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The Effectiveness of Online Curriculum on the Academic Achievement of Students with Cognitive, Emotional, and Behavioral Disabilities

by

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A Starred Paper

Submitted to the Graduate Faculty of

St. Cloud State University

in Partial Fulfillment of the Requirements

for the Degree

Master of Science in

Special Education

May, 2018

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Chapter 1: Introduction

The focus of online education was initially on students who perform at a gifted level (Cavanaugh, Repetto, Wayer, & Spitler, 2013). Since the inception of online learning, an industry has emerged to include for-profit companies, nonprofit organizations, states, and school districts all contributing to eLearning. Because these classes were not designed with students with disabilities in mind, many of those students avoided them (Shah, 2011). The U.S. Department of Education in 2012 estimated 13% of all K-12 students being served by online programs have a disability (as cited by Cavanaugh et al., 2013, p. 3). Around 90% of daily lessons on these online programs are developed by vendors and their interpretation of digital accessibility (Smith, 2016).

The term *accessibility,* however, is often over-used and misunderstood when applied to online learning opportunities (Smith & Basham, 2014). It implies access to content, especially for individuals with disabilities. Standards like Section 508 of the Rehabilitation Act of 1973 and the Web Content Accessibility Guidelines (WCAG) attempt to provide guidance for making content accessible to a wide range of people with disabilities (Kirkpatrick, O Connor, & Cooper, 2017). These guidelines tend to focus the physical and sensory disabilities, but fail to address cognitive, emotional, and behavioral disabilities. The Center on Online Learning and Students with Disabilities asserted in 2012 that Section 508 compliance only provides a degree of supports to students with a learning disability while mainly addressing sensory and physical disabilities.

In the 2013-2014 school year, the National Center for Education Statistics estimated more than three million children 3-21 years old are served under Individuals with Disabilities Education Act (IDEA) have emotional, intellectual, and specific learning disabilities. When

looked at proportionally, more than 47% of all students served by IDEA have a cognitive or behavioral disability. This contrasts with the 15% of students with physical disabilities in categories like vision, hearing, orthopedic, and other health disabilities. With more cognitive, emotional, and behavioral disabilities being served than physical disabilities, the question arises, how effective are current imbedded accessibility features in addressing the needs of those students if the leading guidelines address physical disabilities as the primary needs?

In a 2013 study conducted by Burdette, Greer, and Woods, 46 states were surveyed regarding online learning and students with disabilities. When asked to identify specific issues facing students with disabilities, six states mentioned providing accommodation in online learning and eight states identified delivering of online services to student with emotional disturbances and intellectual disabilities as concerns. When providing accommodation in an environment is already problematic in general, complicating it further with the difficulty of providing services raises concerns about the effectiveness of online learning opportunities for student with cognitive, emotional, and behavioral disabilities.

Students with behavioral disabilities may benefit from choice-making, assigning tasks of interest, intratask stimulation, shortened task lengths, extratask stimulation, and small-group instruction (Harrison, Bunford, Evans, & Owens, 2013). A 2009 meta-analysis by Scruggs, Mastropieri, Berkeley, and Graetz, the National Dissemination Center for Children with Disabilities, and FHI found mnemonic strategies, graphic organizers, classroom learning strategies, computer-assisted instruction, study aids, hands-on learning, and explicit instruction were effective interventions for students with learning disabilities, emotional disturbances, and multiple learning, emotional/behavioral, and mild intellectual disabilities. While these

interventions have been effective in traditional classrooms, they may not translate as well to digital environments.

Defining Online Curriculum

Online curriculum is defined for the purposes of this paper as any sequence of instructional methods and materials arranged to facilitate learning and is accessed in part or whole using technology. Additional terms included under this definition include *digital learning*, *virtual classroom*, *hybrid courses, blended learning*, *asynchronous learning*, and *synchronous learning*.

Research Question

This paper examines one research question:

1. Is online curriculum effective in the academic achievement of student with cognitive, emotional, and behavioral disabilities?

Focus of the Review

Research was limited to students enrolled in education settings. Studies included identified participants who had disabilities. Only studies identifying specific learning disabilities, cognitive, emotional, or behavioral disabilities were considered. To be included, research had to incorporate a method for measuring academic achievement.

