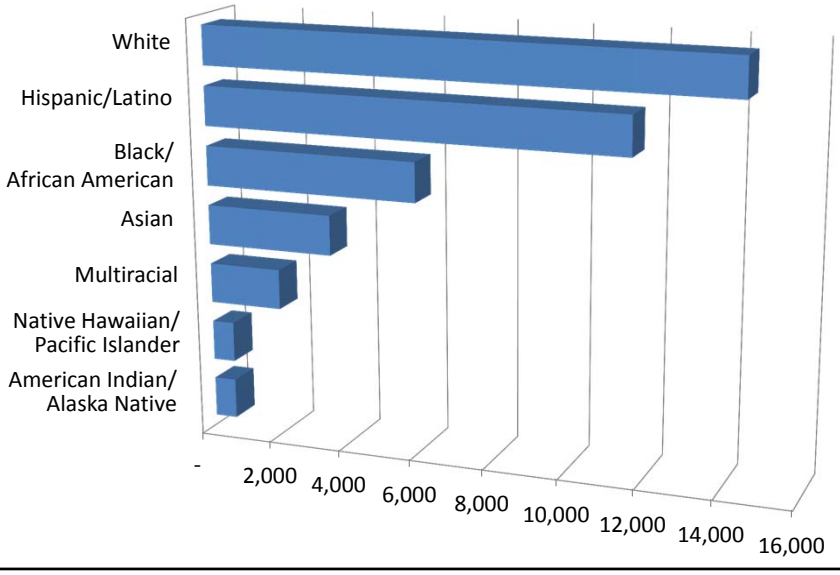

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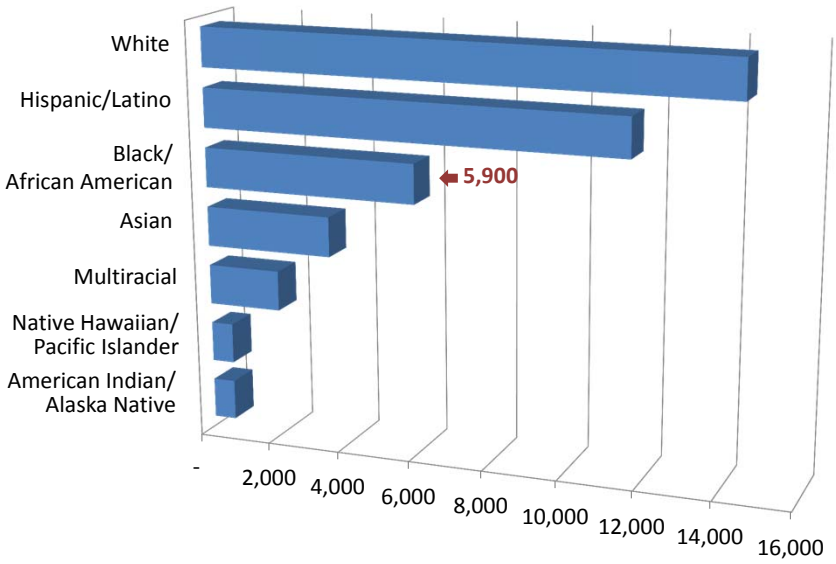

