



# Jumpstart Your Professional Program's Assessment Process

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PROGRAM EVALUATION FOR ACCREDITATION AND EFFECTIVE DATA  
COMMUNICATION STRATEGIES

October 29, 2023

IUPUI Assessment Institute

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# Objectives

01

Identify internal and external **data sources** to provide actionable information relative to specialized accreditation standards and program goals

02

Discuss strategies for **aligning institutional and accreditation program review processes**

03

Develop a **comprehensive program evaluation plan** that includes goals or standards to be evaluated, measures and metrics, benchmarks, timelines, and responsible parties

04

Select appropriate **analysis methods** for assessment data based on sample size, types of data, and questions to be addressed

05

Design tables and figures that **communicate key assessment results effectively** to faculty and staff

06

Identify **key action steps** to guide immediate improvements to on-going evaluation of one or more academic programs

# Introduction

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# Tell Us About Yourself

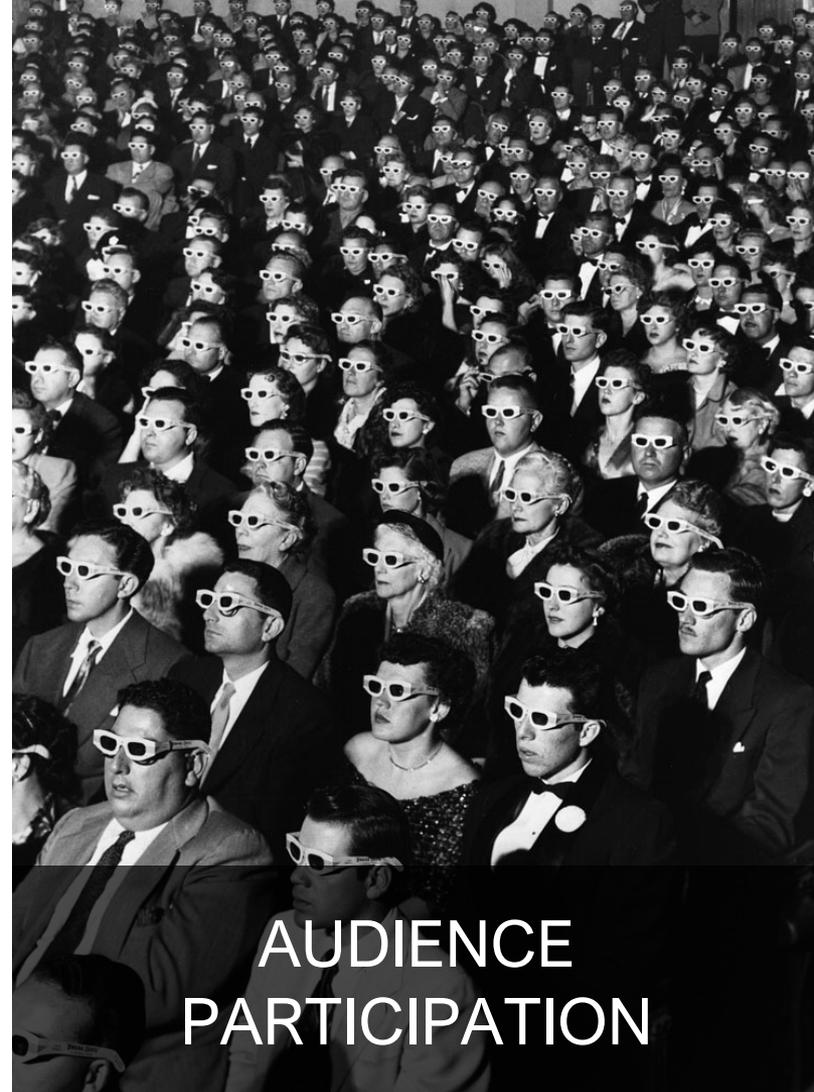
Poll Everywhere: 2 Options to Respond

1

Go to [Pollev.com/qidan](https://Pollev.com/qidan)

2

Send text to 37607 “qidan”



AUDIENCE  
PARTICIPATION

Where are you from?

Nobody has responded yet.

Hang tight! Responses are coming in.

## What area are you most excited to learn about today?!

Assessment Strategies



0%

Program Evaluation Plan



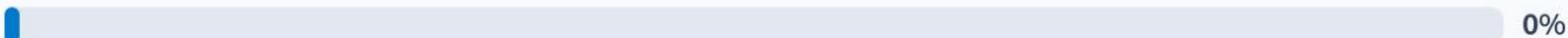
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Data Analysis



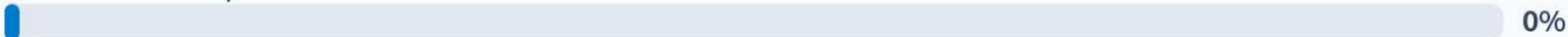
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Data Visualizations



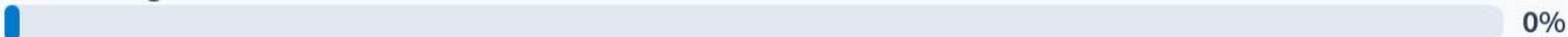
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Accreditation Tips



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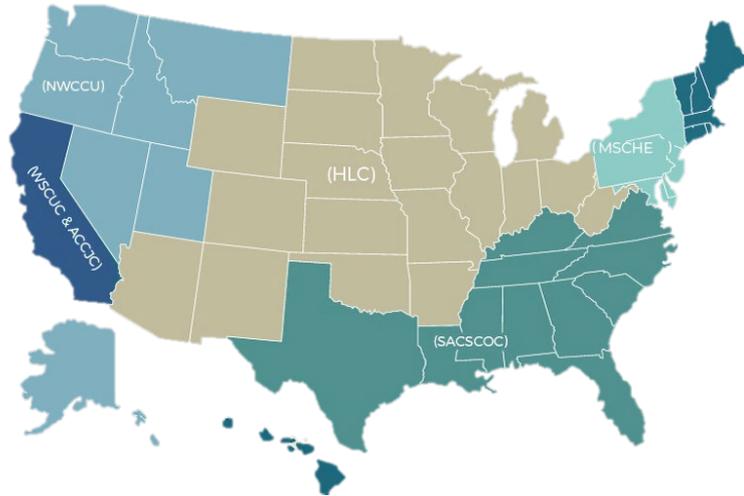
Something Else



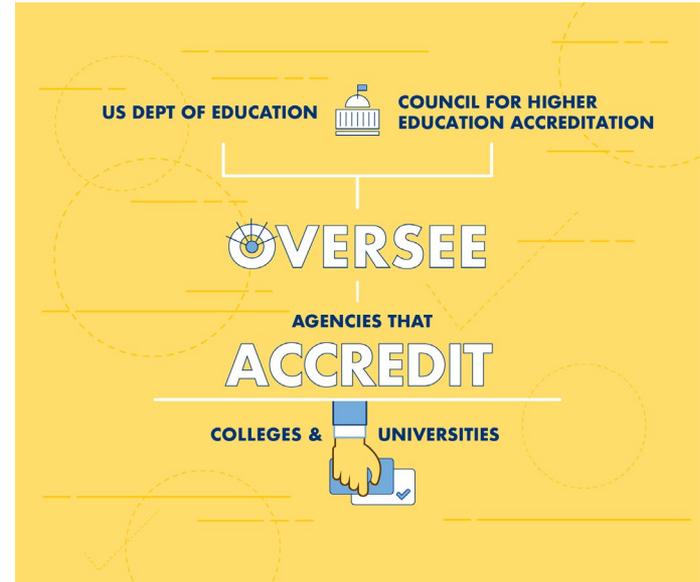
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# Accreditation Matters!

Map of Regional Accrediting Organizations



<https://www.chea.org/regional-accrediting-organizations-accreditor-type>  
<https://www.online.drexel.edu/news/national-vs-regional-accreditation.aspx>



# Accreditation Matters!

## REGIONAL ACCREDITATION

Institution-level accreditation. Includes 85% of US colleges and universities

## NATIONAL ACCREDITATION

Institution and program-specific accreditation for trade, vocational, and career programs

## PROGRAMMATIC ACCREDITATION

“Specialized” or “professional” program-level accreditation



**CAPTE**

Commission on Accreditation  
in Physical Therapy Education



LIAISON COMMITTEE ON  
MEDICAL EDUCATION



ACCREDITATION COUNCIL FOR  
PHARMACY EDUCATION



**CODA**\*

Commission on Dental Accreditation



# Competing Needs of Your Program

Accreditation  
Preparation



Program  
Assessment



## The Purpose of...

assessment  
is to  
**INCREASE**  
quality.



evaluation  
is to **JUDGE**  
quality.

Too short and  
not enough  
leaves. C-



Assessment for  
Improvement  
vs.  
Assessment for  
Compliance

# Needs for Accreditation Preparation v. Program Assessment

## Accreditation = Full Evaluation

Admissions,  
Student  
Affairs &  
Success

Faculty, Staff,  
& Preceptors

Curriculum &  
Learning  
Outcomes

Scholarship &  
Research

Facilities &  
Finances

Service

Strategic Plan & Program Requirements

## Program Assessment = Student Outcomes

Outcome: Patient Assessment

Outcome: Interprofessional Communication

Outcome: Interprofessional Communication

Review of learning evidence, data sources

# Matching Program Outcome Assessment and Accreditation Needs

01

## Forecast for Your Program

- Basic requirements
- Areas needing attention for future accreditation rules
- Existing processes needing evaluation

02

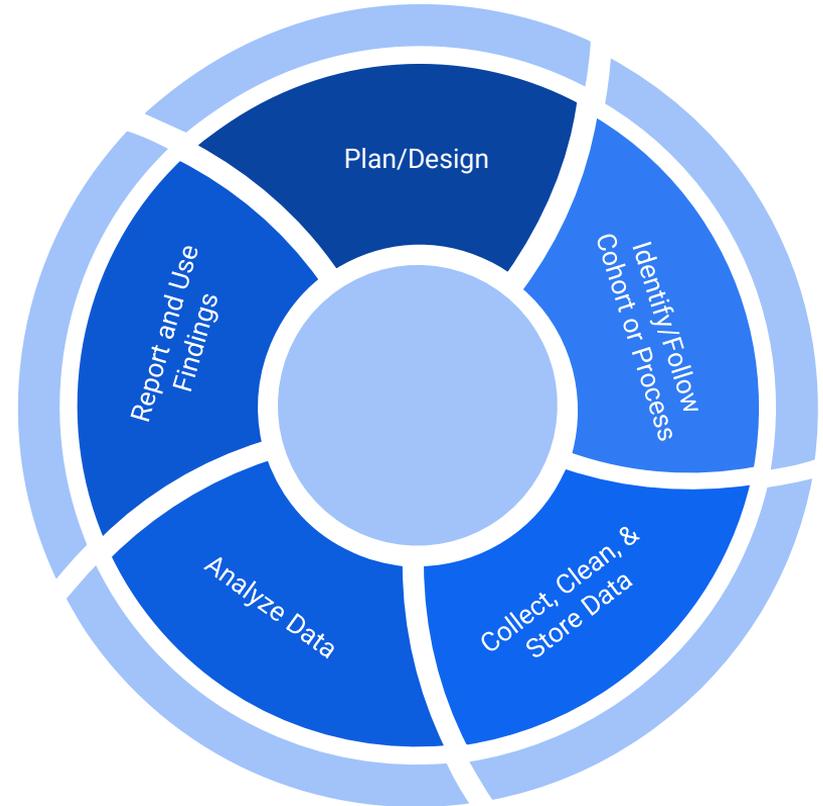
## Decision-making

Affected committee or group decide on movement needed

03

## Planning

Planning process starts for outcome assessment



# Balancing Institutional Assessment and Program Accreditation

## Design

Develop an overall program evaluation process that accounts for both requirements:

- Areas/goals/outcomes
- Types of measures
- Expected evidence and documentation

## Learning Outcomes

Use the same set of learning outcomes/competencies for program accreditation and institutional assessment process (or a subset)

## Timing

Work with institutional assessment office to align timing of:

- Annual outcome reporting
- Program accreditation v. program reviews

A photograph of Auburn University's iconic clock tower and a brick gate. The clock tower is a tall, red brick structure with a white clock face and a pointed roof. In the foreground, a brick gate features a stone plaque with the university's name and founding year. The scene is set against a clear blue sky with green trees.