ERIC, PsycINFO, and Academic Search Premier (ASP) were used to locate relevant studies. Keywords included variations of *online curriculum, online learning, online class, online program, blended learning, eLearning, hybrid learning cognitive, emotional, behavioral, learning disabilities, intellectual, special education, academic achievement,* and *learning outcomes*. Government databases and websites were also searched for statistical information.

Website reports were examined from the U.S. Department of Education, the National Center for Educational Statistics, and the Library of Congress.

Importance of the Topic

As a student's level of need increases, the amount of time spent with their nondisabled peers decreases. This typically means the student is spending less time in the general education setting where the student would have routine access to the core academic instruction by a general education teacher. One possibility for delivering general education content to a student who is not in a traditional classroom setting is to provide that student with access to an online curriculum.

Additionally, classroom teachers use a blended model more and more, which includes online content mixed with traditional face-to-face instruction (Smith & Basham, 2014). This increasingly curated curriculum approach has the potential to create accommodation difficulties. If adaptations or modifications cannot be made to material being used in a classroom, how will students with disabilities access the information and learning? Content adopters need research to guide their consideration of online materials.

In 2008, Christensen and Horn used a logarithmic perspective to predict 50% of courses would be delivered online by 2019. Vasquez and Serianni (2012) stated in their *Rural Special Education Quarterly* article, "While the field of online learning is well into its adolescence, the research necessary to inform practice is still in its infancy." The implication of online learning growth despite a reliable base of empirical data could affect the civil rights of students with disabilities as they find themselves in online environments. Is online education appropriate for student with cognitive, emotional, or behavioral disabilities? Does an online environment create

unwarranted restrictions on students placed there? In a rush to utilize conveniences of the

information age educators risk alienating a vulnerable segment of the population they serve.

Chapter 2: Review of the Literature

Six research articles were reviewed in the examination of the effectiveness of online curriculum on the academic achievement of students with cognitive, emotional, and behavioral disabilities. Articles used in the review included both quantitative and qualitative studies. A summary of these studies is listed below chronologically in Table 1.

Performance Comparison of Online
**   and Traditional Schools**

In 2012, Thompson, Ferdig, and Black sought to identify and quantify the students enrolled in online schools, as well as those students' reasons why they chose those programs. They had four goals in their pursuit:

(a) to establish a knowledge of the basic demographics of online-school users; (b) to gain an understanding of the education background and success of online-school students; (c) to determine whether there is a high prevalence of [Children With Special Health Care Needs (CSHCN)] enrolled in online schooling; and (d) to determine how children perform in online schooling compared with their prior experiences in traditional school. (p. 2)

The authors emailed surveys to parents of students enrolled in state-led online-school programs of three southeastern states within the United States. Only state-led schools were considered due to similarities in operations. Of the 13,384 surveys sent out, 1,971 were validated and used. The surveys included demographic information of both students and parents, the CSHCN Screener, and questions related to the students' experiences and academic achievement. The results from the survey were analyzed with Stata version 9.2 using a level of significance $P < .05$.

The collected data were interpreted using univariate, bivariate, and multivariate analyses. A statistically significant occurrence of CSHCN enrolled online (476/1,971, 24.6% overall, range 21.0%-29.9%) was found when compared the general population (15.0%-15.4%). When the distribution of grades was examined, there was no difference between the reported online-school grades and traditional school grades as reported by each child's parent. The comparison of the grades of the individual online-schooled populations boys, black children, and CSHCN had significantly lower grades than other subgroups. This trend, however, appeared consistent with traditional school population in univariate comparisons.

When multivariate regression was used to adjust for identified academic factors, CSHCN and black children showed a significantly elevated chance of lower grades online than in traditional schools (aOR 1.45, 95% CI 1.29-162 for CSHCN, P < .001; aOR 2.73, 95% CI 2.11-3.53 for black children, P < .001).

The ratio of students with special health care needs in this study is significantly higher in online classrooms than traditional ones. Shah's (2011) assertion contradicts the notion about students with special health needs avoid online classes. The inconsistency illuminates a potential problem with perceptions and opens questions about whether these students are enrolling online despite reservations.

