Cognitive transfer assessment in post-secondary statistics

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Front Matter

- *Cognitive transfer* has been used in the learning literature to describe the degree to which knowledge can be successfully applied to new or novel situations (e.g., Singley & Anderson, 1989)
- **I**ntroductory **ST**atistics **U**nderstanding and **DI**scernment **O**utcomes (ISTUDIO) Assessment

What was ISTUDIO designed to measure?

- Discernment of statistical questions
  - this evaluation is the first step to productive analysis
  - Problem phase in "PPDAC" cycle (Wild & Pfannkuch, 1999; Arnold, 2012)
  - Difference between deterministic and stochastic inquiry (Franklin & Garfield, 2006)
- Statistical thinking
  - Statistical thinking manifests as "shuttling" between problem context and architypical models (Wild & Pfannkuch 1999)
  - ISTUDIO attempts to isolate each direction in the shuttling process
    - context to architype
    - architype to context

Study Details

- sample
- analysis
- ISTUDIO description & credibility

What do you learn when you ask questions like this?

- Test their reflexes (Chance, 2002)

Results/Issues to discuss (Fill this out more)

1. population as a process:
   - summarize 2 examples
   - finding: some students constructed some kind of artificial discrete/countable population
2. lexical ambiguity/misconceptions of parameter
   - summarize 2 examples
   - finding: large variability ascribed to parameter
   - finding: "study design detail/constraint" (cite ZDM & Kaplan papers)
3. is this a statistical question?
   - summarize 2 examples
   - finding: students self-contradict... say "no" and then use inference anyway

Conclusions

References

1. Ben-Zvi, D., & Garfield, J. (2005). Statistical literacy, reasoning, and thinking: Goals, definitions, and challenges. *The challenge of developing statistical literacy, reasoning and thinking* (pp. 3-15) Springer.
2. Chance, B. (2002). Components of statistical thinking and implications for instruction and assessment. *Journal of Statistics Education, 10*(3).
3. Franklin, C. A., & Garfield, J. B. (2006). The GAISE Project. Developing statistics education guidelines for grades pre-K-12 and college courses. In G. F Burrill & P. C. Elliot (Eds.), *Thinking and reasoning with data and chance* (pp. 345-375). Reston, VA: National Council of Teachers of Mathematics.
4. Singley, M. K., & Anderson, J. (1989). *The transfer of cognitive skill.* Cambridge, MA: Harvard.
5. Wild, C.J. & Pfannkuch, M. (1999). Statistical Thinking in Empirical Enquiry. *International Statistical Review, 67*(3), 223-265.