# Developing a Program Evaluation Plan

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AUBURN  
UNIVERSITY

ESTABLISHED 1856

# First Steps: Questions to Address

01 —

**What** do we want and need to measure?



03 —

**When** and how should we collect, analyze, and review the results?



05 —

**Who** should be involved in each phase of the process?



02 —

**How** can we best measure what we need to measure?



04 —

**What** documentation needs to be created?



# Outlining the Evaluation Plan: Example 1

Goal/ Outcome / Standard	Measure(s)	Timing of Data Collection	Responsible for Data Collection & Analysis	Timing of Review & Planning	Responsible for Review & Planning
A1.07 Sufficiency of faculty and staff	1. Program faculty/staff survey	Annual (Oct)	Director of Assessment	Annual (Dec) Faculty/Staff Meeting	Program Faculty/ PD
	2. Student exit survey	Annual (Aug)	Director of Assessment		
	3. Student opinion survey	Annual (Sept)	University IE Office (collection) Asst. Dean of Academic Affairs (analysis)		
	4. Faculty workload analysis	Semesterly (Aug, Jan, May)	Program Director (collection) Director of Assessment (analysis)		



# Programmatic Standards



Human, financial, and physical resources



Curricular content, review, and development



Admissions standards and practices



School/program leadership and administration



Diversity, equity, and inclusion goals and strategies



Required policies and procedures



Institutional support



Required clinical practice experiences



Assessment of student learning, curriculum, and program



Research productivity and student participation



# Questions When Choosing Measures and Metrics

## Compliance

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1

What measures (or metrics) are required by our accreditor or the institution?

Examples: licensure pass rates, retention and graduation rates, standardized or institutional surveys

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## Available

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2

What measures (or metrics) do we have access to currently that we could use or revise to meet our needs?

Examples: course assignments and grades, OSCEs, standardized test scores, course evaluations, budgets, faculty workloads, curriculum maps

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# Questions When Choosing Measures and Metrics

## Optimal

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3

What measures (or metrics) will give us the *best* information for measuring goals and outcomes?

Examples: direct evidence of learning, peer teaching evaluations, formal curriculum review, student focus groups

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## Feasible

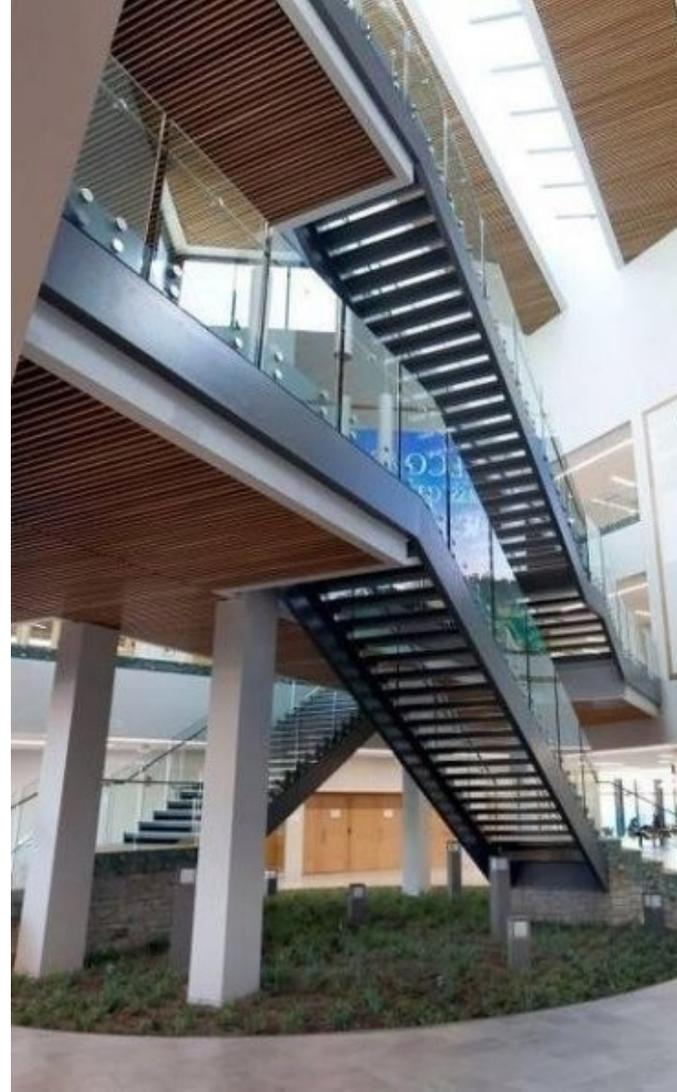
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4

Is it feasible to collect data for a given measure as part of a regular assessment cycle?

Example of a non-feasible/sustainable process: extracting instructional objectives from lecture PowerPoint slides

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# Traits of Good Measures and Metrics

## **Reliable**

The measure, tool, and/or process is repeatable and produces trustworthy information

## **Valid**

The measure or tool is well-aligned with the goal, outcome, or standard and yields accurate information

## **Actionable**

The measure, tool, and process produces actionable information

## **Sustainable**

Workload for the development, data collection, and analysis is manageable with available resources

# Example Measures and Metrics

Curricular content, review,  
and development

Review of syllabi by faculty committee; curriculum maps; surveys and focus groups; external benchmarking; correlational analysis

Human, financial, and  
physical resources

Faculty:student; surveys and focus groups; annual budget, trend analysis, and internal benchmarking; faculty/staff retention; open/filled positions

Admissions standards and  
practices

Correlational analysis; external benchmarking; surveys and focus groups; interview reliability analysis; cohort traits; recruitment metrics

Student learning outcomes/  
graduate competencies

Course assessments (mapped to competencies): exams, OSCEs, case studies, preceptor evaluations; surveys and focus groups

# Examples of Institutional Data Sources

## Student Information System

- Demographics
- Course and program enrollment data
- Course grades and GPAs
- Advising appointments and notes

## Institutional Surveys

- Course and instructor evaluations
- Faculty/staff workplace satisfaction
- Student satisfaction
- Alumni

## Alumni Database

- Demographics
- Contact information
- Employer
- Occupation
- Salary
- Engagement tracking

## Faculty/Staff Databases

- Demographics
- Title, rank
- Credentials
- Dates of employment
- Performance evaluations
- CV information



# Minimizing Survey Fatigue Part I

## 1 Alignment

Ensure all survey items align with outcomes, goals, or standards they are intended to measure

## 2 Duplication

Review surveys from all sources to identify and eliminate duplicate items and information

## 3 Merge

Consolidate items into fewer surveys while ensuring length is still manageable

## 4 Open-ended Items

Limit the number of open-ended items on a survey (require the most time to respond)

# Minimizing Survey Fatigue Part II

## 5 Fidelity

Ensure a survey is the *best* (not just the most convenient) source of information

## 6 Demographics

Merge data (such as demographics) from other sources into survey data to reduce the number of items on the survey

## 7 Cycle

If acceptable to the accreditor, institution, and the program, consider placing one or more surveys on a multi-year cycle

## 8 Timing

Alternate timing of surveys (develop a schedule/calendar) so the same audience is not asked to complete multiple surveys at one time whenever it can be avoided



# Responsibility for Phases of Assessment Process

## What Data?



- Where do the data live?
- Who needs the data?
- How do the data need showcased?

## Who is Involved?

- Who currently has access?
- Who needs to collect, clean, or store?
- Who needs to analyze?
- Who needs to receive report on findings?

**Plan/Design and Identify/Follow:**  
Who has data access

**Collect, Clean, Store:**  
Involve those who have data AND those who will analyze

**Analyze Data:**  
Assign individuals or committees

**Reporting:**  
Assign individual(s) from analysis team to report and administrator to larger group

# Example Committee Structure





# Partnerships: Who Else?



## **Alumni, Preceptors, Employers**

May institute an advisory board or collect information about program effectiveness



## **University**

Request data, information, or database access from other departments or units such as IT, IR, IE, Admissions, Student Affairs, and Alumni



## **Professional Organizations**

Professional organizations and societies may collect useful benchmarking data on curricula, students, faculty, research, etc.



## **Peer Institutions**

Network to form partnerships with peer programs and institutions to share data, instruments/tools, and practices

# Example Timeline for Phases of Assessment Process

PHASE			
<b>Plan/Design</b>	We have a 5 course series of Pharmacotherapeutic Problem Solving – Observe progress	Course 1 – Winter P1 Course 3 – Winter P2 Course 5 – Winter P3	Course 2 – Fall P2 Course 4 – Fall P3
<b>Identify/Observe People or Process</b>	Track average scores on Pharmaceutical Care Plans for each course or defenses	Score tracked every course through LMS	
<b>Collect and Share Data</b>	Representative from PPS subcommittee collects and presents to committee	<u>Every fall/early winter</u> , course series coordinator gathers from courses. Data gathered for “cohort”	
<b>Analyze Data (against benchmarks)</b>	Early: Original metric established-goals of min 75% of students scores 80% or higher on care plans for courses. Modification: Winter 2021, P1 goal is min 50% of students achieve 80% scores: other courses at 75%	Assessment Committee reviews <u>every winter</u> semester	
<b>Report and Use Findings</b>	Committee report back to subcommittee	<u>Spring</u> – reports to Associate Dean, subcommittee, other stakeholders	