Whether students with special health care needs are uncertain about enrolling online or not, Thompson et al. (2012) found once enrolled, they are more likely to perform worse than when they were in a traditional classroom setting. This fact may have been missed without the deeper analysis since the unadjusted comparison of online grade distributions was congruent

with traditional classes. This again raises questions about the potential ramifications of programming based purely on perceptions.

This study's basis on surveys distributed by email is one limitation. While electronic communication is a component of online education, it is an assumption to believe parents have the skills, access to technology, and understanding to respond to an emailed survey just because his/her child is enrolled in an online program. Additionally, Thompson et al. (2012) established a high percentage of the parents had a bachelor's degree or higher. Such results make the homogeneity of the sample uncertain.

**Effectiveness of Computer-Assisted Instruction
  with Specific Learning Disabilities**

Stultz (2013) studied the effectiveness of computer-assisted instruction compared to other, noncomputer-based, methods with students with specific learning disabilities (SLD) for teaching mathematics in high school. Stultz recognized the presence of computers as a tool long utilized in classrooms, but determined there was a need for research into its effectiveness in teaching the subject of mathematics to students with SLD. She hypothesized "a difference between computer-assisted instruction and instruction using teacher-directed activity for teaching high school students with SLD to multiply and divide simple and mixed fractions" (Stultz, 2013, p. 4).

Participants were students in a special education classroom at a high school. All students met the IDEA criteria for SLD. There were 36 males and 22 females for a total of 58 participants. Two groups were formed by randomly assigning participants to each group. All participants were taught for 10 sessions with each session lasting 90 minutes. The teacher-directed activity (TDA) consisted of direct instruction, guided practice using a whiteboard, and

paper-pencil exercises and quizzes. The computer-assisted instruction (CAI) group used

classroom notebook computer with Basic Math Competency Skill Building for Fractions

installed on them. The Brigance Comprehensive Inventory of Basic Skills–Revised (CIBS-R)

was employed to measure results. The pretest and posttest subtests for multiplying and dividing

fractions was given to participants.

Stultz (2013) used an independent samples t test after determining the normality of the

pretest scores could not be assumed, thereby making an analysis of covariance (ANCOVA)

inappropriate. The resulting t value was determined not to be significant (t(47.699 = -.650,

p = .578), which meant there was no statistical difference between the two groups. Post Hoc

analysis did find that despite the standard deviation of pretest scores being relatively close (TDA

= 2.95, CAI = 2.95), there was a more distinct difference in the standard deviation of posttest

scores (TDA = 10.04, CAI = 6.44).

Stultz's (2013) study found no significant differences between the group taught

traditionally with teacher directed activities and the group taught with computer assisted

instruction. This means the performance of students with SLD in an academic setting utilizing

online curriculum would compare to face-to-face programs. If the results of this study are

generalizable, then the choice of digital or traditional delivery method would be irrelevant when

choosing special service adaptations/modifications.

This study, however, is limited by the variability of participants and sample size. All 58

participants attended the same school and were chosen from the same classroom. This calls into

question the findings applicability to the population at large. While the two groups were similar

in gender, scaled intelligence, age, grade, and years in special education, factors like computer literacy, socioeconomic status, and memory were not considered.

As evidenced by the Post Hoc Analysis, of factors appeared to affect the posttest scores. Stultz (2013) suggested possible explanations, most of which centered around interactions with the instructors. Emotional support, relationships, status, and a familiarity with interpreting some participants' behavior were all noted as possible factors. This "human element" in the TDA, and lack of it in the CAI, groups could account for the posttest variations.

Academic Attainment of Students with
** Disabilities in Distance Education**

In 2014, Richardson of The Open University investigated the possibility of correlation between academic attainment in higher education and student with disabilities. Richardson noticed in prior research students identified with multiple disabilities were typically categorized as such, thereby preventing previous studies' results from seeing the full effect of individual disabilities. He wanted to unpack the multiple disabilities category to determine the possibility of compounding disabilities created a different result. Richardson had two research questions in his 2014 study. First "when the effects of demographic variables have been statistically controlled, do students with particular disabilities differ in their academic attainment from nondisabled student?" and second, "when the effects of demographic variables have been statistically controlled, do students with and without particular disabilities differ in their academic attainment?" (p. 293).

