SECTION II
WHAT VIRTUAL AND BLENDED EDUCATION RESEARCH REVEALS

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Executive Summary

Section II reviews research relevant to K-12 virtual and blended learning. The available research has consistently found that students enrolled in full-time virtual schools perform at levels well below their counterparts in face-to-face schools. Recent research indicates that schools that provide a combination of virtual and face-to-face curriculum and instruction (i.e., blended schools) also perform at low levels compared to traditional brick-and-mortar schools. Finally, research also suggests that both virtual schools and blended schools may be more economical than traditional public schools.

Unfortunately, there is little research to describe the virtual or blended student experience, which has resulted in a lack of understanding of the actual instructional model, the nature of the curriculum, and the type and amount of support employed by these schools. This lack of research extends throughout the field of virtual and blended education – and much of this research is atheoretical, methodologically questionable, contextually limited, and overgeneralized. All of these factors make the research into virtual and blended education of little value in guiding policy.
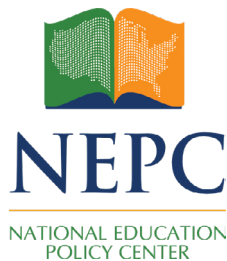
Yet, even in areas where the literature has provided guidance, legislators and policymakers have consistently failed to pass bills or create regulatory regimes that would provide additional oversight and accountability to online and blended schools. Policy organizations and

advocacy groups that have historically been supportive of virtual schooling have begun to question its effectiveness and are now calling for additional regulation. Nevertheless, at this point virtual schooling continues to expand, largely without effective oversight or regulation, despite the general lack of evidence that it is efficacious in most circumstances.

Recommendations Arising from Section II:

- The growth and geographic reach of full-time, taxpayer-funded virtual schools should be regulated. At present there are serious questions about the effectiveness of many models of virtual schooling. Until these questions can be adequately addressed, policymakers should limit or consider a moratorium on their growth.

- Given the lack of understanding of what is actually happening in virtual education (e.g., the nature of and amount of teaching in the instructional model, the specific curriculum that is used, the learning that occurs, etc.), policymakers should require that any virtual school operating in their jurisdiction be required to provide the necessary information to examine the effectiveness of the virtual education that is actually being provided.

- State and federal policymakers should create long-term programs to support independent research on and evaluation of virtual schooling, particularly full-time virtual schooling. More than twenty years after the first virtual schools began, there continues to be an inadequate research base of empirical, longitudinal studies to guide the practice and policy of virtual schooling.

Section II
What Virtual and Blended Education Research Reveals

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Over the past decade, the National Education Policy Center (NEPC) has produced annual examinations of the field of K-12 online and blended learning. In the first report in 2011, Glass and Welner wrote:

> Over just the past decade, online learning at the K-12 level has grown from a novelty to a movement. Often using the authority and mechanism of state charters, and in league with home schoolers and other allies, private companies and some state entities are now providing full-time online schooling to a rapidly increasing number of students in the U.S. Little or no research is yet available on the outcomes of such full-time virtual schooling.[1]

Seven years later, Miron, Shank, and Davidson wrote in the 2018 NEPC annual report:

> Full-time virtual schools and blended learning schools represent promising ideas... Unfortunately, the evidence is overwhelming that virtual schools as currently implemented are not working at primary and secondary levels of schools. This finding has appeared year after year. The evidence on full-time blended learning schools is still weak, but much of the available evidence indicates that full-time blended learning schools are not performing well relative to brick-and-mortar schools. Established models for both full-time virtual and blended learning schools have been influenced considerably by corporate interests and private education management organizations... As currently implemented, these models are not serving students well and these schools are not in taxpayers' best interest.[2]

It is clear that, to date, research in the field has not been an important driver of the practice

of K-12 online and blended learning.

In this section, the research and other literature is examined to determine themes where there is independent, systematic, valid data that can be used by policymakers in the development of legislation and regulation. Similarly, themes that have appeared in previous legislative and regulatory efforts are examined based on what research may exist to guide policymakers. Based on these goals, this section begins with a discussion of the terms used to describe virtual and blended schools in the literature. It continues with an examination of the research related to student performance in virtual and blended schools, how these schools are funded, and what it means to attend a virtual school.

Virtual Schools, Cyber Schools, Online Programs, Blended Programs, and Blended Schools

The International Association for K-12 Online Learning (iNACOL), the main professional association for practitioners of K-12 online and blended learning, as a part of *The Online Learning Definitions Project,* defined online learning as:

> ...education in which instruction and content are delivered primarily over the Internet. The term does not include print-based correspondence education, broadcast television or radio, videocassettes, and stand-alone educational software programs that do not have a significant Internet-based instructional component. Used interchangeably with virtual learning, cyber learning, e-learning.[3]

In the same document, the professional association defined cyber school as "a formally constituted organization (public, private, state, charter, etc.) that offers full-time education delivered primarily over the Internet; term used synonymously with the terms 'virtual school,' 'eSchool,' and 'online school'."[4]

For the most part, academic authors have used the term K-12 online learning to refer to the overall field.[5] Similarly, within the academic literature, the term virtual school is generally used when referring to supplemental forms of K-12 online learning (i.e., where students are enrolled in a brick-and-mortar school, but take one or more courses online to supplement their studies). The term cyber school is generally used when referring to full-time forms of K-12 online learning (i.e., where students are engaged in full-time online instruction and do not attend a brick-and-mortar school at all). However, these general conventions are not used consistently in the academic literature. For example, much of the early literature in the field used the term virtual school as a way to describe the general field of K-12 online learning.[6] Further, many scholars adopt the term in the legislation or policy in the jurisdiction where they are conducting the research. For example, policy in Pennsylvania uses the term cyber charter school and much of the research published on that state also uses that term.[7] Similarly, in many states full-time online schools are referred to as virtual schools in the legislation, and researchers working in those states will often use that term to describe a full-time online learning program.[8] Finally, as much of what is known about the K-12 online learning has come from non-academic organizations, various government agencies, and

even the popular media, it is important to note that authors are also inconsistent in how they use the terms online learning, virtual schooling, cyber schooling, or derivatives thereof—often using them interchangeably as synonyms.

