

**TOWARDS A MORE  
STATISTICALLY  
LITERATE FUTURE**

# Assessment Methods for Measuring Statistical and Data Literacy

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# Assessment Methods for Measuring Statistical and Data Literacy (Workshop F)



- Assessment methods and tools to measure statistical literacy among students
- Strategies for designing valid and reliable assessments
- Examples of assessment practices

# Different assessment methods for different groups



- Students
- Professionals
  - Business
  - Healthcare
  - Social sciences
  - Policy makers
- General Public
- Specific populations
  - e.g. people with disabilities requiring alternative formats



# Building statistical literacy

# Building statistical literacy: "questioning" attitude towards statistics



- Helps students develop critical thinking skills and become more discerning consumers of statistical information
- Helps assessing students' statistical thinking

# Building statistical literacy: "questioning" attitude towards statistics



- Involves teaching students to
  - Question assumptions
    - Evaluate the credibility of sources, data collection methods, and statistical claims
  - Examine data
    - Inspect data for patterns, outliers, and potential biases
  - Consider alternative explanations
    - Explore multiple perspectives and interpretations of data
  - Request evidence
    - Ask for supporting evidence and challenge unsubstantiated claims

# Benefits of a "Questioning" attitude



- Improves statistical reasoning:
  - Students learn to think critically and make informed decisions based on data
- Enhances problem-solving:
  - They develop the ability to identify and address statistical issues and challenges
- Promotes lifelong learning:
  - Students become more adept at evaluating statistical information encountered in daily life and making informed decisions

# Assessment considerations when building a 'questioning' attitude



- Open-ended questions
  - Provide opportunities for students to demonstrate their questioning skills and justify their reasoning
- Real-world examples
  - Use authentic data and scenarios to engage students and foster critical thinking
- Group discussions
  - Encourage students to share their perspectives and challenge each other's ideas, fostering a questioning environment



# Examples of how questioning claims based on data can encourage critical evaluation of statistical information



- Teaching students to identify and avoid biased data sources.
  - discussing the different types of bias that can occur in statistical data, such as sampling bias, selection bias, and response bias.
  - once students are aware of these potential biases, they can be more critical of the data.

# Examples of how questioning claims based on data can encourage critical evaluation of statistical information



- Teaching students to evaluate the methods that were used to collect and analyze the data
  - understanding the different statistical methods that can be used to analyze data, as well as the strengths and weaknesses of each method
  - once students are able to evaluate the methods that were used to collect and analyze the data, they can be more confident in the validity of the results

# Examples of how questioning claims based on data can encourage critical evaluation of statistical information



- Teaching students to interpret statistical results.
  - understanding the meaning of statistical terms, such as "significant difference" and "correlation"
  - once students are able to interpret statistical results, they can be more critical of the conclusions that are drawn from them



# Assessment methods

# Components of a holistic assessment framework



- Completing open-ended tasks that allow students to investigate meaningful problems
- Conducting formal and informal observations of oral and written work
- Collecting evidence regarding the quality of the statistical thinking
- Demonstrating understanding of the use of tools, and the connections between situations

# Alternative assessment approaches needed for different types of question that



- ask students to explain their reasoning or thinking processes
- require students to apply statistical concepts to real-world contexts
- assess students' ability to interpret and communicate statistical information

# Alternative assessment approaches needed for different types of question that



- require students to create or modify statistical representations
- assess students' ability to collect and analyze data
- require students to evaluate the validity and reliability of statistical claims

# Assessment methods for measuring statistical literacy



- 1. Standardized Tests
  - Multiple-choice or short answer questions gauge foundational knowledge of statistical concepts (e.g., mean, median, standard deviation) and basic data interpretation skills (e.g. reading graphs, identifying trends)
- 2. Performance-Based Tasks
  - Go beyond rote memorization by requiring students to apply statistical knowledge and data analysis skills to solve real-world problems



# Assessment methods for measuring statistical literacy



- 3. Open-Ended Questions
  - Assess students' ability to explain statistical concepts, justify their reasoning when analyzing data, and draw well-supported conclusions
- 4. Project-Based Learning
  - Students delve deeper into a topic by collecting data, performing analysis, and presenting their findings
- 5. Portfolios
  - Showcase a collection of a student's work over time, including data analysis tasks, reports, and reflections