Richardson (2014) conducted a descriptive study using information retrieved from the Open University's administrative records. He was able to gather information on demographics, grades, course completion, and disabilities from these records to complete his descriptive study.

Of the 196,405 students enrolled at Open University, 6.8% (n=13,437) were identified through records as having one or more disability, 39.5% (n=77,579) were males, and 60.5% (n=118,826) were females. No participant was younger than 16, the minimum age to enroll in Open University.

According to data from a chi-squared test, 12 disabilities were significantly related to completion rate in both unadjusted data ($\chi^2(12, N = 280{,}413) = 573.98, p < .001$) and when the effects of age, gender, prior qualifications, and financial assistance were controlled ($\chi^2(12, N = 269{,}423) = 269{,}423, p < .001$). Similarly, there was a significant relationship between the twelve disabilities and the pass rate in both unadjusted data ($\chi^2(12, N = 180{,}561) = 323.61, p < .001$) and when the effects of age, gender, prior qualifications, and financial assistance were controlled ($\chi^2(12, N = 175{,}090) = 193.77, p < .001$). Finally, the 12 disabilities were significantly related to the likelihood of obtaining good grades in both the unadjusted data ($\chi^2(12, N = 76{,}151) = 144.48, p < .001$) and when the effects of age, gender, prior qualifications, and financial assistance were controlled ($\chi^2(12, N = 74{,}962) = 78.31, p < .001$).

Richardson (2014) found students with mental health difficulties or restricted mobility completed courses less than nondisabled students. Students with specific learning disabilities, including dyslexia, restricted mobility, and unseen disabilities passed courses at a lower rate than nondisabled students. Additionally, obtaining good grades was less likely for students with dyslexia or other specific learning disabilities as opposed to nondisabled students. Richardson's first research question was thereby confirmed that students with disabilities do differ from nondisabled student in academic attainment.

Richardson's (2014) second research question, do students with particular disabilities differ from those without those particular disabilities, was also confirmed. Students with multiple disabilities in distance learning programs have a lower completion rate, pass rate, and grade attainment than nondisabled students. When Richardson broke down the multiple disabilities category a few additional observations became known:

- Students who are blind or partially sighted reduced their course completion and passing rate when an additional disability was present, but it did not affect their grades.

- Students who are deaf or hard of hearing, as well as students with impaired speech, were less likely to obtain a good grade when additional disabilities were present, but there was no effect to completion or passing rates.

- Students with unseen disabilities have completion rates and grades reduced in the presence of additional disabilities, but there was no effect to their passing rates.

- Students with autistic spectrum disorder, as well as student with fatigue or pain, saw a reduction in their ability to complete courses and obtain good grades in the presence of additionally disabilities despite their likelihood to do better than their nondisabled peers in both areas.

While Richardson's (2014) study was conducted in the higher education setting, there are implications for primary and secondary settings too; specifically, as it relates to this paper, the areas of learning disorders, mental health difficulties, and autism spectrum disorders. The first two displayed significantly lower achievement using online curriculum than nondisabled students. Students with autism spectrum disorder, however, showed significantly higher odds

ratios of outcomes than nondisabled students in areas of course completion and good grades when adjustments were made to control the effects of age, gender, prior qualifications, and financial assistance.

Students in higher education settings make a choice to enroll, whereas primary and secondary students are required to attend academic settings. The findings in this study may not generalize to those settings but provides potential indicators of areas for future research. Additionally, the results of Richardson's (2014) study may not be comparable to campus-based programs where instructors may choose the presentation modality based on the needs of the class.

Online Skills-Based Courses

The following study did not focus individuals with disabilities; it was included in this paper due to the finding's relationship to students with emotional and behavioral disabilities. Students categorized with emotional and behavioral disabilities often fail to demonstrate satisfactory social skills. Skill competency is an important element of the class norms; therefore, skill acquisition is a component of effective curriculum.