Unlike K-12 online learning, which is easily distinguished by the geographic separation of the teacher and student, K-12 blended learning is a little harder to define. At its broadest level, blended learning simply refers to:

> any time a student learns at least in part at a supervised brick-and-mortar location away from home and at least in part through online delivery with some element of student control over time, place, path, and/or pace; often used synonymously with hybrid learning.[9]

Basically, if students are engaged in both face-to-face and online learning as a part of their formal studies, then they are engaged in some form of blended learning. This description is consistent with Graham's definition that "blended learning systems combine face-to-face instruction with computer-mediated instruction" (such as online learning).[10]

A factor that complicates the understanding of blended learning is the fact that in some instances it is applied to a complete school and in other instances it simply refers to the actions of one or more teachers. For example, the models of blended learning provided by Horn and Staker can be applied to both complete schools or to individual programs within a school.[11] Given the varied definitions of blended learning (i.e., blending some form of face-to-face and online instruction), the vast majority of blended learning may not be occurring at the school level. Therefore, researchers are quite limited in their ability to examine the effectiveness of blended learning – beyond instances where a full school is organized on one of these blended learning models. However, even within those complete school environments, researchers are still largely unable to discern the level of blending that is occurring, and in many cases scholars are forced to rely upon schools to self-identify as blended learning schools, or to have proponents of blended learning identify these schools based on their knowledge of the programming. In the latter case, many schools identified by proponents are often identified specifically for ideological or advocacy reasons.

For the purposes of this section, the examination of the research and literature will focus on virtual schools and blended schools as defined in the previous section by Miron and Elgeberi:

> ...full-time, public elementary and secondary virtual and blended schools in the U.S. These include virtual and blended schools operated by for-profit and nonprofit Education Management Organizations (EMOs) as well as virtual schools operated by states or districts. Private virtual or blended schools (funded in whole or in part by charging tuition and fees, rather than relying on a public funding program using tax dollars) are excluded due to absence of relevant data in state or federal data sets. Also excluded are schools offering a combination of programs including traditional face-to-face programs as well as virtual or blended options, unless it was possible to separate data for the full-time virtual or blended school components.[12]

In instances where other types of K-12 online or blended learning programs are referenced, the nature of the program will be described.

Performance of Virtual Schools and Blended Schools

In the 2012 NEPC examination of virtual schools, Miron and Urschel found the percentage of virtual schools that achieved adequate yearly progress was approximately half that of public schools (i.e., 27.4% of virtual schools vs. ~52% of public schools).[13] This result has been a consistent finding in each of the NEPC's subsequent annual reports into virtual schools. Section I of this report finds that the percentage of virtual schools achieving an acceptance school performance rating was lower than the percentage of brick-and-mortar schools. Further, it also reports that the four-year graduation rate for students attending virtual schools was significantly lower than the national average. These findings from the NEPC have been consistent with almost all of the additional research focused on the effectiveness of full-time virtual schooling. In fact, it has not mattered if the research was conducted by legislative audit divisions, investigative journalists, policy think tanks, or academic researchers – the results for virtual schools have been consistent (see Table 2.1).

Table 2.1. Summary of research related to the effectiveness of virtual schools (NEPC reports are shaded)[14]

Study	Finding
National (2019)	"Overall, 48.5% of full-time virtual schools were rated acceptable performance ratings… the on-time graduation rates for full-time virtual schools (50.1%)… fell far short of the national average of 84%."[15]
Ohio (2019)	"Students attending online charter schools have substantially weaker growth in both reading and math than the average TPS VCRs. The gaps translate to 47 fewer days of learning in reading and 136 fewer days of learning in math for online charter students."[16]
National (2018)	"Virtual schools continued to underperform academically, …36.4% of full-time virtual schools received acceptable performance ratings. The graduation rate of 50.7% in virtual schools… fell far short of the national average of 83%."[17]
Michigan (2018)	Students enrolled in virtual schools had a pass rate of 49%, compared to the students' non-virtual course pass rate of 78%.[18]
National (2017)	"[Only] 37.4 percent of full-time virtual schools received acceptable performance ratings… The graduation rate of 43.4% in virtual schools [compared to a national average of 82.3%]." [19]
Michigan (2017)	Students enrolled in virtual schools had a pass rate of 53%, compared to the students' non-virtual course pass rate of 78%.[20]
North Carolina (2017)	"For the 2015-16 school year, both VCS received an overall School Performance Grade (SPG) of D which translates numerically to a 52 for Connections and 45 for NCVA respectively. Both VCS received a SPG of C in Reading and an F SPG in Mathematics. Comparatively, during the 2015-16 school year, traditional public schools had a lower percentage of schools with D and F (22.9%) than public charter school (27.7%)."[21]

Ohio (2017)	The students who started e-schools in the lower baseline academic distribution scored lower on state testing and had lower likelihoods of meeting high school graduation standards. Students with prior levels of high achievement also scored lower than their traditional public and charter school peers, but the difference was not as stark as those with lower prior levels of academic achievement.[22]
National (2016)	"Compared to traditional public school students, full-time virtual charter school students have much weaker academic growth overall. Full-time virtual charter schools perform worse than traditional public schools in most states. All subgroups of students have weaker academic growth in full-time virtual charter schools than in traditional public schools. The vast majority of full-time virtual charter schools perform worse than traditional public schools." [23]
National (2016)	"Of the 121 virtual schools for which data were available, 22 (18.2%) had proficiency rates above the state average; 82 percent had proficiency rates below state averages... The on-time graduation rate (or four-year graduation rate) for full-time virtual schools was half the national average: 40.6% for virtual schools and 81.0% for the nation as a whole."[24]
Michigan (2016)	Students enrolled in virtual schools had a pass rate of 52%, compared to the students' non-virtual course pass rate of 87%.[25]
Ohio (2016)	"Across all grades and subjects, students who attend e-schools perform worse on state tests than otherwise-similar students who attend brick-and-mortar district schools, even accounting for prior achievement."[26]
Tennessee (2016)	"The scores are generally lower [for the full-time cyber schools] than the scores of the districts that established the schools."[27]
National (2015)	"Across all tested students in online charters, the typical academic gains for math are -0.25 standard deviations (equivalent to 180 fewer days of learning) and -0.10 (equivalent to 72 fewer days) for reading."[28]
National (2015)	"Full-time virtual schools continued to lag significantly behind traditional brick-and-mortar schools... The on-time graduation rate (or four-year graduation rate) for full-time virtual schools was nearly half the national average: 43.0% and 78.6%, respectively."[29]
Georgia (2015)	"In 2013–14, none of Georgia's three statewide fully online schools: A) met all of the standardized assessment goals included in their respective charter contracts; or B) outperformed the state on the CCRPI 'achievement' component."[30]
Michigan (2015)	"Cyber enrollments had a 'Completed/Passed' rate of 54%... whereas Non-Virtual Learners had an 89% 'Completed/Passed' rate."[31]
Kansas (2015)	Online students (which included a combination of full-time and supplemental students) performed at similar levels in reading before and after controlling for student demographics, but that online students performed at lower levels in mathematics compared to their face-to-face counterparts.[32]
National (2014)	"Virtual schools' Adequate Yearly Progress results were 22 percentage points lower than those of brick-and-mortar schools... The on-time graduation rates for full-time virtual schools was close to half the national average: 43.8% and 78.6%, respectively."[33]
Colorado (2014)	"Online school performance on state assessments had been lower across all grade levels and content areas than that of its brick and mortar counterparts."[34]

