Technology Interventions to Support Students with High Incidence Disabilities: A Systematic Review of the Literature

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Introduction

• Technology rapidly increasing in society and schools
• Has allowed for innovations in teaching and learning
• Individuals with Disabilities Education Act (IDEA) and Every Study Succeeds Act (ESSA) provide funding for schools to invest in technology
• Two major types of technology resources
  ─ Instructional: tools and resources for effective teaching and learning
  ─ Assistive: piece of equipment, hardware, or software that has been used to create accommodations
Introduction (Cont)

• With increase of technology in schools, some literature reviews conducted on students with high incidence disabilities
  – Most have focused on use of computer assisted instruction and reading
  – Few have explored other areas such as mathematics, science, and social studies
Purpose and Research Question

• Purpose
  – To investigate status of research on how instructional and assistive technology has supported students with high incidence disabilities in general curriculum
  – Focus across disciplines and content areas

• Research Question
  – What are the characteristics of the existing research base on using technology with students with disabilities to increase access to the general education curriculum?
Criteria for Inclusion

- Sample consisted of student(s) identified as having a high-incidence disability
- Dependent variable included measures of academic performance or behavioral competencies
- Independent variable involved some type of technology
- Students in sample are pre-school to high school settings
- Published in peer reviewed journals between January 2010 and January 2020
- Single case or quasi-experimental design
- Conducted in classroom setting
- Yielded 65 studies that met criteria (see Appendix A)
Results

• Analyzed and presented according to the following components:
  – Participants
  – Settings
  – Interventionists
  – Methodology
  – Dependent variables and measures
  – Independent variables and intervention type
  – Fidelity of implementation
Still a work in progress!

But we have some preliminary results........
Participants

- 5,384 students
- Range from 1-2,303 in samples
- Male (n=2,651) and female (n=2,330)
- Race
  - White (n=1,352)
  - African American (n=339)
  - Hispanic / LatinX (n=145)
  - Asian (n=92)
  - Native Hawaiian (n=48)
  - Pacific Islander (n=43)
  - Native American (n=39)
Participants (Cont)

• School
  - Elementary (n=535), middle (n=4,036), and high (n=813)

• Disabilities
  - 1,658 of the students were known to have disabilities
    ▪ Specific learning disability (n=952)
    ▪ Emotional or behavioral disability (n=242)
    ▪ Other health impairment or ADHD (n=226)
    ▪ Intellectual (n=151)
    ▪ Autism (n=37)
    ▪ Speech and language impairments (n=12)
    ▪ Language-based disabilities (n=4)
    ▪ Hearing impairment (n=1)
    ▪ Developmental delay (n=1)
Participant Limitations

• Authors of 9 studies did not provide information on gender

• Authors of 15 studies did not provide information on race
  — Authors of four additional studies provided data but due to reporting nature, could not determine composition of group

• Authors of 5 studies did not report grade levels

• Included large numbers of students without disabilities (n=2,849) and students with an unknown disability status (n=877)
Settings

- **Geographic**
  - Midwest (n=24)
  - Southeast (n=14)
  - Southwest (n=10)
  - Northeast (n=5)
  - Northwest (n=3)
  - Mid-Atlantic (n=2)
  - 8 unknown

- **Community type**
  - Urban (n=30)
  - Suburban (n=8)
  - Rural (n=6)
  - 24 unknown
Interventionist

- Of the 65 studies.....
  - 30 included one or more general or special education teachers
  - 24 included researchers
  - 10 included researchers and teachers
  - 1 paraprofessional
Research Methodology

• 40 used single case design
• 13 quasi-experimental
• 8 randomized control trials
• 4 mixed methods
Dependent Measures

• Grouped to explore outcomes in 6 areas
  – Reading (n=20)
  – Writing (n=6)
  – Mathematics (n=16)
  – Content Specific (n=6)
  – Social / Emotional / Behavioral (n=22)
  – General / Miscellaneous skills (n=6)

  – *Will provide a brief* overview of some of the findings in one area to give overview of analysis in this section
  – Encouraged to look at upcoming paper for more detailed analysis
DV Example: Mathematics

- Included the following measures
  - Norm referenced math assessments
  - Computation
  - Problem Solving
  - Data Interpretation
  - Multiplication Facts
  - Subtraction Facts
  - Linear and algebraic equations
  - Perimeter and area problems
  - Math performance or achievement
  - Timed math computation tasks
  - Basic math skills acquisition
DV Example: Mathematics (Cont.)

  - Use of anchored instruction to demonstrate improvements on fraction assessments, computation, and problem solving

- Bouck et al. (2019), Satsangi & Bouck (2015) and Satsangi et al. (2016)
  - Virtual manipulatives increase fraction problem solving, perimeter and area problem solving, and algebraic equations solving abilities

- Haydon et al. (2012) and Ok et al. (2016)
  - iPads assist with completing more problems per minute and improve math fact performance
DV Example: Mathematics (Cont)

• Kaczorowski et al., (2019)
  — Eworkbooks or scaffolding help students to be more independently accurate during math tasks

• Bryant, Ok, et al. (2015) and Stultz (2013)
  — No difference between applications-based or computer-based technology compared to traditional teacher instruction

• Shin and Bryant (2017)
  — Mixed findings on examination of word problems students answered correctly following computer based instruction
Independent Measures

- *Still under construction*
- Examining
  - Computer-based instruction
  - iPads and other mobile devices
  - Video modeling and video instruction
  - Electronic texts, audiotexts, text-to-speech, speech-to-text, digital pens
  - Student response systems
Treatment Fidelity Limitations

• Authors of 16 studies did not include information on treatment fidelity

• Authors of 6 studies stated how they measured fidelity but did not include their data

• Authors of 3 studies included qualitative description

• Authors of 5 studies reported only on interrater reliability of treatment fidelity but not on what their treatment fidelity was

• *The remaining studies*……..
Treatment Fidelity

- Authors of 9 studies included treatment fidelity and interrater reliability
- 26 provided data on treatment fidelity
- Of the 35 studies, 31 met acceptable treatment fidelity standards
Discussion

• Studies primarily included White students with learning disabilities

• Studies include single case study designs that lack replication

• Mixed results on some measures but participants often report high social validity

• Fidelity of implementation not consistently reported across studies
Limitations

- Potential for missed articles in search
- Parameters of the search and key terms
- Dynamic nature of data bases
Appendix A: Included Studies


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