Skills such as communication, problem-solving, conflict resolution, and negotiating are necessary for success in interpersonal classes. Callister and Love (2016) asked the question, "Can skills-based courses taught online achieve the same outcomes as face-to-face courses in which the instructor and students interacting in real time may have higher level of interaction, thus potentially facilitating higher levels of skills improvement?" In the presence of similar outcomes, Callister and Love sought to determine factors critical to the success of those

outcomes. Further, the authors explored the transferability of highly experiential activities to an online format.

Participants in this study were students from a large public university with both online and campus-based master's degree programs. Classes were designed to be comparable with students choosing their preferred format. One hundred thirty-four students were randomly assigned to negotiation dyads. The campus sample was comprised of students with an average age of 26, average of 3.4 years of work experience, and was 25% female. The online sample included students with an average age of 34.6, average of 10.6 years of work experience, and was 45% female.

Two scored negotiation cases were used to quantitate negotiation outcomes for comparison. Scores increased the closer a dyad was able to get to the optimum solution. Students recorded their negotiation agreement in a spreadsheet with embedded formulas to individual scores, as well as their joint total. Students negotiating online used a visual-technology service like *Skype* or *Google Plus* while face-to-face students met during class time.

Two negotiations were analyzed. A business negotiation was used to test the first hypothesis. To test the second hypothesis, both classes were tasked with using Google Chat, a nonvisual technology, to negotiate a job offer. To minimize the effect of different exposure to the technology, directions for its use was provided to all students. Admission scores, final examination scores, and overall class grades were also compared.

Callister and Love (2016) used a one-way ANOVA to compare scores on the negotiations. Class type was a significant effect on performance ($F_{1,65} = 7.72, p = .007$) with the face-to-face class scoring higher than their counterparts. There was also evidence to support

the second hypothesis; namely, students in campus class would demonstrate stronger negotiating skills despite uniform technology (($F_{1,66} = 10.137, p = .002$). Although not a part of either hypotheses, the authors analyzed final exam grades, as well as overall course grades. They found no significant difference in either situation (final exam was $F_{1,133} = 1.32, p = .249$; course grade was $F_{1,133} = .02, p = .754$).

According to these findings, students learning a skill though face-to-face class out perform their online peers. It is possible the development and mastery of skills may require components not inherently found in online curriculum. Callister and Love (2016) contended the relationship and communication of a teacher with his/her students is the missing factor in technology-based class facilitation.

There was almost a decade of difference in the mean ages of the two classes, as well as 7 more years of work experience when comparing the averages of the two groups. Complacency and self-assurance could have been potential unaccounted for factors to affect the results of this study. With such different averages between the two groups, homogeneity may not have been obtained. The authors reference a similar study with comparable results, but then reported that study found no difference in grades or performance.

Teacher Perceptions

The 2016 study from Marteney and Bernadowski focused on perceptions of teachers. It specifically addressed online instruction for students receiving special education services. While it did not address individual categories in special education, it did address the effectiveness part of this paper's research question.

Marteney and Bernadowski (2016) stated the purpose of their study "was to gain the perspectives of virtual teachers on the potential benefits and limitations of asynchronous education for students with special educational needs." Their research was designed to seek out the benefits of online education for students in special education and provide teacher perspectives on a "specific pedagogical alternative" to traditional classrooms.

The authors surveyed 80 asynchronous online regular and special education teachers. All of the individuals surveyed were employed at an education management company located in southwestern Pennsylvania, USA. The researchers created, reviewed, and piloted their own survey. It was then distributed using QuestionPro software.

According to their findings, teachers felt online learning allowed students with physical disabilities access to education; specifically, visual limitations with 69% of teachers agreeing, auditory limitation with 83% of teachers agreeing, and physical limitation with 92% of teachers agreeing. When asked about academic performance as evidenced by student effort, 72% of teachers agreed they witnessed improvement. There was an 86% agreement with the question of whether teachers had seen positive results in the self-paced classes.

While most responses agreed with the statements in the survey, two questions had lower than 60% of teachers agreeing. When asked whether they agreed or disagreed with the statement "I feel it is easier to implement accommodations for students with IEPs (individualized education plans), GIEPs (gifted individualized education plans), and 504 plans in online courses," only 53% of teachers agreed to some degree. Even fewer teachers agreed with the statement about the utilization of resources by students to achieve academic goals with a total of 28% agreeing to some degree.