Ohio (2014)	"… [virtual] schools experienced lower student performance than their traditional counterparts."[35]
National (2013)	While 52% of brick-and-mortar district and charter schools met AYP, only 23.6% of virtual schools did the same. [36]
National (2012)	Virtual schools that achieved adequate yearly progress was approximately half the overall public school average (i.e., 27.4% of virtual schools vs. ~52% of public schools).[37]
Arizona (2011)	"…nearly nine of every 10 students enrolled in at least one statewide online course, all had graduation rates and AIMS math passing rates below the state average."[38]
Colorado (2011)	"Half of the online students wind up leaving within a year. When they do, they're often further behind academically then when they started."[39]
Minnesota (2011)	"Compared with all students statewide, full-time online students had significantly lower proficiency rates on the math MCA-II but similar proficiency rates in reading."[40]
Ohio (2011)	"…nearly 97 percent of Ohio's traditional school districts have a higher score than the average score of the seven statewide" online charter schools. Those schools in Ohio also underperformed brick-and-mortar schools in graduation rates.[41]
Pennsylvania (2011)	"In every subgroup with significant effects, cyber charter performance is lower than the brick and mortar performance."[42]
Colorado (2010)	"Online students consistently lag behind those of non-online students, even after controlling for grade levels and [almost every individual] student characteristic"[43]
Idaho (2010)	"Students in virtual charter schools generally achieve proficiency in reading and language arts at lower rates than students in non-charter public schools. Students in virtual charter schools consistently achieve proficiency in mathematics at lower rates than students in non-charter public schools. Students in charter schools generally achieve proficiency at higher rates in all subjects than students in virtual charter schools and non-charter public schools."[44]
Wisconsin (2010)	"Virtual charter school pupils' median scores on the mathematics section of the Wisconsin Knowledge and Concepts Examination were almost always lower than statewide medians during the 2005-06 and 2006-07 school years."[45]
Colorado (2009)	"…demonstrating a sincere commitment to student learning and a consistent effort to increase student achievement. It [was] also evident, however, that some programs [were] falling short of the mark."[46]
Ohio (2009)	Online charter school students experienced significantly lower achievement gains compared to brick-and-mortar charter schools in the state.[47]
Kansas (2007)	Full-time K-12 online students in Kansas scored lower on state assessments than traditional students, particularly in mathematics.[48]
Colorado (2006)	Online student scores in math, reading, and writing have been lower than scores for students statewide over the past three years.[49]

As Table 2.1 illustrates, the evidence in the literature consistently shows that students enrolled in virtual schools perform at lower rates compared to their face-to-face counterparts. The only research that reports positive results in favor of virtual schools have been produced

by advocacy organizations supportive of charter schooling and school choice or the for-profit corporations that operate many of these schools.[50]

However, it should be noted that even advocacy organizations such as Public Impact and the National Association of Charter School Authorizers, as well as organizations that have often used methodologies designed to favor school choice initiatives (such as the Center for Research on Education Outcomes), have all repeatedly found that virtual schools perform at lower levels than brick-and-mortar schools (as seen above in Table 2.1).

In fact, a 2016 report by the National Alliance for Public Charter Schools, the 50-State Campaign for Achievement Now, and the National Association of Charter School Authorizers, entitled *A Call to Action to Improve the Quality of Full-Time Virtual Charter Public Schools,* even stated:

> The well-documented, disturbingly low performance by too many full-time [online and blended] schools should serve as a call to action to state leaders and authorizers across the country. It is time for state leaders to make the tough policy changes necessary to ensure that this model works more effectively than it currently does for the students it serves. It is also time for authorizers to close chronically low-performing virtual charter public schools.[51]

While not presented in the form of a specific recommendation, the authors of the *Call to Action* report also wrote that, "states may need to consider governing full-time virtual charter schools outside of the state's charter school law, simply as full-time virtual charter schools."[52] This was an important acknowledgement – particularly from organizations whose sole purpose was to advocate for increased opportunities for charter schools, in that it recognized that educating a child in a largely independent, often home-based environment was critically different from, and should be regulated differently than, educating a child in a traditional face-to-face, brick-and-mortar school.

Interestingly, the research comparing student performance in supplemental K-12 online learning environments and the traditional classroom has been more mixed than student performance in full-time virtual schools.[53] However, Mulcahy and his colleagues have speculated that weaker students may have been self-selecting a less rigorous curriculum in order to avoid taking online courses.[54] Even when students who are struggling have engaged in supplemental forms of K-12 online learning (e.g., at-risk students engaged in online credit recovery courses and programs), research has found these programs can be at least as effective as other forms of credit recovery, but can actually hinder students' long-term understanding and success.[55] In terms of the supplemental K-12 online student, Rice concluded "that the effectiveness of distance education appears to have more to do with who is teaching, *who is learning*, and how that learning is accomplished, and less to do with the medium" (emphasis added).[56]

While there is ample research into the effectiveness – or lack thereof – of virtual schools, the same cannot be said of blended schools. In fact, to date the NEPC's annual reports represent the only systematic examination of the effectiveness of blended schools (see Table 2.2).