FALL



Sept - Dec

WINTER



Jan - Apr

SPRING



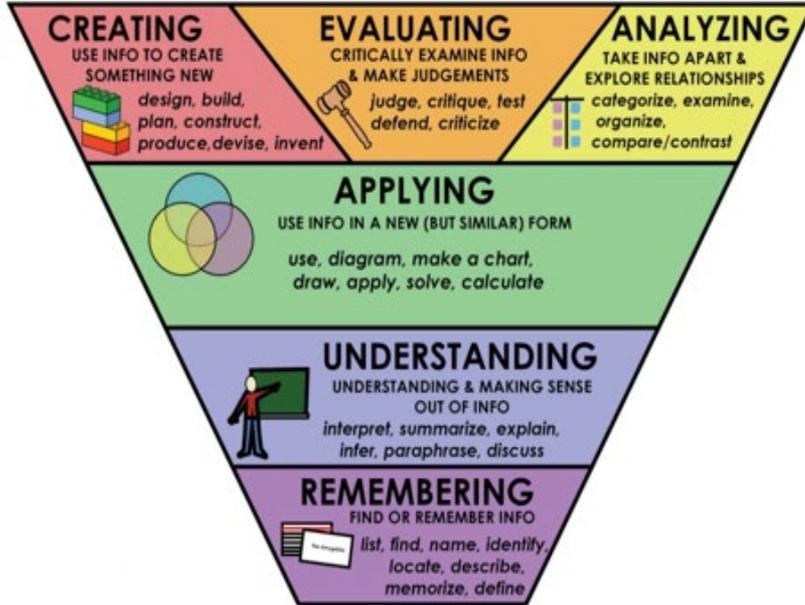
May - Jun



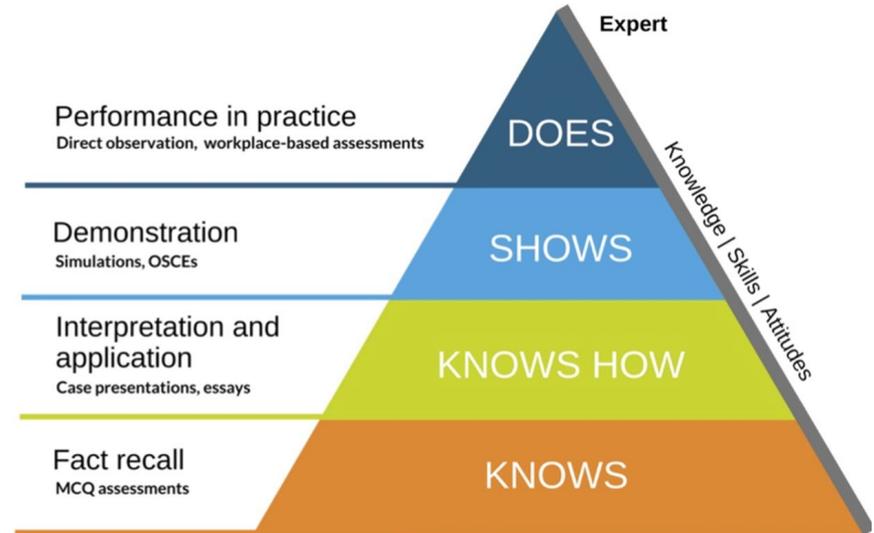
# Spotlight on Assessment of Student Learning

# Basic Learning Models

## Blooms Taxonomy



## Miller's Pyramid of Clinical Competence



**Knowledge**

Recall /reproducing facts without understanding. Exhibits previously learned material by recalling facts, terms, basic concepts and answers.

**Comprehension**

To show understanding finding information from the text. Demonstrating basic understanding of facts and ideas.

**Application**

To use in a new situation. Solving problems by applying acquired knowledge, facts, techniques and rules in a different way.

**Analysis**

To examine in detail. Examining and breaking information into parts by identifying motives or causes; making inferences and finding evidence to support generalisations.

**Synthesis**

To change or create into something new. Compiling information together in a different way by combining elements in a new pattern or proposing alternative solutions.

**Evaluation**

To justify. Presenting and defending opinions by making judgements about information, validity of ideas or quality of work based on a set of criteria.

**Key words:**

Choose Observe Show  
Copy Omit Spell  
Define Quote State  
Duplicate Read Tell  
Find Recall Trace  
How Recite What  
Identify Recognise When  
Label Record Where  
List Relate Which  
Listen Remember Who  
Locate Repeat Why  
Match Reproduce Write  
Memorise Retell  
Name Select

**Key words:**

Ask Extend Outline  
Cite Generalise Predict  
Classify Give examples Purpose  
Compare Relate  
Contrast Illustrate Rephrase  
Demonstrate Report  
Strate Indicate Restate  
Discuss Infer Review  
Estimate Interpret Show  
Explain Match Summarise  
Express Observe Translate

**Key words:**

Act Employ Practice  
Administer Experiment Relate  
Apply with Represent  
Associate Group Select  
Build Identify Show  
Calculate Illustrate Simulate  
Categorise Interpret Solve  
Choose Interview Summarise  
Classify Link Teach  
Connect Make use of Transfer  
Construct Manipulate Translate  
Correlation Model Use  
Demonstrate Organise  
Develop Perform  
Dramatise Plan

**Key words:**

Analyse Examine Prioritize  
Appraise Find Question  
Arrange Focus Rank  
Assumption Function Reason  
Breakdown Group Relation-  
ships  
Categorise Highlight  
Cause and In-depth  
effect discussion  
Choose Inference See  
Classify Inspect Select  
Differences Investigate Separate  
Discover Isolate Similar to  
Discriminate List Simplify  
Dissect Motive Survey  
Distinction Omit Take part in  
Distinguish Order Test for  
Divide Organise Theme  
Establish Point out Comparing

**Key words:**

Adapt Estimate Plan  
Add to Experiment Predict  
Build Extend Produce  
Change Formulate Propose  
Choose Happen Reframe  
Combine Hypothesise Revise  
Compile Imagine Rewrite  
Compose Improve Simplify  
Construct Innovate Solve  
Convert Integrate Speculate  
Create Invent Substitute  
Delete Make up Suppose  
Design Maximise Tabulate  
Develop Minimise Test  
Devise Model Theorise  
Discover Modify Think  
Discuss Original Transform  
Elaborate Originate Visualise

**Key words:**

Agree Disprove Measure  
Appraise Dispute Opinion  
Argue Estimate Perceive  
Assess Estimate Persuade  
Award Evaluate Prioritise  
Bad Explain Prove  
Choose Give reasons Rate  
Compare Good Recommend  
Conclude Grade Rule on  
Consider How do we Select  
Convince know? Support  
Criteria Importance Test  
Criticise Infer Useful  
Debate Influence Validate  
Decide Interpret Value  
Deduct Judge Why  
Defend Justify  
Determine Mark

**Actions:**

Describing  
Finding  
Identifying  
Listing  
Locating  
Naming  
Recognising  
Retrieving

**Outcomes:**

Definition  
Fact  
Label  
List  
Quiz  
Reproduction  
Test  
Worksheet  
Worksheet

**Actions:**

Classifying  
Comparing  
Exemplifying  
Explaining  
Inferring  
Interpreting  
Paraphrasing  
Summarising

**Outcomes:**

Collection  
Examples  
Explanation  
Label  
List  
Outline  
Quiz  
Show and tell  
Summary

**Actions:**

Carrying out  
Executing  
Implementing  
Using

**Outcomes:**

Demonstration  
Diary  
Illustrations  
Interview  
Journal  
Performance  
Presentation  
Sculpture  
Simulation

**Actions:**

Attributing  
Deconstructing  
Integrating  
Organising  
Outlining  
Structuring

**Outcomes:**

Abstract  
Chart  
Checklist  
Database  
Graph  
Mobile  
Report  
Spread sheet  
Survey

**Actions:**

Constructing  
Designing  
Devising  
Inventing  
Making  
Planning  
Producing

**Outcomes:**

Advertisement  
Film  
Media product  
New game  
Painting  
Plan  
Project  
Song  
Story

**Actions:**

Attributing  
Checking  
Deconstructing  
Integrating  
Organising  
Outlining  
Structuring

**Outcomes:**

Abstract  
Chart  
Checklist  
Database  
Graph  
Mobile  
Report  
Spread sheet  
Survey

**Questions:**

Can you list three ...?  
Can you recall ...?  
Can you select ...?  
How did \_\_\_\_ happen?  
How is \_\_\_\_?  
How would you describe ...?  
How would you explain ...?  
How would you show ...?  
What is ...?  
When did \_\_\_\_?  
When did \_\_\_\_ happen?  
Where is ...?  
Which one ...?  
Who was ...?  
Who were the main ...?  
Why did ...?

**Questions:**

Can you explain what is happening ... what is meant ...?  
How would you classify the type of ...?  
How would you compare ...?contrast ...?  
How would you rephrase the meaning ...?  
How would you summarise ...?  
What can you say about ...?  
What facts or ideas show ...?  
What is the main idea of ...?  
Which is the best answer ...?  
Which statements support ...?  
Will you state or interpret in your own words ...?

**Questions:**

How would you use ...?  
What examples can you find to ...?  
How would you solve \_\_\_\_ using what you have learned ...?  
How would you organise \_\_\_\_ to show ...?  
How would you show your understanding of ...?  
What approach would you use to...?  
How would you apply what you learned to develop ...?  
What other way would you plan to ...?  
What would result if ...?  
Can you make use of the facts to ...?  
What elements would you choose to change ...?  
What facts would you select to show ...?  
What questions would you ask in an interview with ...?

**Questions:**

What are the parts or features of ...?  
How is \_\_\_\_ related to ...?  
Why do you think ...?  
What is the theme ...?  
What motive is there ...?  
Can you list the parts ...?  
What inference can you make ...?  
What conclusions can you draw ...?  
How would you classify ...?  
How would you categorise ...?  
Can you identify the difference parts ...?  
What evidence can you find ...?  
What is the relationship between ...?  
Can you make a distinction between ...?  
What is the function of ...?  
What ideas justify ...?

**Questions:**

What changes would you make to solve...?  
How would you improve ...?  
What would happen if...?  
Can you elaborate on the reason...?  
Can you propose an alternative...?  
Can you invent...?  
How would you adapt \_\_\_\_ to create a different...?  
How could you change (modify) the plot (plan)...?  
What could be done to minimise (maximise)...?  
What way would you design...?  
Suppose you could \_\_\_\_ what would you do...?  
How would you test...?  
Can you formulate a theory for...?  
Can you predict the outcome if...?  
How would you estimate the results for...?  
What facts can you compile...?  
Can you construct a model that would

**Questions:**

Do you agree with the actions/outcomes...?  
What is your opinion of...?  
How would you prove/disprove...?  
Can you assess the value/importance of...?  
Would it be better if...?  
Why did they (the character) choose...?  
What would you recommend...?  
How would you rate the...?  
What would you cite to defend the actions...?  
How would you evaluate ...?  
How could you determine...?  
What choice would you have made...?  
What would you select...?  
How would you prioritise...?  
What judgement would you make about...?  
Based on what you know, how would you explain...?  
What information would you use to support the view...?  
How would you justify...?

# Measures of Student Learning

## Direct Measures

Written work



Presentations (poster & verbal)



Portfolios



Reflections



Internships & externships



Essay and MC Quizzes & Tests  
(Only with blueprint)



Rubrics, rubrics, rubrics



## Indirect Measures

Course grades



% of class time spent on....



