Outcomes Assessment in Numeracy Courses
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eLearning Forum Asia

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Background:

- Implementation of the new 4-year curriculum
- Establishment of General Education (GE) program

GE program

- Promote Whole Person Education
- Transferable skills, guiding principles, and attitudes needed in professional and personal lives

General Education
通識教育

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Intended learning outcomes of GE program (PILOs)

1. Communicate effectively as speakers and writers in both English and Chinese;
2. Access and manage complex information and problems using technologically appropriate means;
3. Apply appropriate mathematical reasoning to address problems in everyday life (assessed by the selected Numeracy courses);
4. Acquire an active and healthy lifestyle;
5. Use historical and cultural perspectives to gain insight into contemporary issues;
6. Apply various value systems to decision-making in personal, professional, and social/political situations (assessed by the selected Value and Meaning of Life – VML courses);
7. Make connections among a variety of disciplines to gain insight into contemporary personal, professional, and community situations.

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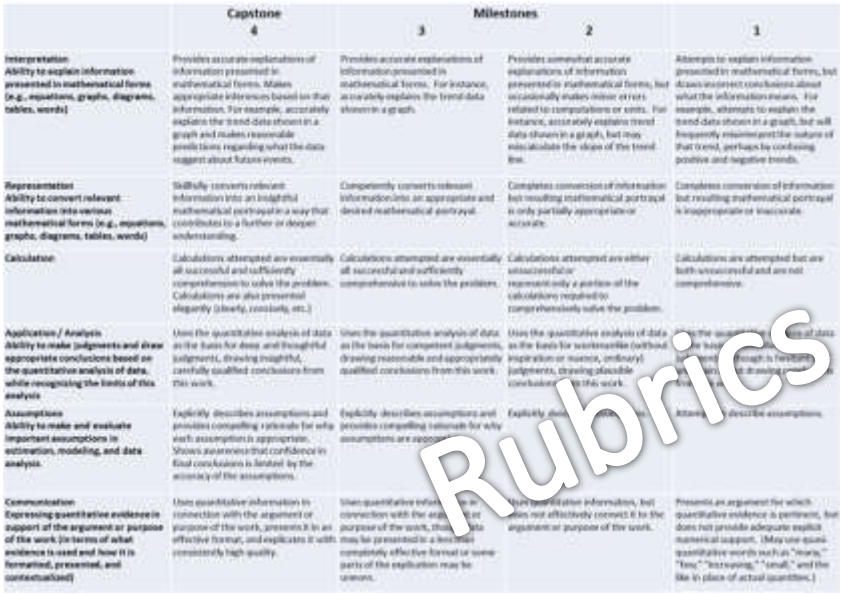
Assessment process

- Centre for Holistic Teaching and Learning
- 4 Numeracy GE courses
- Blackboard Outcomes
  - Selection of mature student work
  - Actual assessment
- Group of assessors
  - Dr. Eva WONG (CHTL)
  - Dr. Leevan LING (MATH)
  - Dr. YAO Yuan (MATH)
  - Dr. Simon TO (MATH)
- Generic rubrics
  - NOT course-specific



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My courses under assessment (2012-2013 Semester 1):

- GCNU1005 Beating the Odds (Probability)
- GCNU1027 Speaking of Statistics (Statistics)

Some features:

- Explanations and calculations BOTH emphasized
- Rubrics not widely used in grading process
- Assignments done in classes
- HKBU Blackboard used as course webpage