Table 2.2. Summary of research related to the effectiveness of blended schools

Year	Finding
2019	"A total of 44.6% blended schools were rated acceptable. This is the first time in the last two years that blended schools perform less than virtual schools…"[57]
2018	"…43.1% of blended schools received acceptable performance ratings… The graduation rate of 49.5% in blended schools fell far short of the national average of 83%."[58]
2017	"…72.7% acceptable ratings for blended schools… The graduation rate of 43.1% in blended schools fell far short of the national average of 82.3%."[59]
2016	"Blended schools tended to score even lower on performance measures than virtual schools… [Only] five out of 22 independent blended schools (22.7%) had a higher percentage of students rated proficient than the state percentage. The on-time graduation rate (or four-year graduation rate) for full-time blended schools was half the national average: 37.4% for blended schools and 81.0% for the nation as a whole."[60]

Beyond the NEPC's annual reports, the only data related to the effectiveness of blended education focuses on blended learning programs (i.e., to the actions of one or more teachers, but not the whole school),[61] and those study have often been isolated to a single program or failed to include a comparison group. As such, the NEPC annual reports represent the most comprehensive examination of the effectiveness of both blended learning and blended schools currently available in the literature.

Financing Virtual and Blended Schools

In Section III of this report, Huerta, King Rice, and Shafer state that "policy debates persist in some states over how to fund full-time virtual schools, both because of cost differences between virtual and traditional brick-and-mortar schools and because of other policy considerations."[62] One of the difficulties that exists with these debates is the understanding that costs in virtual schools vary widely compared to those in brick-and-mortar schools.[63] But that variance has rarely been documented. For example, Patrick, Myers, Silverstein, Brown, and Watson prepared a report on behalf of iNACOL (i.e., an organization devoted to ensuring that all students have access to blended and online learning opportunities) that examined the funding of virtual schools.[64] The authors outlined the funding that full-time online schools received, the proportion that funding represented in comparison to brick-and-mortar charter schools and in comparison to traditional brick-and-mortar schools, and the average funding traditional brick-and-mortar students received (see Table 2.3).

Table 2.3. Funding of online schools compared to traditional schools in select states

State	2012-13 per pupil funded for online schools	Online school funding compared to funding for brick-and-mortar charter schools	Online school funding as a percentage of average state funding for traditional brick-and-mortar schools	Average per pupil spending in traditional schools across the state
Arizona	$5,759	95%	72%	$7,968
California	$6,468	100%	70%	$9,300
Colorado	$6,462	92%	72%	$8,926
Florida	$5,182	81%	81%	$6,393
Georgia	$4,334	100%	46%	$9,432
Indiana	$5,245	87.5%	55%	$9,479
Iowa	$6,001	100%	62%	$9,748
Kansas	$4,030	100%	40%	$9,972
Louisiana	$8,395	100%	90%	$10,701
Minnesota	$8,807	100%	100%	$8,807
Nevada	$6,700	100%	80%	$8,376
Ohio	$5,745	92%	51%	$11,224
Oregon	$6,304	100%	68%	$9,268
Pennsylvania	$8,992	100%	71%	$12,729
Wisconsin	$6,445	100%	56%	$11,453
Wyoming	$6,500	100%	43%	$15,232

This type of analysis has often formed the foundation for providers of virtual schools themselves, and their main advocacy organizations (i.e., the Donnell-Kay Foundation, the Foundation for Excellence in Education, iNACOL, the Thomas B. Fordham Institute, etc.),[65] to argue that virtual schools should be funded at equal levels to brick-and-mortar education.

Interestingly, almost all of the literature that has examined the actual costs of virtual schools has found the opposite. For example, the Ohio Legislative Committee on Education Oversight reported that considering the actual costs, the five existing virtual schools in the state were able to operate with 65% of the funding provided to traditional public brick-and-mortar schools.[66] Similarly, Dodd reported a virtual school was able to meet Annual Yearly Progress with 65% of the funding provided to traditional schools.[67] Gillis found another virtual school was also able to operate at 65% of traditional funding.[68] Further, Barbour concluded that it only cost between 7% to 16% less to operate one district-based virtual school compared with a traditional school.[69] Finally, it is also worth noting that an analysis of virtual schools in Pennsylvania found that all but one reported "significant surpluses of revenue over expenses and [were] amassing significant net assets."[70] All of this literature has indicated that virtual school costs less to provide than face-to-face instruction.[71] This general finding is also consistent with the literature that examined the cost of or funding provided to supplemental K-12 online learning.[72]

Unfortunately, there has only been a single formal examination of the cost of blended schools. Butler Battaglino, Haldeman, and Laurans, basing their comparison on a national average overall per-pupil cost of $10,000 for traditional brick-and-mortar schools, suggested that the actual cost of virtual schools ranged from $5,100 to $7,700, while the actual cost of blended schools ranged from $7,600 to $10,200. However, they also cautioned that their estimates were expressed:

> ...as ranges rather than precise figures—and we pay ample attention to trade-offs, start-up costs, professional development, and other key variables... [and] much better data on both costs and outcomes will be needed for policymakers to reach confident conclusions related to the productivity and efficiency of these promising new models. [73]

The lack of systematic and independent data in terms of the actual costs of virtual and blended schools could be one of the reasons why policymakers have been largely reluctant in the past to legislate or regulate this issue.

A consideration that is often not discussed is the reality that public education is funded by taxpayers. Parents of students who are enrolled in virtual or blended schools do not pay a lower tax rate, but their children generally receive less per-pupil funding than students enrolled in traditional brick-and-mortar schools. A moral question that should be considered is whether students should be economically disadvantaged based on the form of schooling that they have chosen – for whatever reason. One of the obvious issues raised in the literature is the profit motive of many educational management organizations.[74] It is this potential profiteering, particularly when it represents corporate profits,[75] that has prompted legislators to propose reducing or limiting virtual school per-pupil resource allocations in eight states in 2017 and six states in 2018 (see described in Section III of this report). However, a simple reduction in the per-pupil funding has the potential to create a two-tiered education system if the issue of profiteering from public education funding is not addressed. The examples above from Dodd and Gillis demonstrate how virtual schools operated by for-profit educational management organizations are able to successfully operate with less funding. [76] Based on the analysis presented in Section III of this report, to date it has only been California that has proposed legislation aimed at eliminating profiteering in the virtual school sector. Beyond the issue of corporate profits, Barbour raises a second moral question: Even if a school district can provide an equivalent virtual or blended school experience at 75% of the funding provided for face-to-face instruction, how much better could that virtual or blended school experience could be if it received full funding? [77]

