

The Statistical Literacy Assessment Scale (SLAS)

Paper Presentation: Reston, Enriqueta D. (2005). Assessing statistical literacy in graduate level statistics education. Paper presentation at the 55th Session of the International Statistical Institute, Sydney, Australia. A copy of the paper is available at <http://www.stat.auckland.ac.nz/~iase/publications.php?show=13> and scrolling down the page to the Contributed papers portion.

Population: Graduate students enrolled in a one-semester fundamental statistics course for teachers. The scale was developed with graduate students as the target population, but recently the scale was also administered to college statistics teachers.

Background: The author teaches graduate statistics courses for teachers at the College of Education, University of San Carlos, Cebu City, Philippines. The SLAS was developed as a classroom tool for assessing statistical literacy of graduate students who have diverse undergraduate backgrounds, but who have taken at least a 3-unit introductory statistics course in their undergraduate coursework.

Description: The SLAS is comprised of 15 items that are designed to provide a measure of adult statistical literacy along two dimensions: (1) understanding of basic statistical concepts and terminology used in the context of real-world situations and (2) understanding of claims and arguments based on data from various media outlets. For the first dimension, students are required to answer questions within a given real life problem that used statistical terms. For the second dimension, students are asked to interpret data from tables and graphs from various situations presented by newspapers, research reports, and popular advertisements. Although most of the items are based on specific examples occurring in Philippine contexts, the various skills encompassing statistical literacy which served as basis for the development of SLAS were drawn from the general literature on statistical literacy (Schield, 2000; Watson, 1997; Gal and Garfield, 1997; Rumsey, 2002).

Specifically, each of the items presents a brief table, graph, or statistical conclusion, and then students are asked a close-ended question about the information presented (e.g., “Do you agree with the author’s claim?”). Items are answered using a “yes-no-cannot tell” format. If students cannot confidently state “yes” or “no”, they are asked to select “cannot tell” if they believe that more information about the assessment is necessary to understand the data being presented. In addition, students are required to justify/explain their answers using an open-ended response format.

Scoring: One point is given for each correct yes/no/cannot tell response. For the justification of the responses, a three-point rubric scale was devised for assessing the student’s level of statistical reasoning. A score of 2 was given if reasoning was correct and justified based on appropriate statistical concepts, principles, or procedures. A score of 1 was given if reasoning was partly correct but contained logical/conceptual flaws or errors. A score of 0 was given if no attempt to reason was made.

Psychometric Properties: The correlation between SLAS scores and final course grade in statistics was relatively high at 0.74. Internal consistency using Cronbach’s coefficient alpha was 0.65 while inter-rater reliability on the three-point scoring rubric was 0.86. Limited factor-analytic evidence of construct validity has been collected to date for a sample of 82 graduate students, warranting the need for increased sample size and continued work on the scale.

A copy of the scale is shown on below on next pages or at <http://course1.winona.edu/cblumberg/reston.pdf>.

STATISTICAL LITERACY ASSESSMENT SCALE

Directions: Statistical literacy may be described as the ability to understand and follow arguments based on data. Read each of the following situations and answer the question that follows. Encircle the option corresponding to your response on the answer sheet provided. Then write a brief justification, explanation, or comment supporting your answer.

1. The table below represents the employment status by gender of the Philippines Labor Force (2004).

	Male	Female	Total
Employed (in thousands)	19,829	11,904	31,733
Unemployed (in thousands)	2,311	1,574	3,885
Total (in thousands)	22,140	13,478	35,618

Source: Labor Force Survey (October 2004), National Statistics Office

Is “the percentage of male who are employed” equal to “the percentage of male among those employed”?