Feedback surveys



Feedback surveys



Assignments grades, if not  
Accompanied by a rubric



### Catch 22!

Indirect measures often produce quantitative data  
May be easier to assess, measure, & use

## STORY

How the history department increased student competency in using citations

Alumni Feedback

Partnership:  
Writing Center

Focus Groups

# Example: History Department Assessment Foundation

Action Plan for Future  
(SoTL & evidence-based storytelling)

Target Performance Indicators (TPIs)  
(Final essay rubric domain on citations)

Key Performance Indicators (KPIs)  
(GPA in major, final essay scores)

Cohort Characteristics  
(# students, HS GPA)

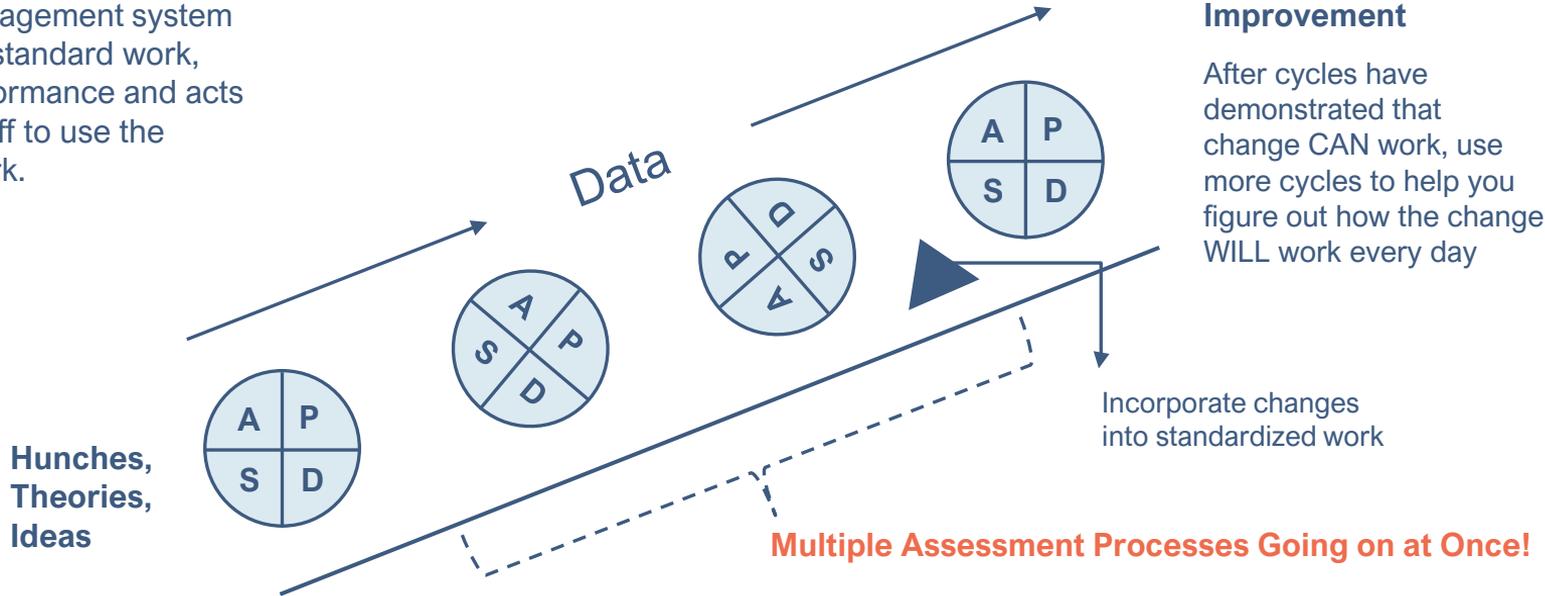
Program and Student Learning Outcomes  
(Analyze historical sources)

# Repeated Use of the Cycle

To hold the gain, you need a process management system that defines standard work, reviews performance and acts to enable staff to use the standard work.

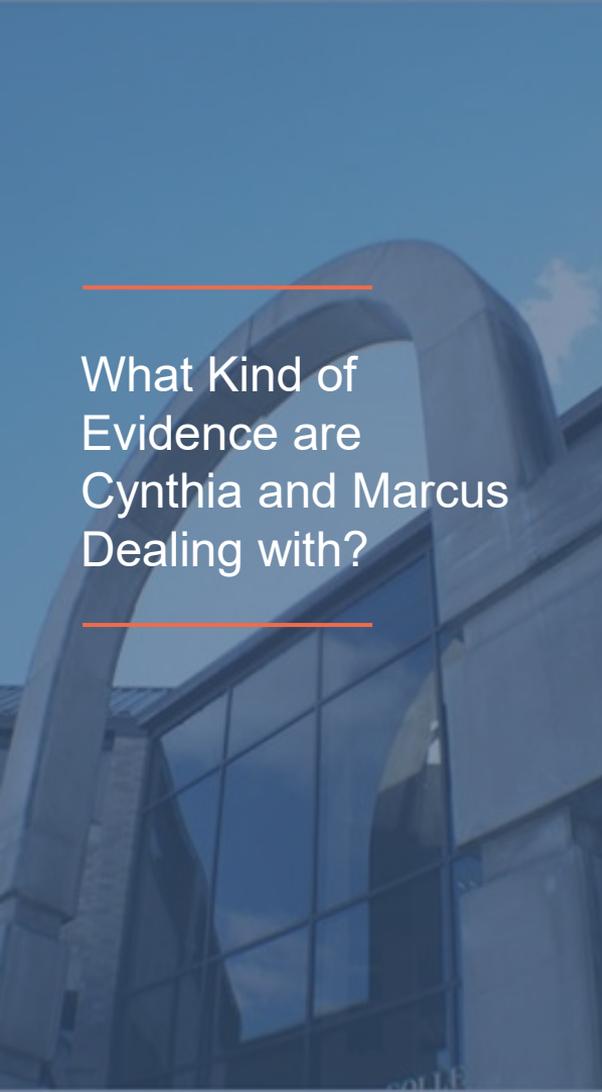
## Changes that Result in Improvement

After cycles have demonstrated that change CAN work, use more cycles to help you figure out how the change WILL work every day



# Evidence Scenario Game





# Case 1: This is all they care about ...but for good reason!

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What Kind of  
Evidence are  
Cynthia and Marcus  
Dealing with?

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Cynthia and Marcus are on a coffee break at the Assessment Institute. Cynthia works at a large medical school in Florida and Marcus works at a law school in Oregon. Both are Directors of Assessment and are gearing up for accreditation!

They discuss licensure exam pass rates and joke that “it seems like this is all the Dean cares about – but for good reason.” Marcus asks, “how do you think the accreditors look at this information?” Cynthia responds, “I am curious about the same thing – I need to show evidence of student learning” and adds “I heard there was a workshop about this topic on Sunday!”

## **Indirect**

(Lacks detail to evaluate mastery of specific knowledge/skills)

# Case 2: SoTL Reviewer #2

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Meredith and Amy work in the English department at a small liberal arts college. They love their work and are eager to share it with others. Recently they created a rubric that examines students' persuasive essays.

Everyone loves the rubric – their Department Chair, colleagues, and even the students! They decide to publish their work in a leading SoTL journal. They get accepted but reviewer # 2 has suggested revisions (of course). Specifically, the reviewer wants to know what proof they have that this is a good measure of student learning.

## Rubric

- 1 Offers direct evidence (actual student artifact – gold standard!)
- 2 Validity + reliability: blueprinting (outcomes), theory + practice, interrater reliability



What should Meredith and Amy consider before responding?

A photograph of a lecture hall with several students seated at desks. In the foreground, a young man is sleeping with his head resting on his arms on the desk. Other students in the background are looking towards the front of the room. The image has a blue tint and a semi-transparent white text overlay.

Break!

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## What areas would you like to learn more about?

Nobody has responded yet.

Hang tight! Responses are coming in.

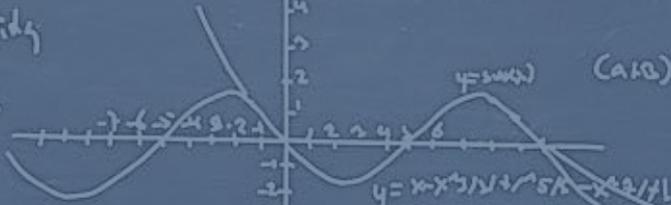
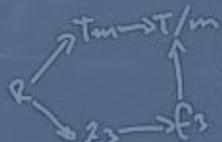
$$F = G \left( \frac{m_1 m_2}{r^2} \right)$$

Quadratic formula  
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\text{HYP. } \sum I_i v = \sum I_i v_{\text{rms}}$$

$$\frac{1 \text{ kg}}{1 \text{ kg}} = \cos$$

$m = \text{mass}$   
 $h = \text{height change}$   
 $g = \text{acc due to gravity}$



$$(a+b)(a-b) = b(a-b)$$

$$t_{1/2} = \frac{45}{2} = \sqrt{\frac{1 - \cos 45}{1 + \cos 45}}$$

$$m_1 \frac{dx_1}{dt_1} = m_2 \frac{dx_2}{dt_2}$$

$(x-x_0) \rightarrow \left[ \frac{1}{m} \right] \rightarrow (x-x_0)$

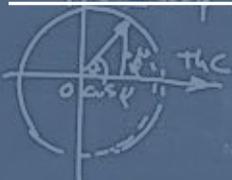
$$E = E_0 + m \left( \frac{1}{\sqrt{1-u^2}} - 1 \right)$$

$$ds^2 = dt^2 - dx^2 - dy^2 - dz^2$$
$$ds = dt \sqrt{1-u^2}$$

$$(\eta^0) = \left( \frac{m}{\sqrt{1-u^2}}, \frac{mu}{\sqrt{1-u^2}} \right)$$
$$(\eta^i) = \left( m - \frac{1}{2} mu^2, mu_i \right)$$

$$(a+b)(a-b) = b(a-b)$$

# Analyzing the Data

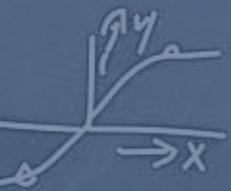


$$\frac{1 \text{ kg}}{1 \text{ kg}} = \cos$$



$$T = \sum \frac{1}{16} \left[ \frac{4}{8km} - \frac{2}{8km} - \frac{1}{8km} - \frac{1}{8km} \right]$$

but  $v^2 = \left( \frac{dx}{dt} \right)^2 = \left( \frac{2\pi a}{t} \right)^2 + \frac{4\pi^2 y^2}{t^2}$



# Benchmarks, Thresholds, & Standard Setting

## Threshold



Level of achievement students are expected to reach at a point in time (end of course, year, at graduation)

## Benchmark



Expected level of achievement based on outside source (peer institution, consortium of departments, etc.)

## Standard-setting



Absolute standard of performance:

- Delphi: multiple secret votes to reach consensus
- Angoff: consider difficulty of items and min. competency needed

## Keep in Mind

- Especially important to set thresholds, benchmarks, and/or standards for performance to make judgments and show value-added learning gains
- Many departments, schools, and colleges do not set clear, measurable thresholds or benchmarks (though they should)
- Example: *At the end of the course, I want the student to be able to...*

# Elements of Analysis (ARC-PA)

## Phases

Study of compiled or tabulated data

Interpreting correlational relationships and trends

With the subsequent understanding and conclusions used to validate current practices or make changes as needed for program improvement



## 4 Elements of Analysis

01

Data collection

02

Analysis of data

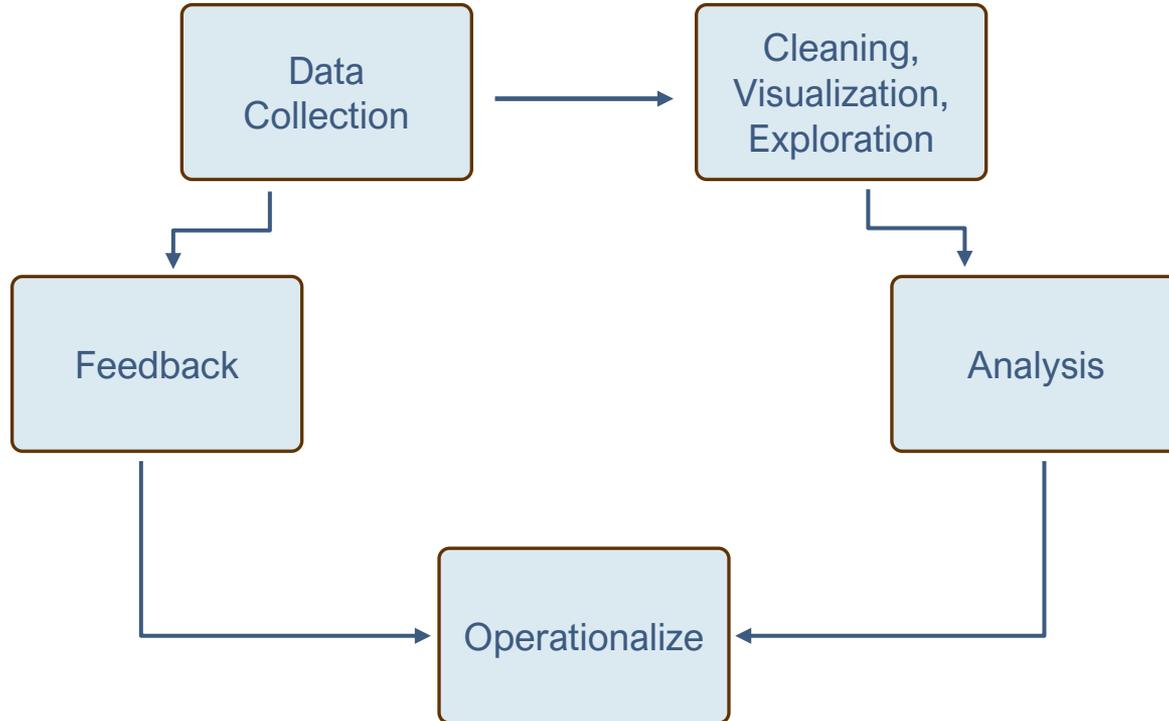
03

Application of results and development of conclusions

04

Development of action plans

# Learning Analytics Cycle



# Statistical Analysis for Education

## Assessment is Educational Research!

IRB approval (but often exempt) + SoTL = Win for everyone

## 3 Main Types of Assessment Studies

01

### Educational Intervention

- A) Pre-measurement, intervention, post-measurement
- B) Control group (no intervention), experimental group (intervention)