This study had a small sample size and was intended as a pilot study. It surveyed teachers who were employed by a single company. Additionally, there were no items on the survey about students with disabilities which were not physical in nature. Having questions only about students with physical disabilities may potentially skew the data.

Online vs. Face-to-Face Credit Recovery
in At-Risk Students

Heppen et al. (2017) identified the critical nature of outcomes in a student's first year of high school. She emphasized the importance of passing mathematics course, particularly algebra, as it effects a student's ability to graduate on time. Credit recovery programs are an alternative to students dropping out due to failure to attain credit. Partnering with the Chicago Public Schools (CPS), Heppen et al.'s study asked:

What is the relative impact of online and [face-to-face] Algebra I for credit recovery on

students' (a) experiences in the class? (e.g.. perceived class difficulty, teacher

expectations); (b) math skills and mindset? (e.g., end-of-course algebra test and

standardized math and algebra assessment scores, reported liking of and confidence in

math); (c) grades and likelihood of successfully recovering Algebra I credit?, and

(d) subsequent math course-taking performance and credit accumulation? (p. 273)

Participants in the study were first-year students from 17 high schools within CPS. Students had failed Algebra IB, the second-semester Algebra I class. To protect from "no-shows," only students attending either of the first two days of the summer session were including in the study. A total of 1,224 student participated. Upon enrollment, students were randomly assigned to either an online or face-to-face (f2f) Algebra I class. The online class had 613 students and the face-to-face class had 611 students.

A certified math teacher taught both classes. The content was consistent with typical second-semester algebra; however, the online classes where structured in a way to encouraged sequential progress while the face-to-face classes did not have a uniform sequence and occasionally included pre-algebra and first-semester algebra content. Online students received immediate feedback and, to progress through the course, students needed to achieve at least a 70% on tests and quizzes. Feedback was not immediate and varied in timing for students in the face-to-face class. The progress in face-to-face classes was not set at a specific percentage.

The CPS district was the principal source for outcome data. They provided course grades and passing rates for participants, PLAN assessment math scores, as well as the grades from the second-year courses taken by students in the study. For baseline data, the participants' EXPLORE, a Grade 9 math assessment was used. Students were also given a posttest and survey at the end of the course by the research team.

Six outcome categories were established with the sub-categories being measured. *Class Experiences* used a Rasch-scaled score to represent means. Three measures produced significant results: class difficulty (d=0.51), class clarity (d=-0.64), and comfort with computers (d=0.35). Online students perceived their class to be more difficult and found their class unclear on what was needed to be successful when compared to their face-to-face counterparts. The online students reported higher levels of comfort with computers than the face-to-face students. There were no significant differences in Engagement, Teacher Personalism, or Teacher Expectations.

Math Skills also used a Rasch-scaled score for the means. Online students were found to have significantly lower scores than face-to-face students on the posttest administered at the end

of the course (d=-0.19). When the students were administered the PLAN mathematics, including the algebra subtest, Heppen et al. (2017) found no statistically significant differences on either.

In *Math Mindset*, there was no significant differences between the groups in their perception of the usefulness of mathematics. The online classes, however, were significantly less likely to have confidence in their math skill or to "like" mathematics.

The primary interest of the study was successful recovery of second-semester Algebra I credit and whether online and face-to-face would have different rates of credit recovery. Student in the online class had a recovery rate of 66% while student in the face-to-face class had a rate of 78%.

There was no significant difference between the two groups when analyzing *Subsequent Course Performance*. Similarly, in *Progression Toward Graduation* the cumulative math credits of participants at the end of the second-year, second-semester was found to be not statistically significant, despite face-to-face students have more average credits (f2f=2.51, online=2.39). There was also no difference between classes when examining indicators of on track graduation.

This study was included in this paper because of the participants parallel to individuals with emotional and behavioral disorders. As stated in Heppen et al. (2017), CPS chose the online course because it was believed to have supports for struggling students; however, the supports were largely ineffective. As reported in the study, online courses can be frustrating and less clear on the ingredients to succeed in the class. For students who failed a class the first time, the self-reported perceptions of the online students could perpetuate a stereotype about math as a difficult discipline.