The Virtual School Experience

As the issue of funding is tied to student attendance in virtual schools, it is worthwhile to examine what is known about what it means to "attend" a virtual school. Unfortunately, there is almost a complete absence of research into the nature or quality of curriculum and student experience, nor is there research examining the unstated assumptions about the type of learning provided by the virtual education experience. What we do know about the daily life of a student attending a virtual school is both dated and often based on material pro-

vided by either the corporate educational management organizations themselves or second-hand reviews. For example, a 2005 book chapter describes that upon enrolling in a virtual school, the education process begins when the company "provides each eligible student with a textbook and instructional materials, computer, printer, and reimbursement for Internet connection."[78] Similarly, in a 2003 article in *Education Week*, a company executive reported that "each student enrolled in an online school managed by K12 receives a computer, a printer, and four to six boxes—or 90 pounds—of materials, including workbooks, textbooks, and 'manipulatives' to study language arts, mathematics, science, history, art, and music."[79] Fifteen years later one would expect there to be fewer physical materials, and potentially additional or, at least, somewhat different technology; but there isn't literature to confirm these expectations. The assumption that technology is provided is also not always accurate. In a recent court case in Missouri, a student was assigned to a district-based virtual school, but was not provided with a computer, Internet access, or technology of any kind.[80] The student in question was simply told to travel by bus to the public library where their time on the computer was restricted to two hours per day. As such, it may not be safe to assume that technology is always provided.

However, assuming that there are curricular materials and technology provided, once those items arrived, Klein wrote that "parents structure their days to accomplish the learning tasks required by the CAVA program [i.e., California Virtual Academy, a K12, Inc. managed school], but in accordance with their own beliefs, values, and scheduling priorities. CAVA presents sample daily and weekly schedules online to help parents."[81] Similarly, Connections Academy advised parents that as their child's "learning coach" they were partners with the virtual school's teachers and administrators, and provided guidance from other Connections Academy parents on topics such as: classroom setup, time management, motivation strategies, reward systems, managing multiple students, curriculum planning, students with special challenges, using technology, integrating the roles of parent and coach, and extra credit.[82] Setting aside the fact that this list of topics could easily be taken from the syllabus of some university's teacher education courses, Ohanian also pointed out that "no mention is made of how much time Mom must spend online to print out all the material."[83] Regardless, these examples highlight the reality that the role of the parent, or learning coach, is critical to the instructional model used by these virtual schools.

One of the best descriptions of the instructional model employed by virtual schools came as a part of a Wisconsin Appeals Court decision in the 2006 case of Johnson v. Burmaster. The case was to determine whether the Northern Ozaukee School District, through its operation of the Wisconsin Virtual Academy (WIVA) (a K12, Inc. managed school), was in violation of the state's charter school, open enrollment, and teacher licensing statutes. Judge McCormack wrote:

> The WIVA students, under the direction of their parents, study the materials and complete various assignments to demonstrate their understanding. The parents are provided with instructor's materials to assist the student's learning. The parents check the students' work on their assignments to determine whether the students have mastered the topic. A parent is required to devote four to five hours per day to the student's education…. WIVA's certified teachers… review samples of students' work to assess progress, and hold one

to two twenty- to thirty-minute telephone conferences per month with each student and parent, during which they discuss and assess student progress. They correspond with students via email, and respond to parental requests for assistance via email and telephone. Certified teachers also conduct thirty- to forty-minute interactive online classes using online conferencing software; students participate in such classes two to four times per month.[84]

Based upon this description, the court found that parents were required to teach, and that "a public school, using public funds, that relied upon unlicensed individuals as the primary teachers of the pupils" was contrary to state law.[85] Essentially, the key finding – at least on this point – was that parents were the primary source of instruction for the students enrolled in the virtual school. This finding supported Bracey's earlier assertion that "although enrolled in 'virtual charter schools,' most children receiving the K12 curriculum are home-schooled."[86]

As Judge McCormack described above, the actual virtual school teachers in Wisconsin had biweekly or monthly telephone conferences with each student and parent, conducted weekly or biweekly interactive online classes, corresponded with students via email and responded to parental requests for assistance via email and telephone. This was consistent with Klein's description of another K12, Inc. program in California:

> Face-to-face meetings with families are scheduled once every 45 days. Teachers also monitor attendance and academic progress of the students, support families with instructional and learning needs, and complete report cards. They are responsible for providing parent and student workshops and outings throughout the year that are scheduled according to a traditional school calendar schedule.[87]

The lack of direct contact between the student and teacher in both of these descriptions is likely due to high student-teacher ratios. For example, a K12, Inc. internal memo from 2010 indicated that the student-teacher ratio could range from 60:1 to 72:1 at the elementary and middle school level that, and from 225:1 to 275:1 at the high school level.[88] While not as extreme, in Section I it was reported that virtual schools – such as those managed by K12, Inc. – still had nearly three times as many students per teacher than the national average.[89] This is also assuming there is a virtual school teacher at all. The recent Missouri court case mentioned above revealed that students were assigned to a district-based virtual school, where the school district had contracted with a corporate vendor to provide access to a learning management system and online curriculum, but neither the school district nor the corporate vendor provided a teacher to interact with or monitor the progress of students enrolled in that virtual school. [90]

In addition to the reliance on the parent, guardian, or other family members as a part of the instructional team, virtual schools also rely upon their online curriculum to provide instruction to the student. In her examination of CAVA, Klein described the instructional model of the K12, Inc. curriculum using 18 screenshots to illustrate the steps a student would complete.

- The beginning screen provides an overview of the lesson components that are listed

on the left side; the objectives, notes, materials, and other options on the right side.

- Students are first taught new spelling words. They add these to their ongoing alphabetized collection and then are asked to focus on short vowels and beginning and ending blends. Whiteboards are used for phonemic and spelling pattern practice.

- Next, introductory proofreading is taught with practice in correct sentence punctuation, misspelled word correction, and addition of new words to students' written composition.

- Next, the guided reading selection is used to build vocabulary and comprehension skills. Answers to questions are available along with the audio pronunciation of *Josefina*, keyword definitions, and extension suggestions (e.g., additional reading resources and activities).

- This learning activity strengthens students' understanding of the story and allows for application and creative expression of the concepts that are emphasized.