02

## Predictors of Student Success

Relationship between factors (HS GPA, Gender) and outcomes (test scores)

03

## Multifaceted Case Studies

- A) Several schools or departments working together
- B) Using several data points to tell a story (surveys, grades, rubrics)



Annual assessment report, self-study

# Identifying Types of Data



## Discrete v. Continuous

- Discrete = finite measurement (change in pocket)
- Continuous = Infinite measurement (time)



## Categorical

- Represent items (no natural ordering)
- Dichotomous (2 categories): e.g., yes/no
- Example of more than 2: ethnicity



## Ordinal

- Rank order with unknown or unequal intervals
- Example: Likert-type survey items



## Ratio

- Rank order with equal intervals
- Absolute zero point
- Example: GPA, height, # of questions answered correctly

# Using Descriptive Statistics

## Descriptive Statistics

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- Aim to describe, characterize, or summarize data
- Provide an idea of what the data look like
- Examples:
  - Charts: box plots, pie charts, bar charts, histograms
  - Values describing properties of the distribution: Mean, SD

## Measures of Central Tendency

- Mean: *average* value in a distribution
- Median: *middle* value in a distribution
- Mode: *most frequent* value in a distribution

## Measures of Spread or Variability

- Range (distance from highest to lowest value)
- Interquartile range (25<sup>th</sup> – 75<sup>th</sup> percentile)
- Variance
- Standard Deviation (SD)

# Identify Study Design & Appropriate Test

## Sample Size

Depends on:

- I. Type I and Type II error rates ( $\alpha$ ,  $\beta$ )
- II. Variability of the data  $\sigma^2$
- III. Effect size  $d$

## Choice of Statistical Test

## Things to Consider

### What is the Main Hypothesis?

- If no hypothesis, no statistical test
- Need a reason for the test(s) being run
- Connect hypothesis to research question(s)
- Limit confirmatory hypotheses

## What Type(s) of Data?

Test used is determined by the data types and research questions/hypotheses

### Are the Data Independent?

- Data from the same individual or matched individuals  $\neq$  independent
- Matched design = matched analysis

# What is Statistical Significance?!

## Alpha Value

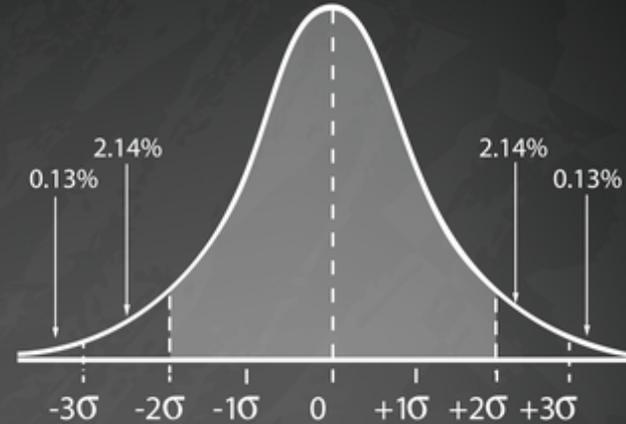
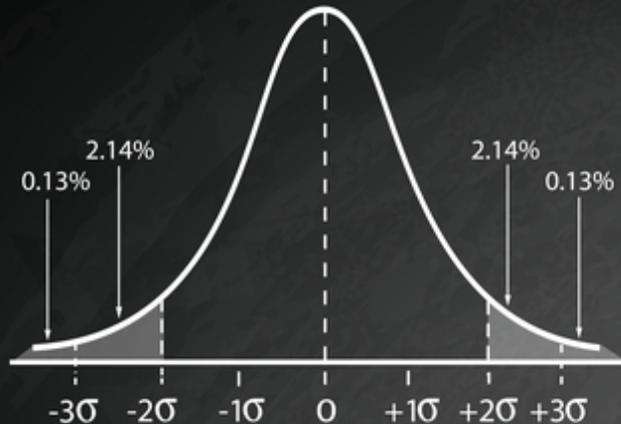
- Convention is  $\alpha = .05$  and  $.01$
- If  $p \leq \alpha$ , result is statistically significant
- Multiple types of statistical tests

## Cohen's d (Effect size)

- Statistically significant  $\neq$  practically significant
- Examine effect size:
  - $d < 0.5$  (small)
  - $0.5 \leq d < 0.8$  (medium)
  - $d \geq 0.8$  (large)

## Confidence Intervals

- 95% confidence interval defines range of values within which the true value for population is found (for  $\alpha = .05$ )



## Pearson correlation (r)

Determine strength and direction of relationship between two continuous variables



## T-tests

Independent and paired samples. Tests whether statistically significant differences exist between groups or observations. DV is continuous and IV is categorical.



## One-way ANOVA

Tests whether statistically significant differences exist in the means of two or more independent groups. DV is continuous and IV is categorical.

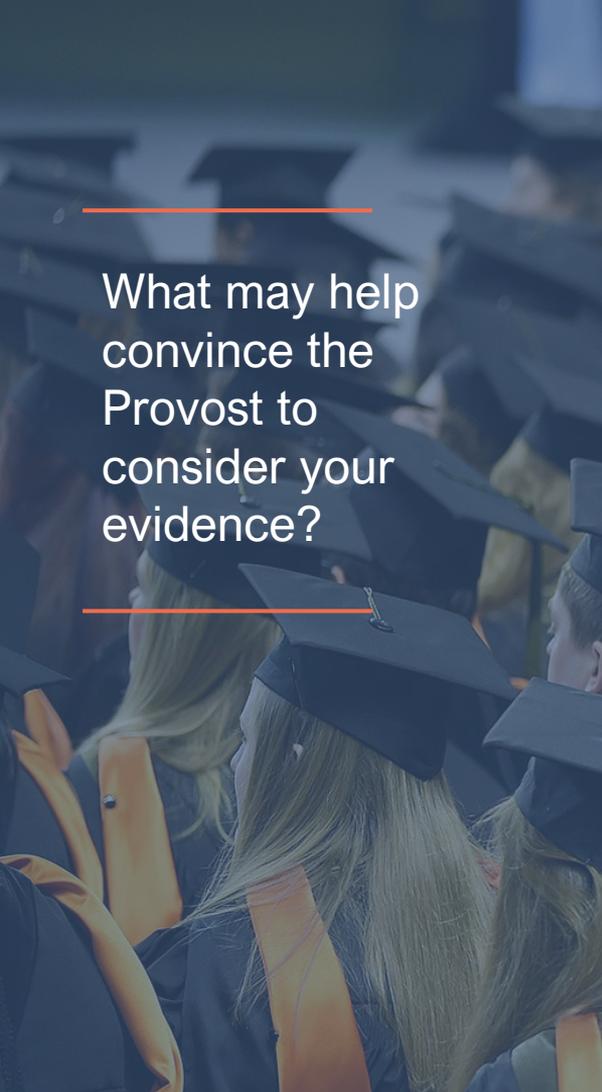


## Linear Regression

Determines whether relationship between two variables is statistically significant, and the direction and magnitude of the relationship, while controlling for any other IVs in the model. DV is continuous and IVs can be categorical, ordinal, or continuous.



# Statistical Analysis Made Easy(ier)



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What may help convince the Provost to consider your evidence?

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## Case 3: Everyone is Learning & Doing Great!

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Trey and Tanya work in the IR Office at RMU. Today, the Provost reached out and wanted to know more about the effects of RMU's change from a 5- to a 4-day class week. Survey data are positive, but she is worried student grades may have declined.

Trey and Tanya have a file with all course grades and quickly run descriptive statistics using SPSS. They compare grades from this year (4-day week) to prior years (5-day week) and wisely consider academic preparedness (HS GPA) across different student cohorts.

Results show only 1 significant difference in grades across years: sophomore grades have declined since the change. You explain this and the Provost replies, "everyone is learning and doing great, this is a glitch, nothing to worry about."

**You currently have indirect evidence but with strong validity.**

Time to consider other potential explanatory variables.

# Data Visualization Tools

## (Storytelling)

01

### Flow Chart

Official symbols

02

### Histogram

Dispersion, visual standard deviation  
Pareto chart (special case)

03

### Scatterplot

Regression line, X and Y axis

04

### Dashboards

Example: National student clearinghouse

05

### Ishikawa Diagram

Cause and effect analysis

06

### Gantt Chart

Timelines and milestones

07

### Run (Control) Chart

Measurement of a variable as a function of time

# Histograms & Scatter Plots

## Histogram

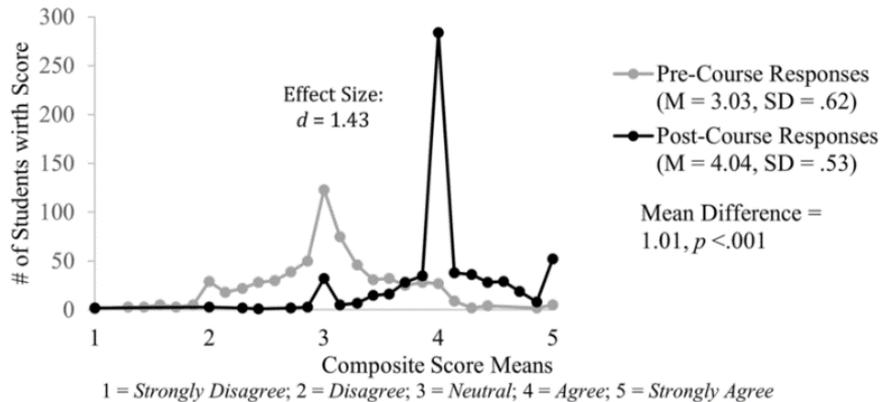
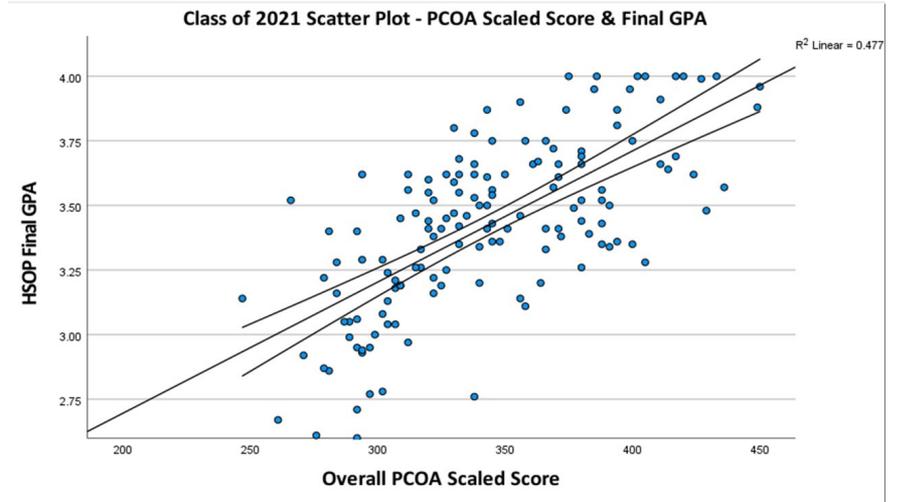