Summary

The studies in this section examined teacher and parent perceptions, academic achievement of online students with disabilities, and comparisons between online and traditional face-to-face students. Six studies from 2012 to 2017 were reviewed in this chapter. Table 1 provides a summary of the findings in the reviewed studies.

Table 1

Summary of Chapter 2 Findings

Author(s)	Study Design	Participants	Procedure	Findings
Thompson, Ferdig, & Black (2012)	Quantitative	1,971 parents of three states with state-led online-school programs in the southeastern region of the United States	Brief parental survey was distributed within three states. Demographics, parent and child educational history, child's health status, and experiences and educational achievement with online school and classes. The child's health status was measured by the Children with Special Health Care Needs (CSHCN) screener. Results from the surveys were compared with state public-school demographics and statistical analyses controlled for state-specific independence.	Prevalence of CSHCN was high in online schooling (476/1,971, 24.6%). Parents of CSHCN reported significantly lower grades online than in traditional schooling (aOR 1.45, 95% CI 1.29-1.62, $P <$ .001)
Stulz (2013)	Quantitative	58 high school students with specific learning disabilities. All the students were in a special education classroom. There were 36 male and 22 female participants.	Participants were randomly assigned to one of two group and given pretests. There were then taught using either computer-assisted instruction (CAI) or teacher-directed activities (TDA). The participants completed posttests at the end of the study.	The results were not statistically significant, $t(47.699)=-.560$, $p= .578$. Post Hoc analysis indicated that despite not having statistical significance, there was a large amount of variability in the standard deviation of the two groups.

Table 1 (continued)

Author(s)	Study Design	Participants	Procedure	Findings
Richardson (2014)	Quantitative	196,405 students enrolled in 2009 at Open University.	Information was retrieved from Open University's administrative records to obtain demographic characteristics, course registration, disabilities, and course attainment.	The 12 disabilities were significantly related to completion rate The 12 disabilities were significantly related to the pass rate The 12 disabilities were significantly related to the likelihood of obtaining good grades when effects of age
Callister & Love (2016)	Quantitative	134 university students split into 67 dyads. H1 dyads were Campus (N = 27) and Online (N = 40) and H2 dyads were Campus (N = 28) and Online (N = 40)	Negotiation dyads were scored based on Pareto-optimal outcomes. Each group entered their score in a spreadsheet that had embedded formulas.	H1 found significance due to class type $(F(1,65) = 7.72, p = .007)$ H2 also found significance due to class type $(F(1,66) = 10.137, p = .002)$ In both hypotheses, the campus mean (NH1 = 889.81, NH2 = 10.414) was high than online mean (NH1 = 845.15, NH2 = 8,448)

Table 1 (continued)

Author(s)	Study Design	Participants	Procedure	Findings
Marteney & Bernadowski (2016)	Qualitative	80 asynchronous online school teachers. Teachers surveyed were regular and special education teachers at one southwestern Pennsylvania education management company	A self-constructed survey was distributed using QuestionPro software.	67% of respondents disagreed to some degree to the statement "I feel students utilize all classroom resources available in an online learning environment to achieve academic goals to their fullest potential." 53% of respondents agreed to some degree to the statement, "I feel it is easier to implement accommodation for student with IEPs, GIEPs, and 504 plans in online courses." 72% of respondents agreed to some degree to the statement, "I have seen an improvement in student academic performance based on student efforts throughout my course(s)."
Heppen et al. (2017)	Quantitative	1,224 students across 17 high schools. All students failed Algebra IB at participating schools. 38% female, 57% Hispanic, 33% African American, 8% white, 2% other races, 12 % eligible for special education, 47% spoke Spanish as home/native language. On average they failed 4.5 semester courses and math scores were 0.29 standard deviations below the district average. 40% were suspended, 5% had changed schools, and they averaged 30 missed days of school within the past year.	Students who enrolled within the first two days of summer school were randomly assigned to either an online or f2f class. Both classes were scheduled for 60 total hours. The school district provided data including course grades, pass rates, PLAN math scores, and second year course grades. Baseline was taken from 9 grade EXPLORE mathematics assessments.	Online students perceived course significantly more difficult than f2f (d=0.51) Online students reported significantly less clarity in class than f2f (d=-0.64) Online students scored significantly lower than f2f on posttest (d=-0.19)

Chapter 3: Summary

The purpose of this review was to examine the effectiveness of online curriculum on the academic achievement of students with cognitive, emotional, and behavioral disorders. Despite the scarcity of research on this topic, six studies spanning the last 6 years were examined. Most of the studies included in this paper echoed the need for investigation in this area while decrying the lack of research on the topic.