- The assessment for this lesson is given orally to the students [by their learning coach] in order to determine if they are able to identify and describe the actions of the characters and name story problems and solutions.

- Finally, after the steps detailed above are taken, a read-aloud is recommended to conclude the lesson sequence. It can be completed at any time, as it is a recommended daily activity. A book list is provided for selection considerations.[91]

In this example, it is the learning coach that is responsible for determining if the student has successfully completed the outcomes of the lesson. In other instances, the "curriculum is mastery based so students must achieve 80% on lesson assessments. If necessary, students have the opportunity to go back and spend more time on the lesson in order to retake the exam and pass."[92]

In describing the natural outcome of this cycle, Ohanian wrote:

> Furthermore, the claim that lessons are adapted to the needs of each student is not borne out by the facts. If a student misses more than 20 percent of a lesson assessment, the parent is told the student must repeat the lesson. If the student again misses more than 20 percent, the instruction is to repeat the lesson again. And again. The so-called "needs of each student" is an endless loop of repetition of the same material.[93]

When the K12, Inc. curriculum was first released, one report described the curriculum as "typical worksheet-style computer lessons, with brief bits of animation or sound effects as rewards."[94] When asked by a reporter two years later, one Wisconsin parent uncharitably described the model as Pavlovian, saying that "young kids are being encouraged through technology to run a maze, ring a bell, and eat the cheese."[95] In referencing this quote, Bracey indicated that "although this parent actually means to refer to operant rather than Pavlovian conditioning, the message is clear: the curriculum is not interesting and it promotes a one-size-fits-all approach. The instruction is mechanical and the system does not encourage creativity."[96]

More recently, an article in *School CEO: The School Marketing Magazine,* in a section entitled "The Myth of Personalization," described the process as:

> Students start with a multiple-choice test on the material for the day. The instruction they receive in the lesson depends on which questions they miss on the test. For example, a student who misses two questions about reptiles in a biology lesson will then receive material about reptiles. Another student who misses questions about both reptiles and mammals will spent their lesson on not just reptiles, but also mammals. The material doesn't change per student; students just get more or fewer questions depending on what they get right and wrong. The differentiation only takes into account students' prior knowledge – not their unique needs or learning styles.[97]

This more recent description, almost twenty years after some of the descriptions above, seem to indicate that the instructional model used in the online curriculum remains consistent.

The K12, Inc. curriculum itself is based on the "Core Knowledge approach" by E.D. Hirsch, Jr., designed to impart a "cultural literacy."[98] Hirsch himself wrote that:

> The acculturative responsibility of the schools is primary and fundamental. To teach the ways of one's own community has always been and still remains the essence of the education of our children, who enter neither narrow tribal culture not a transcendent world culture but a national literate culture. For profound historical reasons, this is the way of the modern world. It will not change soon, and it will certainly not be changed by educational policy alone.[99]

The K-12 curriculum thus "emphasizes phonics-based reading and a great book approach in literature [and an early foundation in basic arithmetic]. In social studies, Western culture and history is emphasized."[100] According to Ohanian, this approach runs counter to commonly accepted developmentally appropriate practice, which believes that "that children learn more effectively in environments that allow them to work independently and with each other to construct their own knowledge."[101] Unfortunately, this is one of the only examples in the literature where an assumption about the type of learning provided by the virtual education experience is questioned. While not explicitly stated, many of the assumptions about both the nature of learning and the content of the curriculum in virtual schools are consistent with the assumptions described by Boninger, Molnar, and Saldaña in their recent examination of personalized learning.[102]

There are two main issues with this overall description. The first issue is whether it is an accurate description of the instructional model that is used by all virtual schools. It is important for the reader to notice that with the exception of one court case from 2018 and a single magazine article from 2019, every other piece of literature referenced in this section is a decade or more old. Is the description provided by these dated sources still applicable to the virtual school experience today? Further, in Section I of this report Miron and his colleagues have provided a detailed analysis of various types of virtual schools (i.e., district-based, charter, independent, nonprofit-EMOs, for-profit EMOs, etc.). Is the description above applicable to the virtual school experience in all of these structural variations? Is the descrip-

tion above even applicable to all virtual schools of one specific type (e.g., all for-profit EMO virtual schools)? Unfortunately, there is no available research to answer these questions.

The second issue with this description of virtual education is that policymakers – and the public at large – appear to have simply accepted the nature of this model of taxpayer-funded, virtual education. Virtual schools have consistently produced poor outcomes since researchers have begun to examine their effectiveness. Researchers and those involved in public education have a long history of questioning the efficacy of virtual education for children.[103] Yet, virtual schools continue to proliferate, often due to a lack of regulation (as Huerta and his colleagues describe in Section III of this report). In examining the impact of this model of virtual education on public education, Fulton and Kober (2002) wrote:

> Less attention is paid to how these changes could affect the deeper purposes and principles underlying the… system of public education – in other words, the expectations and ideals that have shaped the… vision of public education for more than a century. These include such purposes as preparing students for life, work, and citizenship, and creating a cohesive society; and such principles as providing universal access and equity in education, and making schools responsive to their local community.[104]

Twenty years ago, Baker warned, "if curriculum and the tools of teaching (let alone schools themselves) are controlled by conglomerates… many of the virtues of public schooling might be lost," there was the potential for "the debasement of education as just another corporate product."[105] Beyond the issues of the effectiveness of the virtual education, or the appropriate levels of funding that it should receive, is a more fundamental question that practitioners, scholars, and – most importantly – policymakers should be asking today. Is the current model of virtual education something we should aspire to for our children?

Research into the Design, Delivery and Support in Virtual and Blended Education

There is a growing body of research into virtual education, and an emerging body of research into blended education. Unfortunately, as Holloway described in the first edition of the *Handbook of Research on Educational Communications and Technology*, "there are excellent studies, but they are limited by short time spans. Since this is the state of educational research in general, it is a magnitude greater for educational technology."[106] Holloway continued this criticism stating, "the entire corpus of research in diffusion and adaption of educational technology seems less rigorous in technique and design and weak in causal findings." Essentially, Holloway was complaining about the fact that the research in the field of educational technology was often focused upon small samples, completed over a short time frame, and lacking in methodological rigor. The same critique can be made about research into virtual and blended education.