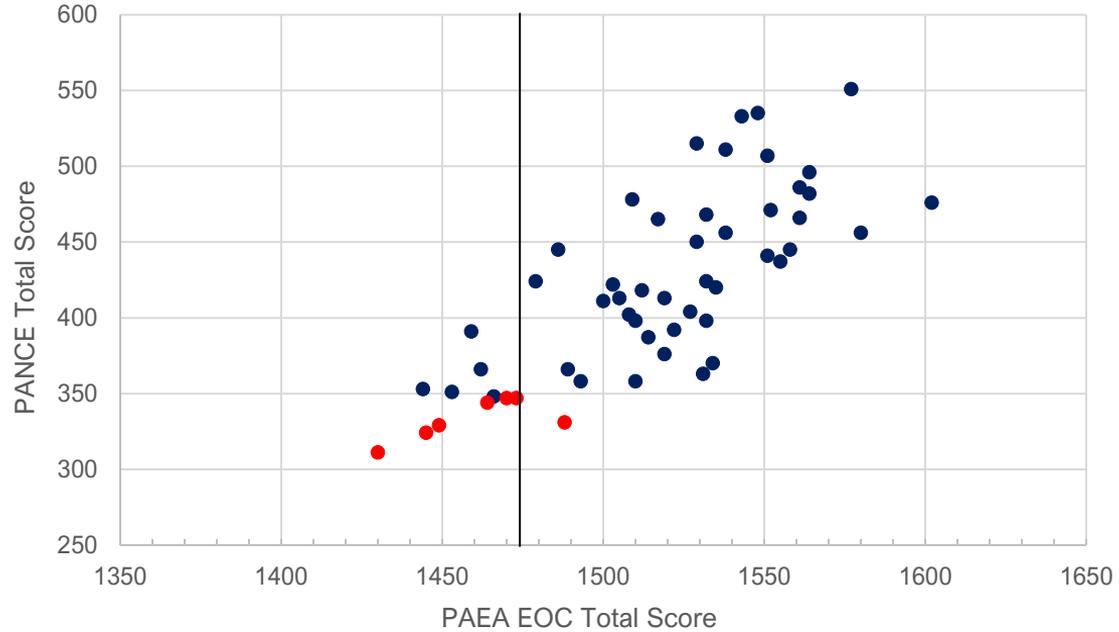
Fig. 2 Distribution of composite score means for students' self-reported knowledge of COVID-19 before and after completing the new student-led course. The distribution is shown for pre-course (gray) and post-course (black) survey results. The post-course survey aggregate mean increase of 1.01 was both substantial ( $d = 1.43$ ) and statistically significant ( $p < .001$ ).

## Scatterplot



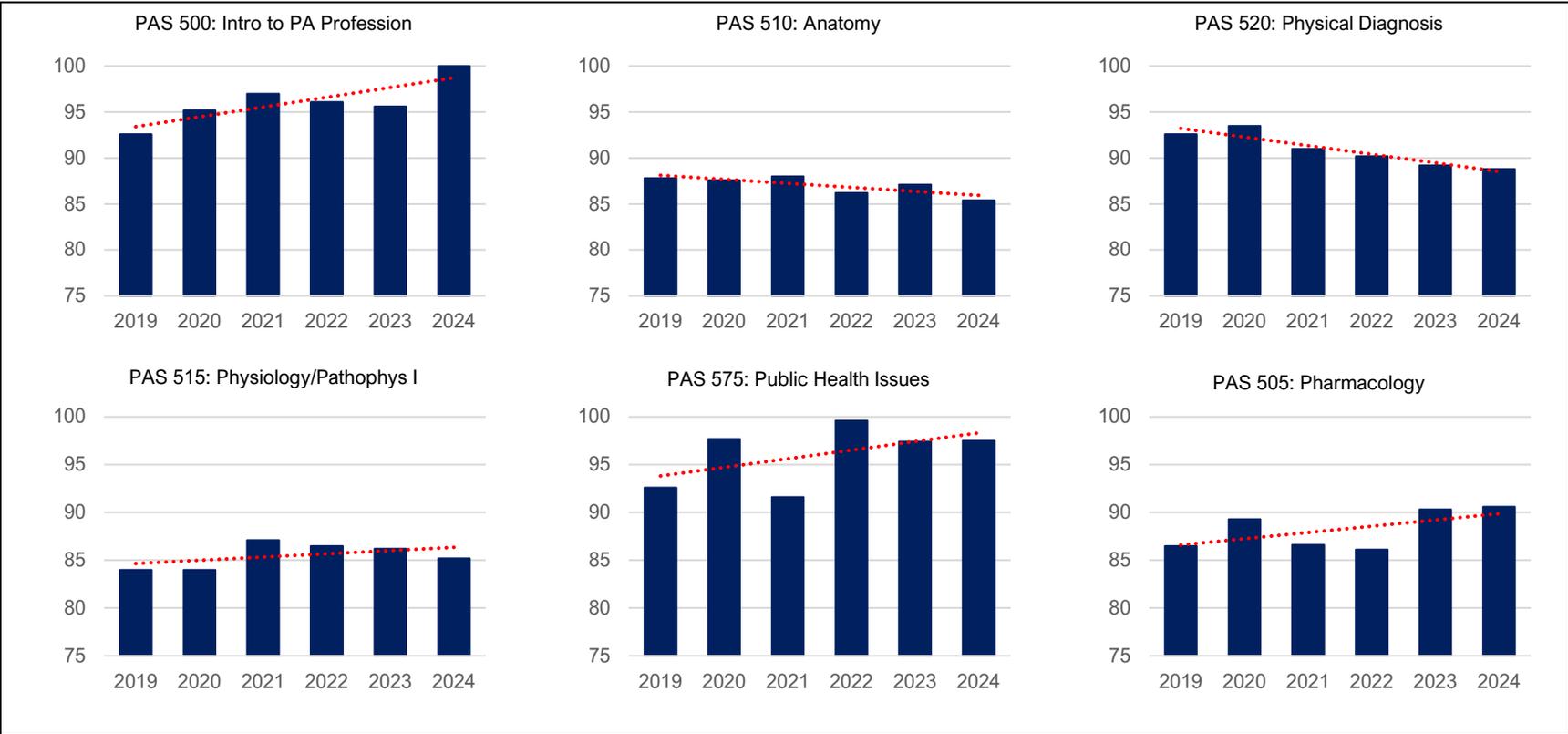
# Example Scatterplot and Cut Score

Fig. 1. PANCE total score v. EoC total score with EOC cut score of 1474



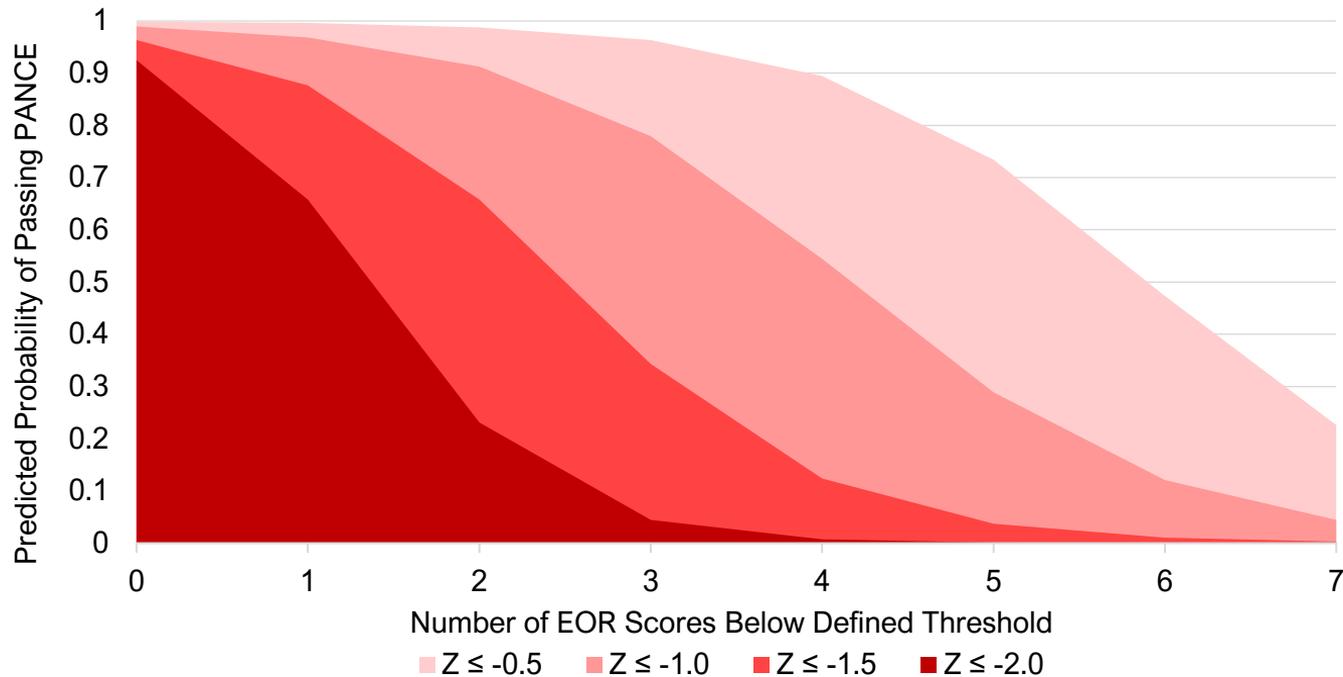
# Example Bar Charts of Course Grade Distributions

Fig. 1. 2019-2024 PA program mean course grades for Summer I



# Example: Area Chart

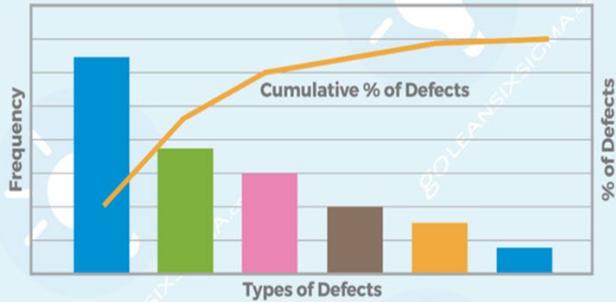
Figure 1. Predicted probability of passing the PANCE by number of Z scores below threshold



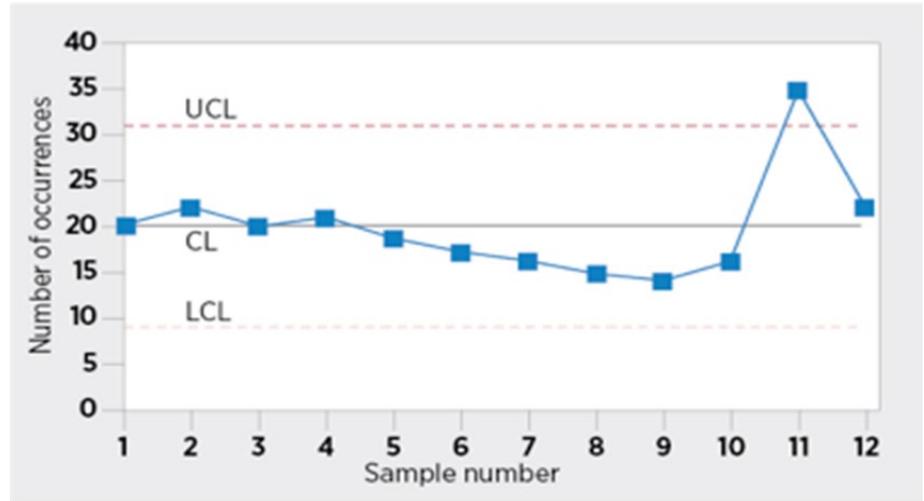
# Advanced Chart Examples

## Pareto Chart

A Pareto Chart is a bar chart that displays the most significant types of defect occurrences in descending order.