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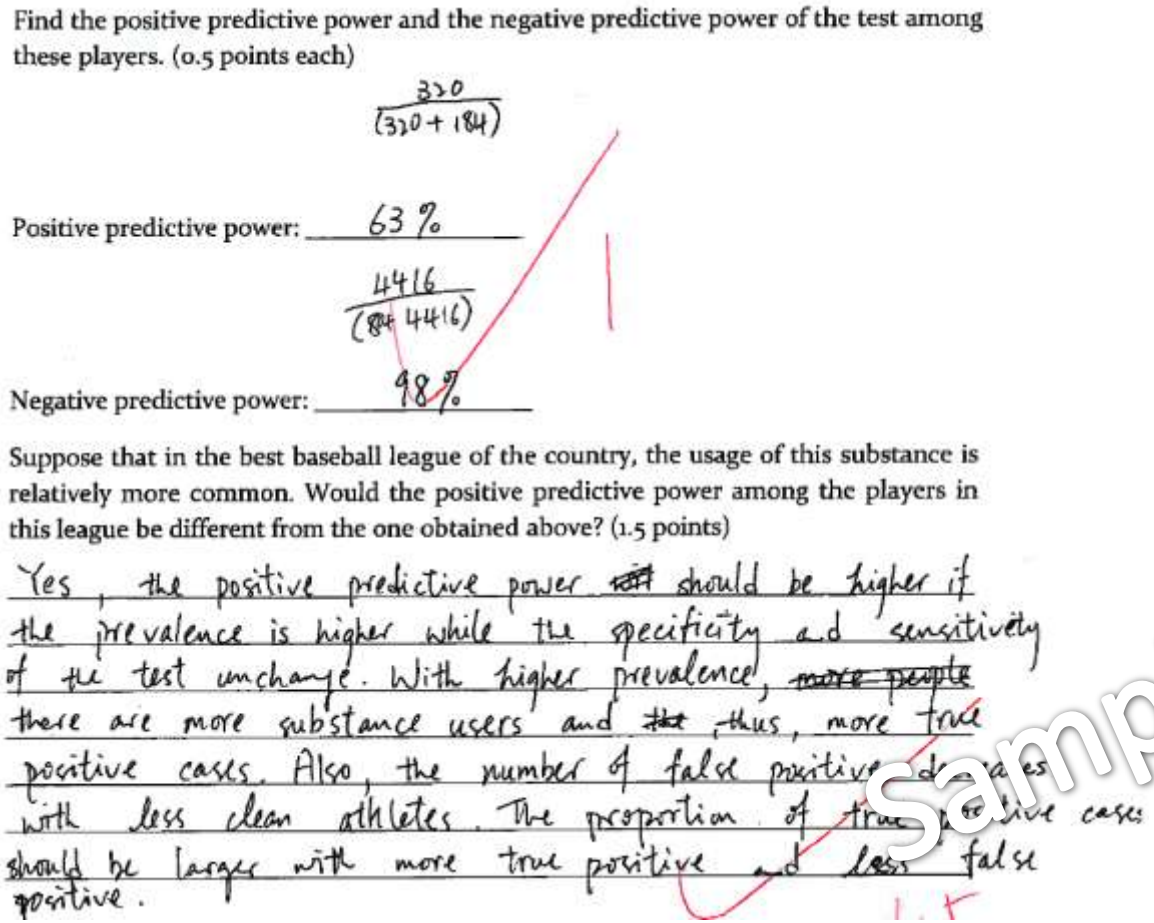
Some features:

- Explanations and calculations BOTH emphasized



Find the positive predictive power and the negative predictive power of the test among these players. (0.5 points each)

$\frac{320}{(320+184)}$

Positive predictive power: 63 %

$\frac{4416}{(84+4416)}$

Negative predictive power: 98 %

Suppose that in the best baseball league of the country, the usage of this substance is relatively more common. Would the positive predictive power among the players in this league be different from the one obtained above? (1.5 points)

Yes, the positive predictive power ~~isn't~~ should be higher if the prevalence is higher while the specificity and sensitivity of the test unchange. With higher prevalence, ~~more people~~ there are more substance users and ~~the~~ thus, more true positive cases. Also, the number of false positive cases with less clean athletes. The proportion of true positive cases should be larger with more true positive and less false positive.

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Some features:

- Rubrics not widely used in grading process
  - BUT rubrics can be used in outcome assessment!