In the sole chapter on K-12 virtual and blended education in the *Handbook of Distance Education*, Barbour lamented that:

beyond this body of comparative research, the remaining research has been methodologically limited. Much of it has been qualitative in nature, which can be quite useful for understanding K-12 online learning in a specific setting, but by definition is not generalizable to other jurisdictions. The remainder suffers from issue of over reaching (e.g., interviewing a group of hand picked teachers or developers and using their opinions to generate "best practices").[107]

To illustrate this point, Barbour described two representative studies: one into the effective design of online courses for high school students and one into best practices of online teachers. The first study produced 10, and later seven, principles of effective design for online courses.[108] Those principles were generated based on interviews with six individuals who had designed at least one online course for a single, supplemental virtual school. The researcher did not review the online courses those individuals created to determine whether the interviewees had actually incorporated the principles into their design. The researcher did not examine student performance in online courses that employed the principles compared to those where the principles were absent. The researcher did not interview the teachers who taught the online courses designed by those six individuals, or students who completed those courses, to determine their perceptions of principles or what those stakeholders felt constituted effective design.

Similarly, the second study produced 37 best practices for asynchronous online instruction.[109] Those best practices were generated based on interviews of 16 teachers employed by a single, supplemental virtual school. The 16 teachers were recommended, by the virtual school itself, as being effective based on a review of student evaluations of teaching. The researchers did not observe any of the teachers' online asynchronous instruction to determine if they actually employed the best practices themselves. The researchers did not examine student performance in courses where these best practices were enacted, compared to courses where the best practices were not present.

In both of these examples the researchers collected perception-based data from a single source, a small sample, and a specific geographic focus; with no verification of the opinions being expressed by those surveyed or interviewed. Ironically, both studies intended to report on "effective principles" and "best practices." This is not to suggest that these studies are bad research. Both studies adequately outlined the research problem, situated that problem within the body of literature that existed at the time, described a well-cited methodological plan to collect and analyze data, supported their results with examples from the data, discussed what they found in light of what was known, and provided implications for practice and suggestions for future research. Simply put, these two studies were isolated examples that represent the majority of research into virtual and blended education – case studies.[110] The generalizability of case study research underscores a fundamental misunderstanding of the differences between descriptive and inferential research. Descriptive research is designed to describe a specific group based on the data with no intention of generalizing the findings beyond that group. Inferential research is specific designed to collect data to allow the researcher to make generalized statements beyond the group being studied.[111] In order to conduct effective inferential research, researchers need to include multiple samples, from multiple contexts, over extended periods of time.

While the two examples above reported research conducted on supplemental virtual schools, the research into full-time virtual schools and blended school exhibit similar characteristics. For example, after cautioning readers that the results of their case study should not be generalized, Stevens, Borup, and Barbour recommended four generalized design principles they believed school districts should adopt to increase the readiness of teachers in blended learning environments.112 Conversely, in a case study that explored online instruction of students with disabilities, Crouse, Rice, and Melland couched their conclusions with specific references to "teachers in this study." However, based upon the six interviews conducted as a part of this case study, the authors still concluded their journal article by stating:

> Teachers may also benefit from targeted support that brings forward relevant traditional experience and builds on it for use within an online context. Therefore, teacher preparation programs might consider ways in which partnering and maintaining research relationships with online schools and experiences with students with disabilities will bring more prepared teachers to online learning and provide better support for sustaining these teachers in their work.113

Like the earlier studies focused on the supplemental context, this is not to suggest that these full-time virtual school and blended learning studies are examples of bad research. Only that much of the research is narrow case studies which can not be, should not be, but all too often are, used to draw generalized conclusions.

These examples are also not to suggest that all virtual and blended education research is descriptive in nature. An example of an inferential line of inquiry has been the Adolescent Community of Engagement (ACE) framework, designed to better describe how parents, teachers, and peers can influence online student engagement in the virtual environment. The initial development of the ACE framework began based on studies that used student and parent surveys to measure learning interactions and correlated them with learning outcomes at a single virtual charter school,114 followed by three rounds of data collection at the same virtual school that included teacher surveys and interviews;115 teacher focus groups and interviews, along with student interviews;116 and student and parent interviews.117 Research into the ACE framework was expanded to include data collection at an independent study distance learning program using surveys of students and interviews of students and parents.118 Finally, the ACE framework has been investigated using teacher and local school-based facilitator interviews, as well as student focus groups, in a supplemental virtual school.119 This line of inquiry included multiple rounds of data collection (e.g., surveys, interviews, focus groups, and student learning outcomes), data from various stakeholders (e.g., students, parents, teachers, and local school-based facilitators), in different virtual education contexts (e.g., a virtual charter school, an independent study program, and a state-run supplemental virtual school). These studies have allowed the researchers to refine and rebrand the framework to be the "Academic Communities of Engagement" framework, which focuses more on the actions that can support virtual learners (as opposed to the individual actors).120

From a policy perspective, one of the most striking examples of methodologically limited research guiding policymakers is the adoption of standards to measure the quality of virtual

and blended education. The iNACOL *National Standards for Quality Online Courses* were first released in 2007 based on reviews of existing standards and adopted the Southern Regional Education Board's standards from 2006,[121] with an addition due to iNACOL's involvement with the "Partnership for 21st Century Skills" initiative.[122] Over the next four years, a number of organizations and US states adopted these standards for formal use. iNACOL used feedback from various organizations, particularly the California Learning Resource Network and the Texas Agency's Texas Virtual School Network,[123] to update its existing standards in 2011.[124]

However, in a two-year, three-phase validation study, Adelstein and Barbour were unable to provide significant support for the iNACOL *National Standards for Quality Online Courses* from the research literature or panels of experts, and an application of even a revised version of the standards did not meet the expectations of inter-rater reliability.[125] The standards have been examined against the existing research and have failed that examination. The standards have been analyzed by experts in the field and have been found lacking. The standards have been utilized in a systematic way and found to not be valid. Yet, these methodologically flawed standards have been adopted by several states as a way to measure the quality of K-12 online and blended teaching, courses, and programs.[126] For example, Michigan uses the standards to review courses offered in a statewide virtual schooling catalogue.[127]

The review of research in the *Virtual Schools in the U.S.* reports traditionally focuses on student demographics and performance, finance and governance, instructional program quality, and teacher quality in virtual and blended education.[128] However, as the examples above illustrate, the methodological limitations of the research make it of little value in guiding policy.