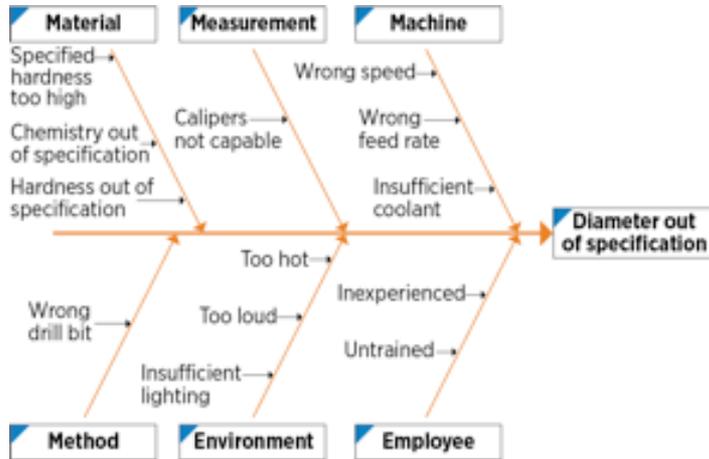
## Run Chart



# Diagrams

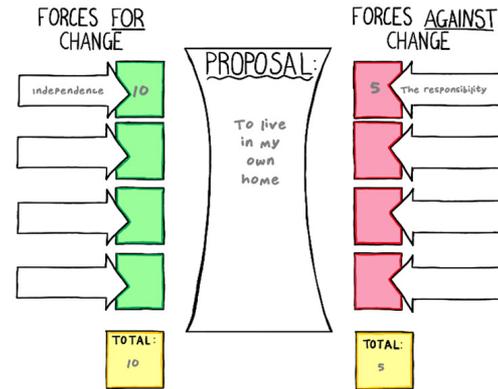
## Ishikawa (Fishbone) Diagram

(Helpful for cause and effect analysis)



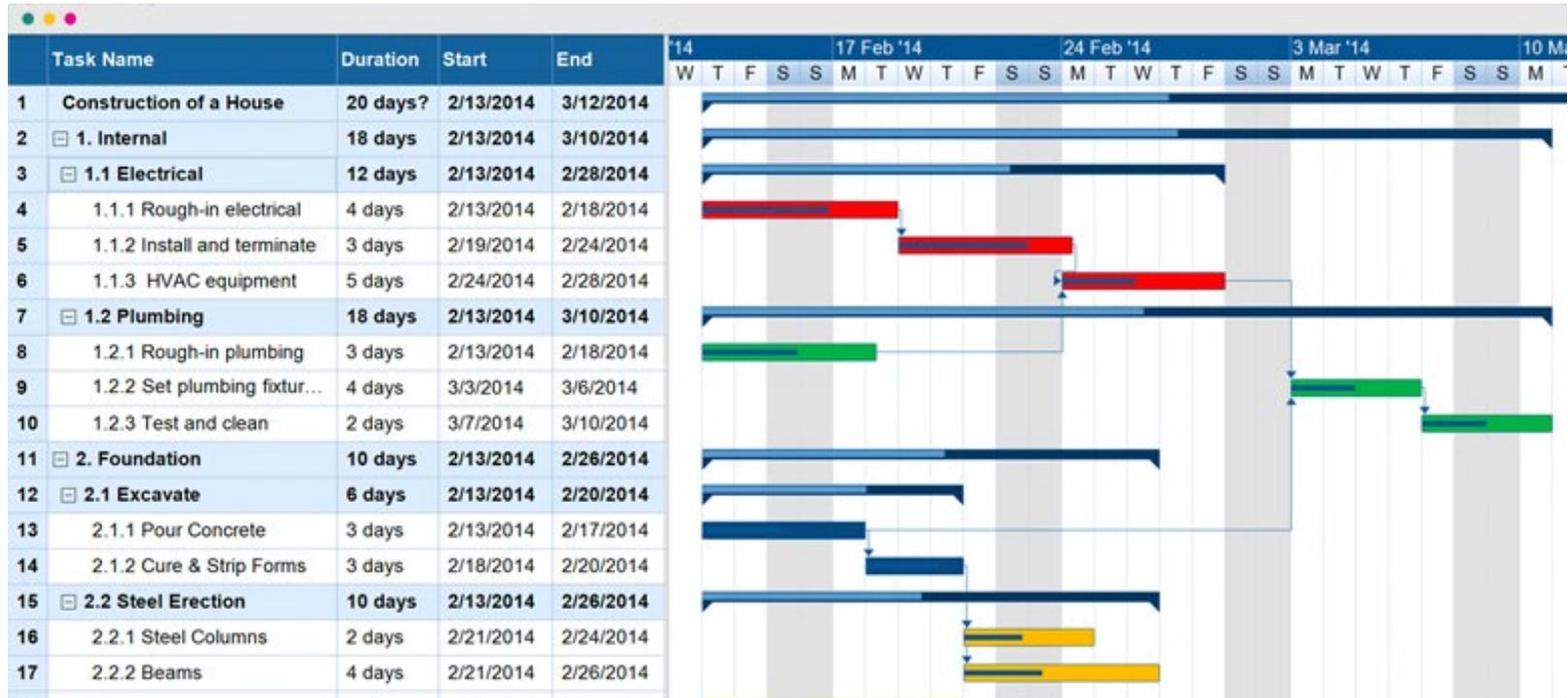
## Forcefield Analysis

(Helpful for process and change management)

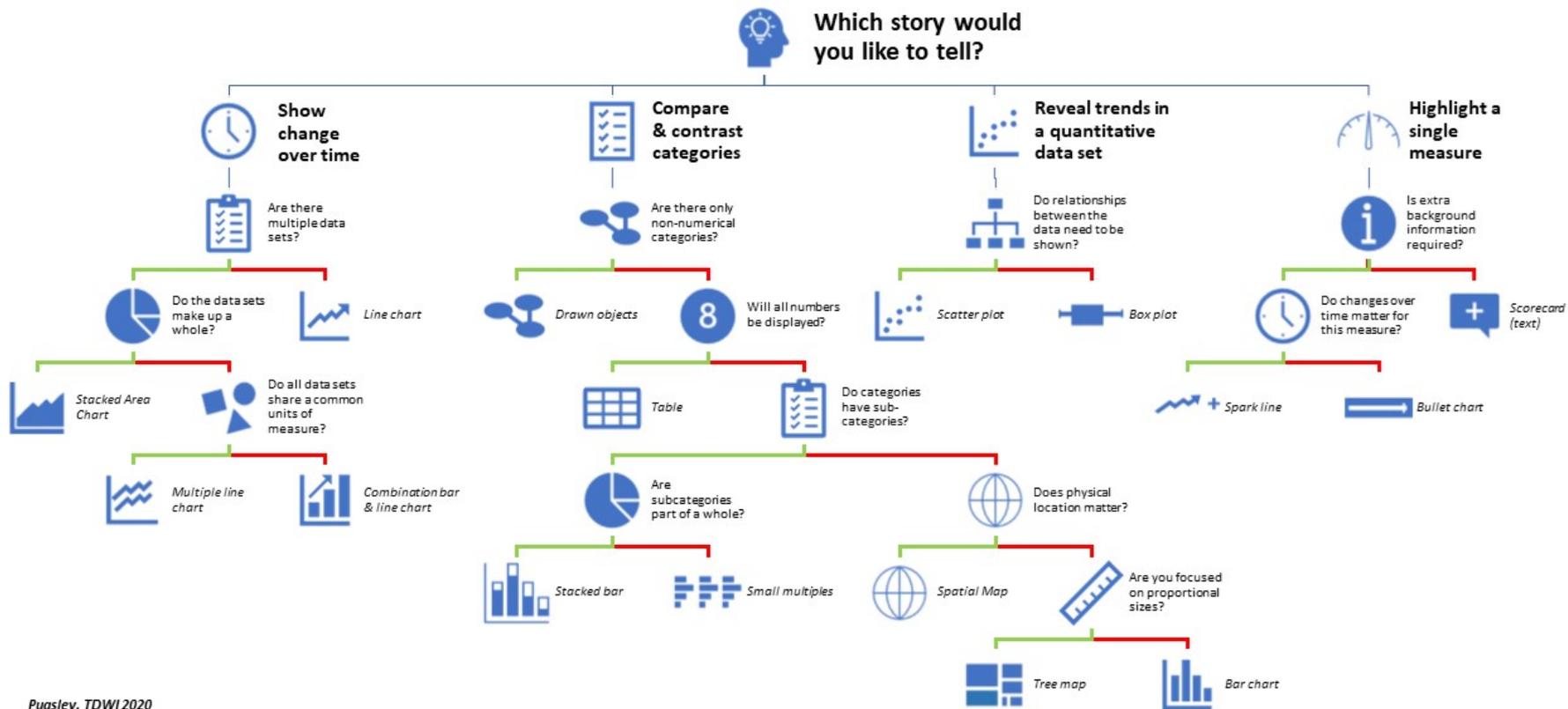


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# Gantt Chart



# Data Story Visualization: A Decision Tree



# Discussing Data - Useful Verbiage



Here to provide interpretation but these are ultimately your data...

Helper not a gatekeeper....

We accounted for that in the analysis...

We anticipated that...

Keep giving me feedback... let me know I am on the right track...

This is only one piece of the story, it's ok if everything does not fit in each chapter....

What data do we not have that you would like to see....

What is your timeline....

This is X% accurate and will only improve with more data....

We don't have to be perfect, only better than we were before....