# Assessment methods for measuring statistical literacy



- 6. Self-Assessment Surveys
  - Allow students to reflect on their strengths and weaknesses in data literacy
- 7. Tool Adoption and Usage
  - In professional settings, track how frequently individuals utilize data analysis software

# Assessing students' statistical literacy in social settings



- Complete tasks that involve
  - the interpretation of graphical representations of data
  - the application of statistical concepts in real-world contexts
  - ability to communicate their statistical thinking in written and oral form
  - presentations, reports, or discussions
- To evaluate students' understanding of the concepts of
  - Scales of measurement
  - Sampling techniques
  - Data representation
  - Measures of central tendency
  - Measures of variability

# Strategies for designing valid and reliable assessments



- Align with Learning Objectives
  - Clearly define what students should know and be able to do by the end of the unit or course.
  - Design assessments that directly target those objectives
- Use a Variety of Assessment Methods
  - Don't rely solely on multiple-choice questions
  - Include open-ended questions, performance-based tasks, and projects to capture diverse skills and understanding

# Strategies for designing valid and reliable assessments



- Ensure Clear Instructions and Rubrics
  - Provide students with explicit instructions on what the assessment entails and what is expected of them
  - Develop rubrics that clearly outline scoring criteria for different levels of performance
- Pilot Test and Refine
  - Try out your assessment with a small group of students beforehand
  - Analyze their responses and identify any ambiguities or areas for improvement in the questions or tasks

# Strategies for designing valid and reliable assessments



- Consider Fairness and Accessibility
  - Ensure the assessment is fair to all students by avoiding cultural biases or language that could disadvantage certain groups
  - Offer modifications and accommodations for students with disabilities



# Conclusions

# The main challenges of statistical literacy assessment



- The need for different, alternative approaches to assessment, as singular methods of assessment,
  - such as multiple choice or short answer questions, are often divorced from context and focus on
    - accuracy of statistical computations,
    - correct application of formulas, or
    - correctness of graphs and charts
  - thus assessing only one or two of the subgoals



# The main challenges of statistical literacy assessment



- The challenge is to identify assessment methods that are able to elicit and reveal student learning corresponding to different subgoals
  - these methods need to gauge the degree of integration between students' skills, knowledge and attitudes
  - and their ability to manage meaningful, realistic questions, problems, or situations, both as generators as well as interpreters of data, findings, or statistical messages

# The primary opportunities of statistical literacy assessment

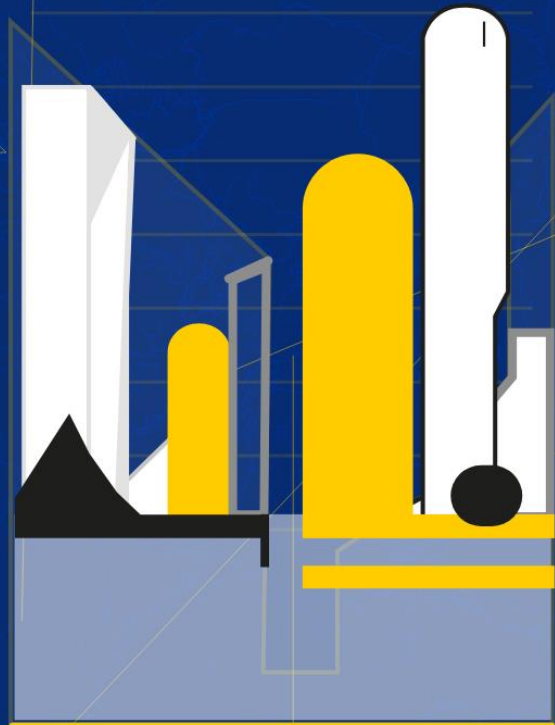


- Identifying students' strengths and weaknesses in understanding statistical concepts and their application in real-world contexts
- Enhancing critical thinking by encouraging students to question and interpret statistical information.
- Evaluating students' progress in developing statistical thinking skills

# The primary opportunities of statistical literacy assessment



- Providing targeted instruction to enhance students' statistical literacy
- Promoting student engagement by connecting statistical concepts to real-world scenarios
- Fostering communication skills through the written and oral presentation of statistical findings



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# Group discussion – questions