Behavior Analysis in Higher Education

Alexis Apel, Kaitlin Thibodeau, & Dr. James Diller

Problems with the Higher Education System

- Student work is not adequately reinforced (Keller, 1968) or it is maintained by long-term contingencies (Boyce & Hineline, 2002)
- Students are taught as if they all work at the same pace (Boyce & Hineline, 2002)
- Students do not receive individualized attention (Keller, 1968)
- Only a small portion of students are active participants in each classroom (Boyce & Hineline, 2002)

Classroom Strategies Based on Behavior Analysis

- Programmed Instruction
- Personalized System of Instruction
- InterTeaching
- Precision Teaching
- Computer-Based Instruction

Common Characteristics of Behavior-Analytic Educational Methods

- Management of educational consequences
- Division of course material into small units
- Multiple opportunities for response
- Observable behavior as a measurement of learning
- Individualized instruction
- Emphasis on social validity (Bernstein & Chase, 2013)
Programmed Instruction (PI): Procedure

- Clear learning objectives
- Small units of material
- Logical progression of material
- Active and frequent response
- Immediate feedback
- Priming, prompting, and fading (Fernald & Jordan, 1991)

Programmed Instruction: Examples

- Programmed Texts

  Lloyd and Knutzen (1969)'s programmed psychology course
  - All students responded at a high and steady rate
  Fernald and Jordan (1991) tested students who had received PI and read a conventional textbook on three course units in psychology
  - Students who received PI and students who learned from a conventional textbook performed similarly
  - PI was less time intensive

Programmed Instruction: Benefits

- Kulik, Cohen, and Ebeling's (1980) meta-analysis found that when significant differences in PI and lecture classes are found, the difference favors PI
- There is no difference in withdrawal rates between PI and conventional instruction (Kulik et al., 1980)
- PI is less time intensive (Kulik et al., 1980)
- Feedback in programmed instruction can lead to better student learning outcomes (Jaehnig & Miller, 2007)
Programmed Instruction: Limitations

- Fewer than half of the studies comparing PI and lecture have found significant differences in student learning outcomes (Kulik et al., 1980)
- Outcomes typically differ by 2 points (Kulik et al., 1980)
- Student ratings of programmed instruction are mixed (Kulik et al. 1980)

Personalized System of Instruction (PSI): Procedure

- Mastery of course material is required before a student can continue
- Use of proctors to grade student work
- Self-pacing
- Use of printed study guides to direct learning
- Use of lecture as reinforcement contingent upon student work (Keller, 1968)

Personalized System of Instruction: The Keller Plan

- Course material was divided into units
- Classroom served as a study hall
- Students could request testing
- Tests were graded immediately by proctors
  - Students who demonstrated mastery were allowed to continue
  - Students who did not pass had to retake the test at another time without penalty
- Lectures were used as reinforcement for completion of student work (Keller, 1968)

Personalized System of Instruction: Benefits

- Students using PSI have significantly higher exam scores and final grades, by about 8 points (Kulik, Kulik, & Cohen, 1979)
- Students retain more information for longer periods of time using PSI (Bernstein & Chase, 2013; Kulik et al., 1979)
- There are no significant differences in withdrawals between PSI and traditional classrooms (Kulik et al., 1979)
- Students generally rate PSI as better than traditional teaching methods (Kulik et al., 1979)
Personalized System of Instruction: Limitations

- Self-pacing component leads to procrastination (Bernstein & Chase, 2013; Eyre, 2007), but contingency management has shown to be effective in mitigating this problem (e.g., Brooke & Ruthven, 1984).
- Grade distributions are either negatively skewed or bimodal (Bernstein & Chase, 2013).
- Administrators may feel that instructors are not actually teaching when they use PSI (Eyre, 2007).
- PSI is more time intensive for the instructor (Bernstein & Chase, 2013; Eyre, 2007).

Interteaching: Procedure

- Students use a preparation guide to get ready for each unit.
- Students discuss the guide during class.
- The instructor monitors and facilitates discussion.
- Students complete a record of the session.
- Instructor uses the records to construct lectures before the next interteaching session (Boyce & Hineline, 2002).