2. In an article on graduate education in the Philippines (PAGE Journal, July 2004), the author wrote: “Starting out from five universities in 1946, graduate education has spread to 268 colleges and universities by 1990, an *increase* of 95 per cent in 45 years.”
Is this increase in the number of colleges and universities from 1946 to 1990 a 95% increase?
3. In an article entitled “**SWS: 44% Feel Worse off, Optimism Low**” printed in *The Philippine Star* (April 20, 2004), the Social Weather Stations (SWS) claimed that a national sample of 1,400 registered voters was *statistically representative* of the Philippine population, with 300 respondents from Metro Manila, 250 from Luzon North of Metro Manila, 250 from Luzon South of Metro Manila, 300 in the Visayas and 300 in Mindanao.
Do you agree with this claim?
4. Based on the same article in No. 3, the report continued that SWS indicators for the economy in March 2004 are still gloomy, with 44 per cent of the electorate saying that “*the quality of life worsened from a year ago.*”
Does this result mean that there are 44 out of every 100 voters from the population of Philippine electorate who feel worse off from a year ago?
5. The SWS survey also revealed that “58% of the households rate their families as *poor* compared to 64 percent a quarter ago. When the household heads were asked how much monthly budget for home expenses they would need in order not to consider themselves poor, the *median responses* were P15,000 in Metro Manila, P10,000 in the balance of Luzon, P10,000 in the Visayas, and P7,000 in Mindanao.
Based on these findings, if a family living in Metro Cebu has a gross monthly income of P12,000, would it be considered *poor*?
6. An advertisement claims that “*9 out of 10 dentists recommend Oral B tooth brush*” .
Does this mean that 9 out of *any* 10 dentists in the country recommend Oral B toothbrush?
7. Note the following advertisement claims: *Safeguard soap kills 99% of body germs, Lysol kills 99.99% of all household germs and many other antiseptics claim only between 99% to 99.99%.effectiveness.*

Is it possible to claim that a certain antibacterial/antiseptic product can kill 100% of germs?

8. A local daily (Cebu Daily News, 31 March 2004) reported the following findings based on a nationwide survey. “ *Of a sample of one million regular Internet users, about 23 percent already do online banking, compared to just 10 percent for online shopping... The average Filipino surfer was male, aged between 20 and 39, and earns between \$700 to \$1,000 a month.*”

Can these findings be generalized from the sample to the whole population of regular internet users in the Philippines?

9. The table below shows the mean number of children ever born by age of women in the Philippines in the 1998 National Demographic and Health Survey.

Age, yrs	Mean No. of Children Ever Born
15 -19	0.07
20 – 24	0.68
25 – 29	1.75
30 – 34	2.86
35 – 39	3.75
40 – 44	4.16
45 – 49	4.74
Total 15 – 49	2.16

Source: National Statistics Office and Department of Health, 2000

According to the survey report, “*the mean number of children ever born shows that on the average, women gave birth to almost two children by their late 20’s, almost four children by their late 30’s and almost five by their late 40’s.*”

Does this narrative interpretation agree with the figures shown in the table?

10. The inflation rate is a measure of the increase in the prices of basic goods and services. An article in the business section of a national daily claims that “*Inflation rate is high in the Philippines but there are some recent signs of improvement.*” The table below, showing the inflation rate (in per cent) by commodity group in the Philippines from 1999 to 2003, was presented to support the claim.

Do you agree with the author’s claim?

Commodity	1999	2000	2001	2002	2003
Food, Beverage and Tobacco	64.4	24.5	49.0	23.4	19.0
Clothing	75.5	30.8	44.9	31.2	21.9
Housing and Repairs	111.5	64.3	81.4	59.3	28.7
Services	125.0	139.6	139.6	59.3	61.1

11. In a news report entitled “**Road accidents claim fewer lives in 2003; more buses involved**” printed in *Sunstar Daily* (22 June 2003), the table below was presented.

