Comparing Online and Lab Methods in a Problem Solving Experiment

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Online Experiments

Pros

- **Experimental Settings**
  - Lab environments are artificial
  - More naturalistic environments (home, work, Internet cafes, etc.)
  - Less pressure to perform
  - Results generalize to more settings and situations
- **Population and Sample**
  - Not limited to local community
  - Wider access
  - Better generalization
  - Highly voluntary participation
- **Automation**
  - Saves time
  - Reduces cost
  - Controlled documentation and instructions
  - Fewer demand characteristics and experimenter effects
- **Reduced Constraints**
  - Easy access
    - Time (24-hour access)
    - Location (anywhere with a computer)
  - Organization
    - Less management
    - Scheduling
    - Simultaneous participation
- **Openness of Research Process**
  - Increased replicability
  - Public control of ethical standards

Cons

- **Reduced Control**
  - Varied environments
  - Noise, distractions, interruptions
  - More variance (different computers, displays, etc.)
- **Dropout**
  - Quitting before the end
  - Solution
    - High entrance barrier technique (Reips, 2002) → Force dropout early
    - Treat dropout as a variable
- **Multiple Submissions**
  - Cheating is rare (Reips, 2002)
  - Solutions
    - No incentives (e.g., $$$)
    - Ask for personal information
    - Password protection
    - Verify IP addresses
- **Other Limitations**
  - No experimenter present to answer questions directly
  - Many studies cannot be done on the Web (fMRI, eye tracking, etc.)
  - New ethical concerns

Source: (Reips, 2000; Reips, 2002)

Gizmo Problem Solving Experiment

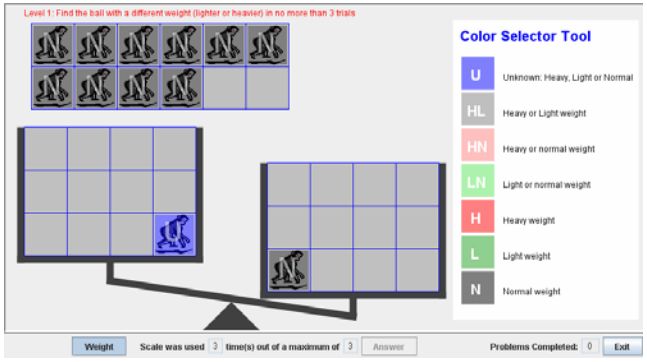
Task: Find, with three uses of a scale, the one gizmo that is either heavier or lighter than the rest of a set of 12 gizmos.

Goal: Replicate results obtained in a lab experiment (Dandurand, Bowen & Shultz, 2002)

Variables:

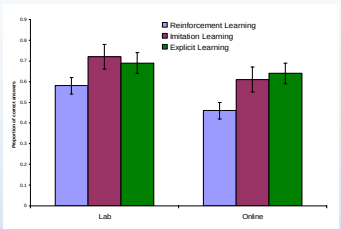
- Manipulated
  - **Learning group**
    - Reinforcement – Got feedback
    - Imitation – Watched 5 successful demos
    - Explicit – Read instructions
  - **Location and Population**
    - **Lab:** Undergrads and Grads and Engineers
    - **Online:** Undergrads and Unselected web users
- Measured
  - **Accuracy:** Solve or Fail
  - **Response Time:** Time to complete a trial (3 weighings)

Implementation: Java - Ideal for distributing code online (using browser plug-in)



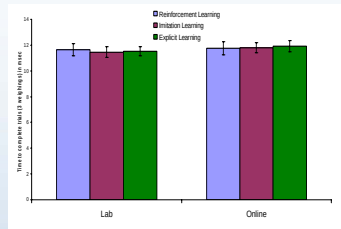
Hypothesis: Online experiments are reliable (Krantz & Dalal, 2000; Reips, 2002) → No main effect or interaction with **location**.

Accuracy



- **Online replicates lab**: Learning situation matters: **Imitation** and **Explicit** groups outperformed the **Reinforcement** group.
- **Online method is reliable**
  - No main effects or interactions with *location*
  - Both lab and online show the same pattern of results

Response Time



- **Replicates lab results**: No significant differences among **Learning Groups**
- **Online method is reliable**
  - No main effects or interactions with *location*
- Difference in populations
  - Subject pool participants were faster.

Discussion and Summary

Pros

1. Reliable and valid, as reported in other researches (e.g., Krantz & Dalal, 2000)
2. Automation
3. Combines with university subject pool
4. Ideal for short experiments and questionnaires

Cons

1. Low participation and high drop out
   - Cognitively demanding tasks: less attractive?
   - Web affords short and superficial interactions
   - Short attention span, distractions, lower commitment
2. If using unselected web users only, time required to collect data may be long and variable

References

- Dandurand, F., Bowen, M. and Shultz, T. R. (2004). *Learning by imitation, reinforcement and verbal rules in problem-solving tasks.* Proceedings of the Third International Conference on Development and Learning (ICDL'04) Developing Social Brains. La Jolla, California. October 20-22 2004.
- Krantz, J. H., & Dalal, R. (2000). Validity of Web-based psychological research. In M. H. Birnbaum (Ed.). Psychological Experiments on the Internet pp. 35-60. San Diego: Academic Press.
- Reips, U.-D. (2000). The web experiment method: Advantages, disadvantages, and solutions. In M. H. Birnbaum (Ed.), Psychological Experiments on the Internet. pp. 89-118. San Diego, CA: Academic Press.
- Reips, U.-D. (2002). Internet-based psychological experimenting: Five dos and five don'ts. *Social Science Computer Review, 20* (3), 241-249.
- Reips, U.-D. (2002). Standards for Internet-based experimenting. *Experimental Psychology, 49* (4), 243-256.
- Reips, U.-D. (2002). Theory and techniques of web experimenting. In B. Batinic, U.-D. Reips, & M. Bosnjak (Eds.). *Online Social Sciences*. Seattle: Hogrefe & Huber.

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