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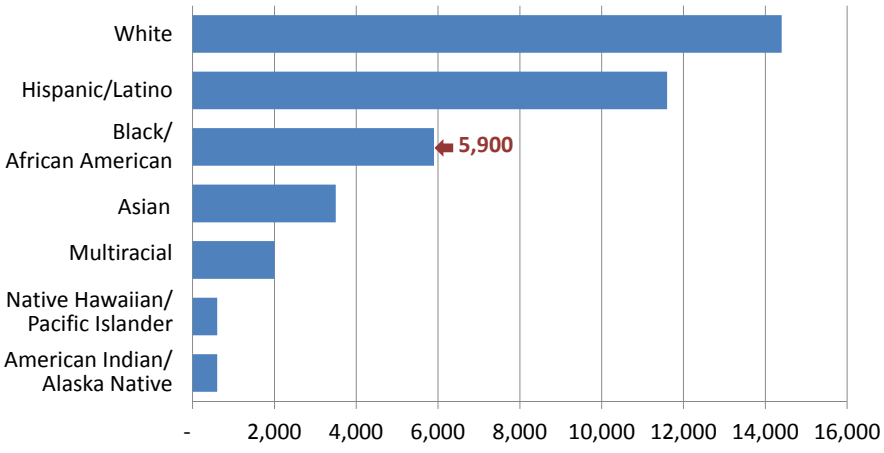
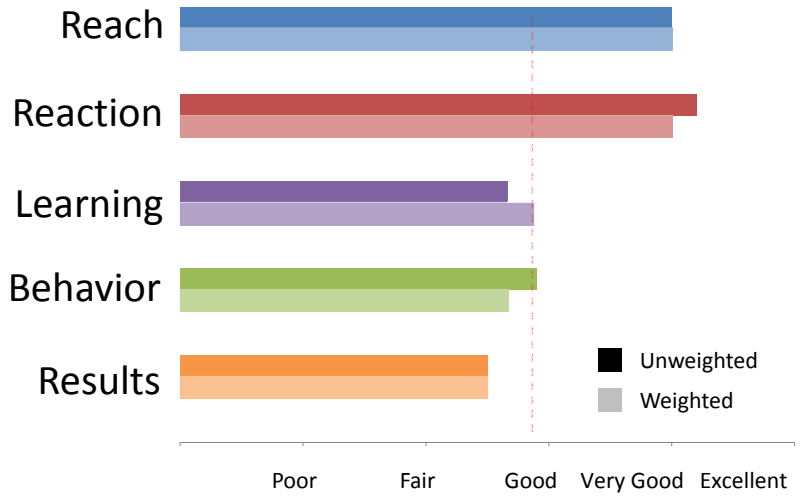
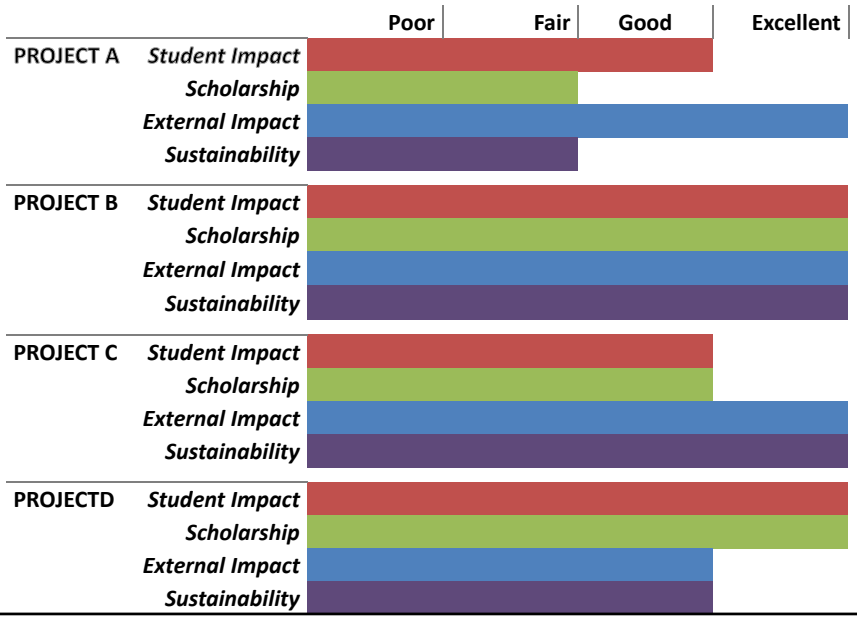


VISUALIZING EVALUATIVE CONCLUSIONS



VISUALIZING EVALUATIVE CONCLUSIONS



VISUALIZING EVALUATIVE CONCLUSIONS

Problem-based learning projects	1. To what extent do the community projects meet criteria for high-quality, problem-based learning?
Reach	2. To what degree did the courses engage the intended students?
Learning	3. What is the effectiveness of the course in terms of the gain in soft skills and technical competence?
Retention	4. What is the effectiveness of the course in improving student retention?
Student Outcomes	5. What is the project's effect on employment and/or continued education?

VISUALIZING EVALUATIVE CONCLUSIONS

IMPLICATIONS FOR REPORTING

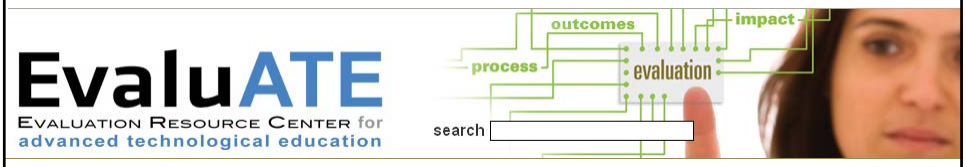
- Organize results by evaluation question, impact level, or project component rather than by data source
- Show linkages between conclusions and evidence
- Use high-quality charts to support key points

EvaluATE EVENTS

The Nuts and Bolts of ATE Evaluation Reporting
May 15 | 1-2:30 p.m. ET

www.evalu-ate.org/events

WWW.EVALU-ATE.ORG



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