Find the positive predictive power and the negative predictive power of the test among these players. (0.5 points each)

320/504 = 63.49%

Positive predictive power: 63.49%

4416/4496 = 98.22%

Negative predictive power: 98.22%

Suppose that in the best baseball league of the country, the usage of this substance is relatively more common. Would the positive predictive power among the players in this league be different from the one obtained above? (1.5 points)

The positive predictive power would be higher than the one obtained above. Since the prevalence is higher, for every 5,000 players, on average the number of true positives will increase and the number of false positives will decrease (due to the decreased number of clean athletes). Thus the proportion of true positives among all positives will increase.

	Capstone	Milestones		
	4	3	2	1
Interpretation **Ability to explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words)**	Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information. For example, accurately explains the trend data shown in a graph and makes reasonable predictions regarding what the data suggest about future events.	Provides accurate explanations of information presented in mathematical forms. For instance, accurately explains the trend data shown in a graph.	Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related to computations or units. For instance, accurately explains trend data shown in a graph, but may miscalculate the slope of the trend line.	Attempts to explain information presented in mathematical forms, but draws incorrect conclusions about what the information means. For example, attempts to explain the trend data shown in a graph, but will frequently misinterpret the nature of that trend, perhaps by confusing positive and negative trends.
Representation **Ability to convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, tables, words)**	Skillfully converts relevant information into an insightful mathematical portrayal in a way that contributes to a further or deeper understanding.	Competently converts relevant information into an appropriate and desired mathematical portrayal.	Completes conversion of information but resulting mathematical portrayal is only partially appropriate or accurate.	Completes conversion of information but resulting mathematical portrayal is inappropriate or inaccurate.
Calculation	Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem. Calculations are also presented elegantly (clearly, concisely, etc.)	Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem.	Calculations attempted are either unsuccessful or represent only a portion of the calculations required to comprehensively solve the problem.	Calculations are attempted but are both unsuccessful and are not comprehensive.
Application / Analysis **Ability to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis**	Uses the quantitative analysis of data as the basis for deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from this work.	Uses the quantitative analysis of data as the basis for competent judgments, drawing reasonable and appropriately qualified conclusions from this work.	Uses the quantitative analysis of data as the basis for workmanlike (without inspiration or nuance, ordinary) judgments, drawing plausible conclusions from this work.	Uses the quantitative analysis of data as the basis for tentative, basic judgments, although is hesitant or uncertain about drawing conclusions from this work.
Assumptions **Ability to make and evaluate important assumptions in estimation, modeling, and data analysis**	Explicitly describes assumptions and provides compelling rationale for why each assumption is appropriate. Shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions.	Explicitly describes assumptions and provides compelling rationale for why assumptions are appropriate.	Explicitly describes assumptions.	Attempts to describe assumptions.
Communication **Expressing quantitative evidence in support of the argument or purpose of the work (in terms of what evidence is used and how it is formatted, presented, and contextualized)**	Uses quantitative information in connection with the argument or purpose of the work, presents it in an effective format, and explicates it with consistently high quality.	Uses quantitative information in connection with the argument or purpose of the work, though data may be presented in a less than completely effective format or some parts of the explication may be uneven.	Uses quantitative information, but does not effectively connect it to the argument or purpose of the work.	Presents an argument for which quantitative evidence is pertinent, but does not provide adequate explicit numerical support. (May use quasi-quantitative words such as "many," "few," "increasing," "small," and the like in place of actual quantities.)

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Some features:

- Assignments done in classes
  - Hard copies of students' work only
  - Students' work manually scanned (not optimal)
- HKBU Blackboard used as course webpage

Possible improvements (course practice):

- Utilize centralized e-platforms for at least some assignments at later stages (facilitate selection of mature student work)

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Use of generic rubrics:

- Identify related categories (with other assessors)

Suppose that 8% of the baseball players in a country are users of a performance enhancing substance. A test for the use of the substance with 80% sensitivity and 96% specificity is available. Complete the following table of the average result for every 5,000 players tested: (0.5 points for each correct row; no steps required)

	Substance users	Clean athletes	Total
Positive	320	184	504
Negative	80	4416	4496
Total	400	4600	5000

Category
Interpretation
Representation
Calculation
Application/Analysis
Assumption
Communication