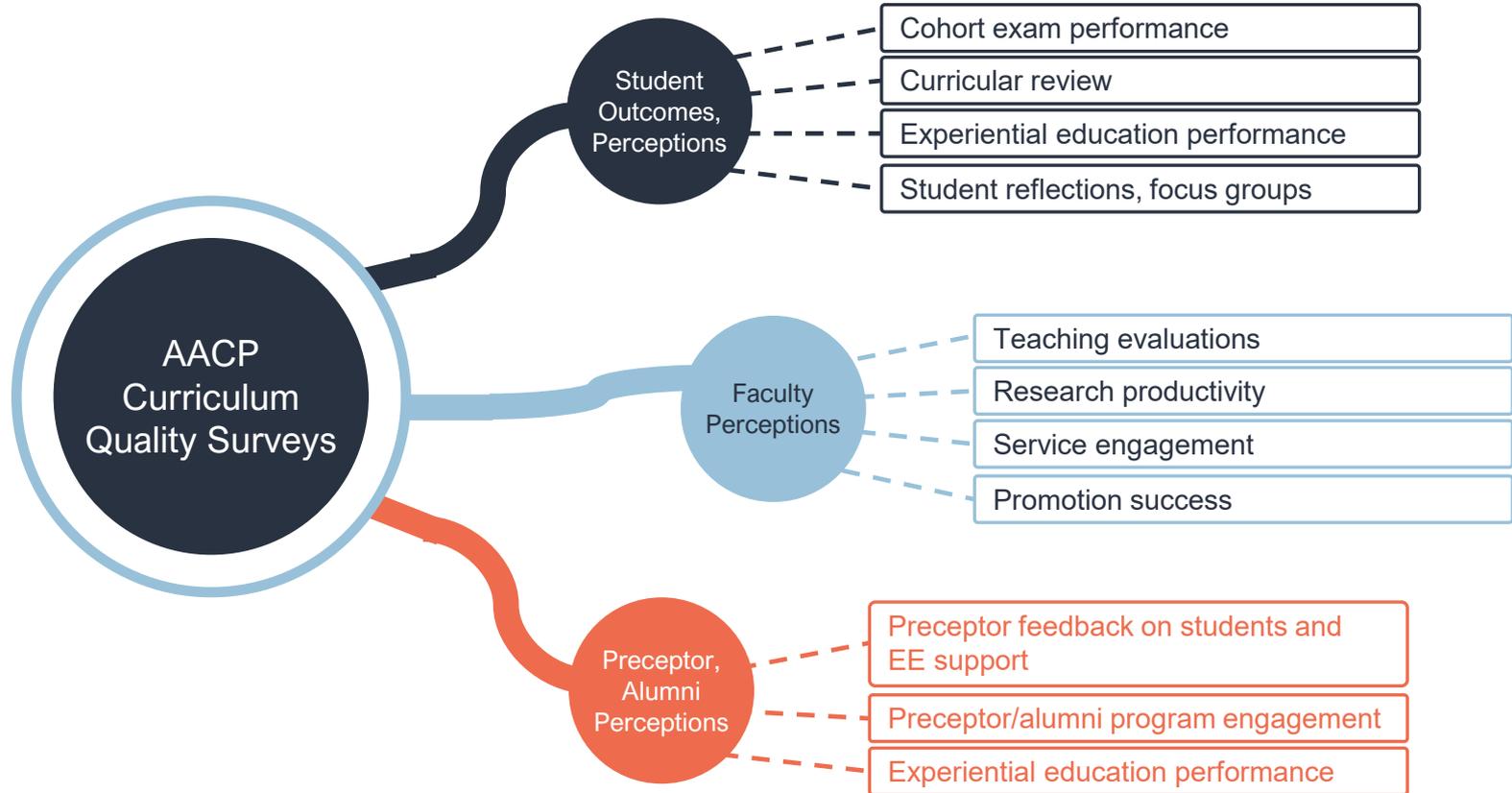
# Accreditation Tracking & Project Management

	A	B	C	D	E	F	G	H	I	J	M	N	
1		 <b>FREDERICK P. WHIDDON COLLEGE OF MEDICINE</b> UNIVERSITY OF SOUTH ALABAMA											
2		<b>LCME Current Risk Assessment</b>											
3													
4		<b>Standard 1</b>	<b>Standard 2</b>	<b>Standard 3</b>	<b>Standard 4</b>	<b>Standard 5</b>	<b>Standard 6</b>	<b>Standard 7</b>	<b>Standard 8</b>	<b>Standard 9</b>			
5		Mission, Planning, Organization, and Integrity	Leadership and Administration	Academic and Learning Environments	Faculty Preparation, Productivity, Participation, and Policies	Educational Resources and Infrastructure	Competencies, Curricular Objectives, and Curricular Design	Curricular Content	Curricular Management, Evaluation, and Enhancement	Teaching, Supervision, Assessment, and Student and Patient Safety	Medical Student Selection, Assignment, and Progress	Medical Student Academic Support, Career Advising, and Educational Records	Health Personal Counseling, and Financial Aid Services
6	x.0	■											
7	x.1	⊕			▲	▲	⊕		■			● ■ ⊕	
8	x.2			● ■	■		⊕		▲ ■ ⊕		★	● ■ ⊕	
9	x.3			▲ ⊕			■ ⊕		■ ⊕				
10	x.4		● ■	★		●			■ ⊕	● ⊕			
11	x.5	■		⊕									
12	x.6			● ■ ⊕	■	●		●		●			
13	x.7									● ⊕			
14	x.8					■			■ ⊕		■		
15	x.9							■		★ ⊕	■		
16	x.10												
17	x.11					★ ● ■							
18	x.12												
21		<b>In compliance</b>	Has met the intention of the entire element based on review of current LCME requirements										
22		<b>Needs reviewed</b>	Needs reviewed by CQI Oversight Committee to ensure compliance, based on current LCME requirements										
23		<b>At risk</b>	May not meet the intent of the element based on review of current LCME requirements										
24		★	Denotes element identified as previously Unsatisfactory (based on 2018 site visit)										
25		▲	Denotes element identified as previously Needs Continued Monitoring (based on 2018 site visit)										
26		●	Denotes element identified as dissatisfied >10% in ISA										
27		■	Denotes element with open items/comments by CQI Committee										
28		⊕	Denotes element identified as frequently cited by LCME										

Idea is to always ensure accreditation standards are being met (CQI)!!

Not – Oh No! Let's Get Ready for Accreditation!!

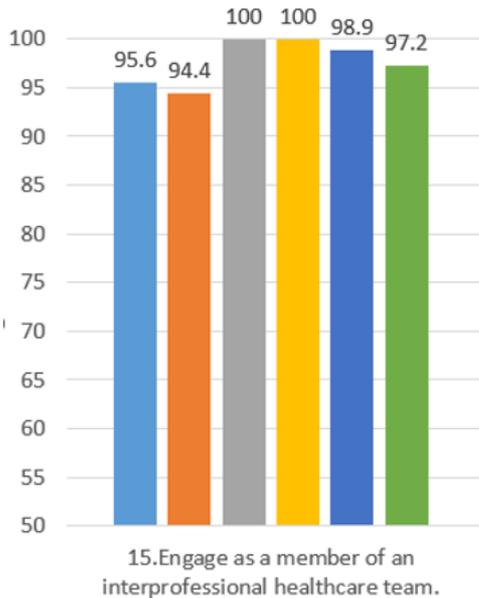
# Example: Merging a Required Survey with Program Data



# Example of Merged Required Survey and Program Data

Ability-based outcome: 3.4 Interprofessional Education

% Agreement with statement from 2018-2022+Public from AACP Survey



Didactic Multiple Choice Question Performance Data

Students performed well with an average of 88% in SAS1 and 95% in SAS2.

For SAS1, the score is evaluated based on 16 MCQs for a population of 92 students.

For SAS2, the score is evaluated based on 6 MCQs for a population of 89 students.

2021-2022 Aggregate Student Performance on Required Patient Care Core APPEs to 3.4 Interprofessional Education

Maintain a professional demeanor and appearance in all interactions with patients, patient families, preceptors, colleagues, and other health care providers.



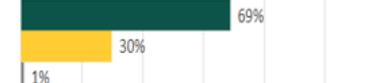
Provide education to patients and health care professionals such as; pharmacists, pharmacy student and residents, physicians and nurses.



Collaborate with the healthcare team and patients or care givers as appropriate to develop the care plan.



Provide and utilize appropriate literature to develop and support the care plan and answer medication-related questions.



Percent of Aggregate Student Performance on Trust Scale

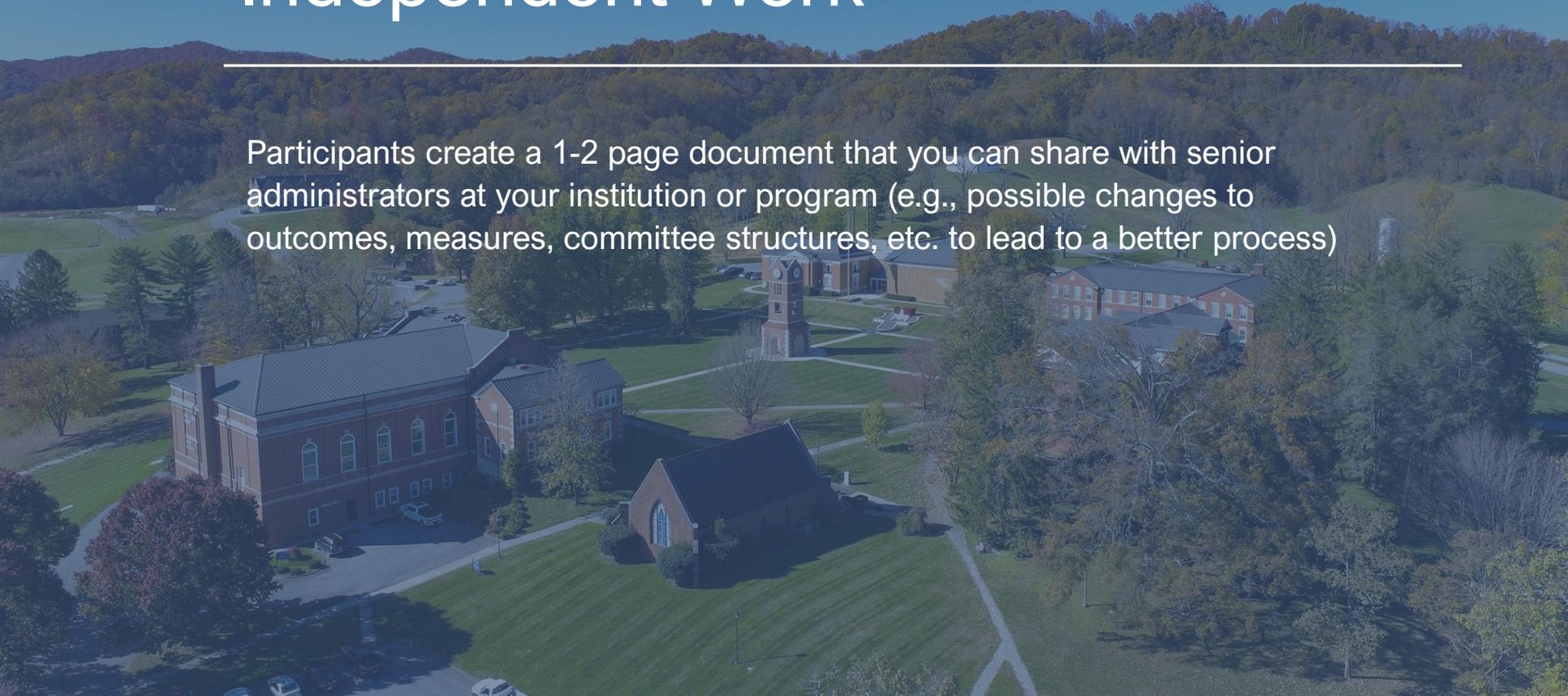
# Tools for Data Collection, Analysis, and Reporting



# Independent Work

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Participants create a 1-2 page document that you can share with senior administrators at your institution or program (e.g., possible changes to outcomes, measures, committee structures, etc. to lead to a better process)



# Q&A and Concluding Remarks

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