Interteaching: Examples

- Students' test scores were higher following interteaching than following lecture.
- Students scored better on final exam questions based on interteaching than questions based on lecture.
**Interteaching: Benefits**

- Interteaching results in improved student learning outcomes (Dunn, Saville, Baker, & Marek, 2013)
- Instructors can avoid being redundant during lectures (Boyce & Hineline, 2002)
- Students are self-paced within a class period, rather than an entire course (Boyce & Hineline, 2002; Saville et al., 2005)
- Students generally give positive feedback about interteaching (e.g., Saville et al., 2006)

**Interteaching: Limitations**

- Instructors spend a small amount of time lecturing (Boyce & Hineline, 2002), but instruct more often than in other behavioral methods (Saville, Zinn, & Elliott, 2005)
- If no class credit is contingent upon effective interteaching sessions, quality of the sessions may suffer (Boyce & Hineline, 2002)
- Poor students often choose to work together (Boyce & Hineline, 2002)

**Precision Teaching (PT): Procedure**

- Monitoring of student performance
- Movement cycles e.g. writing 10 digits per minute
- Acceleration and deceleration of learning for weekly growth statements
- Acceleration lines are used to predict future learning (Brent, 1977)
- Proficiency levels: standard level of performance
Precision Teaching: Examples

- Zaritsky (1973): used PT to record the amount of homework students handed in
  - Significant increase in homework hand-ins
- Spangler and Hankins (1975): Compared students using PT and conventional instruction in an adolescent psychology class
  - Students using PT performed better on a midterm exam

Precision Teaching: Benefits

- Data driven (Brent, 1977)
- Student performance
- Teaching decisions
- Conclusions can be drawn from PT charts without formal training (Brent, 1977)
- Students prefer PT over conventional methods (Doughty et al., 2004)

Precision Teaching: Limitations

- Some studies find a positive impact of PT on student performance (Doughty, Chase, & O'Shields, 2004), but most of these studies do not control for the effects of practice or reinforcement rate
- Studies that control for these effects have generated inconclusive results (Doughty et al., 2004)
- Time intensive (Brent, 1977)

Computer-Based Instruction (CBI):

- Computer-Assisted Instruction: A computer teaches directly (Kulik & Kulik, 1987; Pear & Novak, 1996)
- Computer-Managed Instruction: A computer performs major tasks (Kulik & Kulik, 1987; Pear & Novak, 1996)
- Computer-Enriched Instruction: A computer performs supplemental tasks (Kulik & Kulik, 1987)
Computer-Based Instruction: Examples

- Computer-Aided Personalized System of Instruction (CAPSI; Pear & Novak, 1996)
  - Mastery, self-pacing and the use of proctors
  - Students studied material and took tests using the computer program
- Computerized programmed instruction in an education course (Kitch & Bostow, 1998)
  - Small units, active response and immediate feedback
  - Material was presented on the computer and students responded electronically

Computer-Based Instruction: Benefits

- Computer-based instruction has a positive impact on student learning outcomes (Kulik & Kulik, 1987)
- Computer-assisted instruction requires a high level of student participation (Pear & Novak, 1996)
- Computer-based instruction is less time intensive than non-computerized methods (Kulik & Kulik, 1987)
- Student ratings are moderate to high (Kulik & Kulik, 1987; Pear & Crone-Todd, 1999; Pear & Novak, 1996)

Computer-Based Instruction: Limitations

- Students report disliking the lack of interaction with the professor and the lack of scheduled class time (Pear & Novak, 1996)
- Some variations of CBI have high withdrawal rates (e.g., Pear & Crone-Todd, 1999)
- Effect sizes for computer-based instruction were larger in studies of shorter duration (Kulik & Kulik, 1987)

Future Directions

- Behavior-analytic educational methods are not widely implemented (Bernstein & Chase, 2013)
- Methodological issues
  - Philosophical differences
- Behavior-analytic instruction offers solutions to problems in higher education
References


Eyre, H. L. (2007). Keller's Personalized System of Instruction: Was it a fleeting fancy or is there a revival on the horizon?. Contemporary Educational Psychology, 32(3), 222-236. doi:10.1016/j.cedpsych.2006.07.014


References


Eyre, H. L. (2007). Keller's Personalized System of Instruction: Was it a fleeting fancy or is there a revival on the horizon?. Contemporary Educational Psychology, 32(3), 222-236. doi:10.1016/j.cedpsych.2006.07.014