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Observation #1:
Involvements of categories are NOT explicit

- Assignments set according to CILOs

Suppose that 8% of the baseball players in a country are users of a performance enhancing substance. A test for the use of the substance with 80% sensitivity and 96% specificity is available. Complete the following table of the average result for every 5,000 players tested: (0.5 points for each correct row; no steps required)

	Substance users	Clean athletes	Total
Positive	320	184	504
Negative	80	4416	4496
Total	400	4600	5000

Category
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Observation #2:

Some categories are generally more heavily involved

- Same rubrics for multiple courses
- Blind spots (of myself) identified

Suppose that 8% of the baseball players in a country are users of a performance enhancing substance. A test for the use of the substance with 80% sensitivity and 96% specificity is available. Complete the following table of the average result for every 5,000 players tested: (0.5 points for each correct row; no steps required)

	Substance users	Clean athletes	Total
Positive	320	184	504
Negative	80	4416	4496
Total	400	4600	5000

Category
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- Possible refinements suggested

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How outcomes assessment helps TAL #1:

Outcomes assessment ***process***:

- Blind spots (coursework design) identified
- Possible refinements (coursework design) suggested

Category
Interpretation
Representation
Calculation
Application/Analysis
Assumption
Communication

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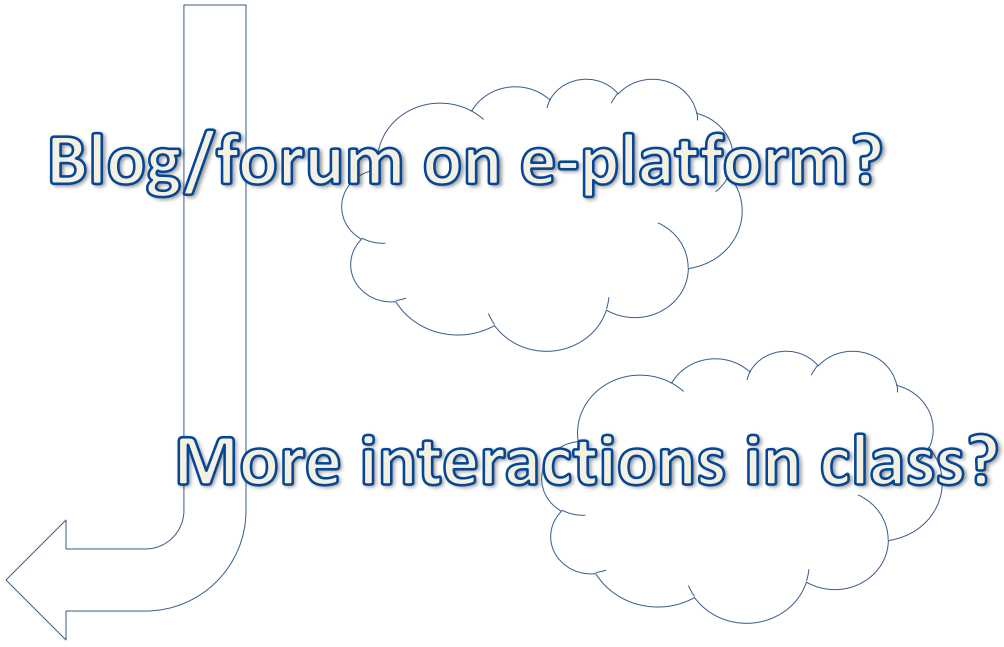
How outcomes assessment helps TAL #2:

Outcomes assessment ***results***:

- Weaknesses (students' performance) identified
- Refinements (teaching focus/method) needed

Category
Interpretation
Representation
Calculation
Application/Analysis
Assumption
Communication



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Impacts of Outcomes Assessment on a front-line teacher

Embrace e-platforms (course practice)

Identify blind-spots (coursework design)

Identify students' weaknesses (teaching focus)

Exchange of ideas (teaching practice)

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Acknowledgement:

Simon Kai-Ming TO 30 May 2013