Conclusions

As evidenced from the included studies, there is still little data to confirm or reject the effectiveness of online education when working with special populations, such as students with cognitive disabilities or emotional/behavioral disabilities. Surveys from the research by Thompson et al. (2012) and Marteney and Bernadowski (2016) presented a perception by parents and teachers of students' needs met, and of students being successful in online environments. In juxtaposition, Richardson (2014) and Heppen et al. (2017) found students online can become frustrated and struggle to complete and/or pass courses. This contrast of perception and quantitative data illustrates the need for more research to drive best practices.

The studies focused on students with disabilities (Richardson, 2014; Stulz, 2013; Thompson et al., 2012) also conflicted in results. Thompson et al. discussed parents' reports of their children having lower grades online compared to grades received in a traditional class. According to Richardson, individuals with learning disabilities and mental health disorder had significantly lower achievement online than their nondisabled peers. With the smallest sample size of all the studies included, Stulz reported no significant difference in students with learning disabilities assigned to computer-assisted or teacher-directed classes.

One theme resurfacing repeatedly was the teacher-student relationship (Callister & Love, 2016; Heppen et al., 2017; Stulz, 2013). Thompson et al. (2012) and Marteney and Berandowski (2016) included survey questions related to teacher/staff support. All the studies conjecture the support and relationship of teachers has an influence on student success regardless of the environment. Heppen et al. and Callister and Love take it a step further and suggest the possible correlation of teachers' ability to "read" their students and adjust the curriculum's scope and sequence to student confidence and success.

Recommendations for Future Research

Research on the effectiveness of online education for students with disabilities is sparse, especially at the primary and secondary levels. Using methods such as Richardson's (2014) study at both the primary and secondary levels could provide important insight. Since post-secondary education involves the independent choice to enroll, Richardson's research might not applicable to younger students.

Studies targeting nonphysical disabilities could elucidate whether online curriculum, both school district designed and vendor created, is meeting the needs of students with cognitive, emotional, and behavioral disorders and disabilities. Testing whether standards such as Section 508 of the Rehabilitation Act of 1973 and WCAG 2.0 are sufficient when creating content used by the other 85% of students served under IDEA without a physical disability could provide data to help improved digital learning opportunities.

Research needs to move past the pilot studies and into large sample-sized investigations. Studies with less than 100 participants cannot bring light into the research, as established by the bibliographic review for this paper. The researchers in the previewed literature almost

unanimously identify online learning as under-researched. Special education and specific disabilities are populations with a steady increase in online schooling.

Implications for Practice

With scant research and inconsistent results, it is difficult to establish whether online curriculum is effective in the academic achievement of students with cognitive, emotional, and behavioral disabilities. According to the large-scale studies appear to indicate individuals with disabilities will do significantly poorer than nondisabled peers when using online curriculum. Further, these students will do better in traditional face-to-face classes than online. However, the most striking observation when reviewing the research on this topic was not in the results of the studies, but in their conclusions.

Study after study commented on a difficult to control element. Teachers and mentors appeared to affect the results, often by deviating from established curriculum. Heppen et al. (2017) pointed to the face-to-face teachers occasionally remediating their course topic while the online course, despite self-paced, was rigid in the content offered. Stulz (2013) also commented on the "positive emotional connection" the instructor in the teacher directed actives had with the participants. In both cases, the research teams share students' reports of feeling more comfortable with the subject matter and scored better than online counterparts. These reflections point to a positive effect to be replicated in any teacher led class. Teacher-student relationships may improve the effectiveness of learning.

Summary

This paper attempted to find out whether online curriculum had an effect on academic achievement of student with cognitive, emotional, and behavioral disabilities. The results were

inconclusive. More large-scale research on this topic is recommended to provide empirical

evidence rather than relying on parent and teacher perceptions.

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