	2002	2003
Number of Accidents	41	33
Accidents that Resulted in death	16	13
Vehicle Involved		
Bus	9	17
Motorcycle	21	9

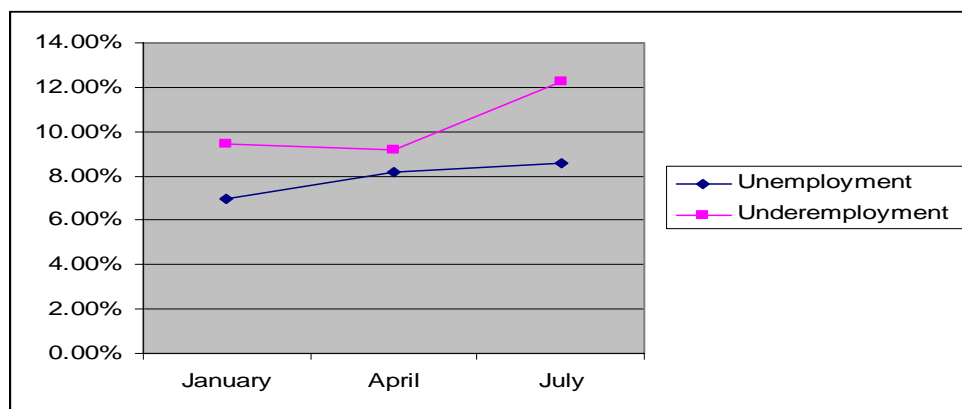
Do the data in the table provide sufficient evidence to conclude that “road accidents claim fewer lives in 2003?”

12. In an article “A land of paradoxes: obesity in the sea of poverty,” (Khaleej Times Online, 2004), the author mentioned a study released by the government Food and Nutrition Research Institute and 14 of the country’s medical specialty associations which established that obesity is fast consuming a growing number of Filipinos with 52 per cent of women and 12.1 per cent of men found obese among a sample of 4,700 respondents in year 2003.

Do these data support the generalization that obesity is more associated with the female gender?

13. The graph below shows the trend in unemployment and underemployment rates in the Philippines for the month of January, April and July 2003 based on the preliminary result of the Philippine Labor Force Survey.

Based on the trend, is it expected that both unemployment and underemployment rates will steadily increase?



14. In an experimental study on the effectiveness of a computer-assisted language program at private sectarian university, the researchers used two groups of college students enrolled in a basic English course. The experimental group was taught using the innovative language program while the control group was taught using conventional classroom procedures. Both groups were given pretests and posttests. As part of the findings, the researchers reported in the local university journal the following: “*Considering the difference between the Pre-test and Post-test means of the control group which is 18.5 compared to that of the experimental group which is 11.94, it may be deduced arithmetically that more learning happened in the control group.*”

Do you agree with the researchers’ report?

15. In the United States, Northwest Airlines advertised that it was “*the number one on-time airline.*” The basis for this claim were the figures on the table below which presents the percentage of flights that arrived on time in the five major airports served by both Alaska Airlines and Northwest Airlines for the month of June 1991 (Technology Review, Oct. 1994; cited in Smith, 1998).

Do you agree with Northwest Airlines’ claim?

Cities	Alaska Airlines			Northwest Airlines		
	No. of	No. of on-	Percentage	No. of	No. of on-	Percentage
	Arrivals	arrivals	on time	Arrivals	arrivals	on time
Los Angeles	559	497	88.9	811	694	85.6
Phoenix	233	221	94.8	5255	4840	92.1
San Diego	232	212	91.4	448	383	85.5
San Francisco	605	503	83.1	449	320	71.3
Seattle	2146	1841	85.8	262	201	76.7
AVERAGE			86.7			89.1

A copy of the answer sheet is provided next page.

ANSWER SHEET: STATISTICAL LITERACY ASSESSMENT SCALE

Item No.	OPTIONS			JUSTIFICATION / EXPLANATION / COMMENT
1	Yes	No	Cannot tell *	
2	Yes	No	Cannot tell	
3	Yes	No	Cannot tell	
4	Yes	No	Cannot tell	
5	Yes	No	Cannot tell	
6	Yes	No	Cannot tell	
7	Yes	No	Cannot tell	
8	Yes	No	Cannot tell	
9	Yes	No	Cannot tell	
10	Yes	No	Cannot tell	
11	Yes	No	Cannot tell	
12	Yes	No	Cannot tell	
13	Yes	No	Cannot tell	

14	Yes	No	Cannot tell	
15	Yes	No	Cannot tell	

* Cannot tell from the given information.