The Problematic Nature of Research on Virtual and Blended Education

The lack of useful research that is available to guide policymakers is the responsibility of researchers in the field. While this report is primarily intended for those policymakers, it is important to examine the root of these problems with the research to assist researchers and, eventually, provide better research-based guidance for policymakers. In speaking about the field of distance education in general, Black wrote that:

> [A]lthough isolated studies of distance education in its original forms of correspondence study were undertaken in the early decades of the last century, scholarship in the sense of a sustained, growing body of knowledge generating theory through systematic research, really began in the 1950s."[129] Can the same be said for virtual and blended education? Has the literature moved from isolated studies to "a sustained, growing body of knowledge generating theory through systematic research?

To begin, it is important to outline a structure to examine the field. Graham, Henrie, and Gibbons explained, "well-established scholarly domains have common terminology and widely accepted models and theories that guide inquiry and practice, while researchers in less mature domains struggle to define terms and establish relevant models."[130] Saba out-

lined four specific challenges that fields like virtual and blended education face as they mature: 1) confusing terminology, 2) a lack of historical perspective, 3) the absence of construct validity, and 4) a postmodern turn.[131] The following subsections will briefly examine virtual and blended education research through the lens of these four challenges.

Confusing Terminology

Saba wrote that one of the limitations of the field of distance education in general was "the emergence of terms and phrases in the current literature that have received acceptance among different groups of practitioners, while they remain poorly defined, or undefined."[132] The same can be said of virtual and blended education. As shown in the earlier "Virtual Schools, Cyber Schools, Online Programs, Blended Programs, and Blended Schools" section, the literature has used a variety of terms such as online school, virtual school, cyber school, electronic school, Internet high school, K-12 online learning program, and so on. In some cases multiple terms may refer to the same type of program or school, and in other cases the same terms may refer to very different types of programs or schools. For example, Lueken, Ritter, and Beck published an article in the *Journal of Online Learning Research* entitled "Value-added in a Virtual Learning Environment: An Evaluation of a <u>Virtual Charter School</u>."[133] In the very next issue of the same journal, Borup and Stevens published an article entitled "Factors Influencing Teacher Satisfaction at an <u>Online Charter School</u>" that focused on the same kind of program.[134] Two issues after that, Borup and Stevens report a second study from the same program in an article entitled "Parents' Perceptions of Teacher Support at a <u>Cyber Charter High School</u>."[135] The illustration highlights how a journal with a specific focus on "research related to K-12 online and blended learning,"[136] published three articles over the span of a single year that used three different terms to describe the same type of virtual education. With both virtual learning and blended learning, confusing terminology leads to two problems: 1) researchers either cannot compare the results between studies from two different programs because they simply do not know if the same thing is being compared, and 2) this confusion, along with the potential that important literature may not even be found, leads to a field that fails to build on what is already known.

Lack of Historical Perspective

Saba summarizes this problem when he laments that "reading some of the articles, even in peer-reviewed journals, one comes to the inevitable conclusion that their authors, editors, and reviewers are not familiar with the historical origin and conceptual growth of the field."[137] Ferdig and Kennedy described the problem as researchers, particularly those who were new to the field, often approached virtual and blended instruction as if they were the first to write about their specific topic.[138] They speculated this situation was cause by the fact that scholars published in a wide variety of journals, many of which had nothing to do with virtual learning, distance education, or even educational technology. This observation was supported by Arnesen and her colleagues, who found their sample of 356 K-12 online learning articles came from 155 different journals, 102 of which only published a single article.[139] Additionally, an analysis using the data set provided by Arnesen and her colleagues reveals

10 articles published in 2015 or earlier that had never been cited and an additional 53 articles that had been cited fewer than five times.[140] Many of these 63 articles were authored by some of the most prolific authors in the field, published in journals featuring multiple K-12 online learning articles, and written on topics that were relevant to the field. Hence, there should be no apparent reason why many have not been cited in subsequent research.

It should be noted that the analysis of the historical perspective above was limited to journal articles. Yet, numerous scholars have described how virtual and blended education research available in journals was limited. For example, Barbour and Reeves stated, "much of the literature for virtual schooling has primarily been disseminated through private research centers, evaluations or doctoral dissertations."[141] Lowes and Lin described the various publication outlets in the field as including: journal articles, chapters in edited collections, and increasingly by research organizations; book-length academic studies; program evaluations; guidelines and standards; and popular media articles and reports designed for policy or advocacy purposes.[142] Further, program evaluation has had a significant impact on the early scholarship in virtual education, and continues to exert influence on the growing base of blended education literature.[143] This additional fragmentation of where and how scholarship is published further complicates researchers' ability to situate their own studies within the historical origin and conceptual growth of the field.

Absence of Construct Validity

At its basic level, construct validity is "the degree to which a test measures what it claims, or purports, to be measuring."[144] Unfortunately, within virtual and blended education there has been an absence of validated instruments. As Barbour noted the only systematic efforts to create a validated instrument were the Educational Success Prediction Instrument and the Parental Involvement Mechanisms Model.[145] Since the publication of this report, Graham and his colleagues have also undertaken an initiative to create a validated instrument to measure K-12 teacher readiness for blended learning.[146] As Barbour cautioned, without validated instruments, researchers must create their own instruments for each and every study, and there is no guarantee the instrument will measure what it is designed to measure or how well the instrument will reflect the complete reality of a particular context.[147] Validated instruments are the building blocks for models that can explain specific situations within the virtual and blended education context. "Models... are intended for building a theory of distance education that is inspired by current knowledge, research, and practice. They may be adopted by practitioners to guide program development, implementation, and evaluation."[148] Models also provide policymakers a level of trustworthiness that research can guide legislation and regulation.

The lack of validated instruments has caused a lack of theoretical underpinnings within the research in the field. As Saba explained, "for inclusion of these concepts in a theory of distance education, at the minimum, such constructs must be validated in experimental empirical studies."[149] The lack of validated instruments in virtual and blended education is reflected in the lack of theory development in the field. For example, Barbour wrote that the ACE framework was one of the few lines of original inquiry that has attempted to ground itself

theoretically or conceptually.[150] Barbour also reported that isolated studies that had made use of the existing social presence theory.[151] In a more comprehensive review, Lokey-Vega, Jorrín-Abellán, and Pourreau reported that only 137 of the 790 unique publications, or 17%, contained any reference to one of 26 different theoretical terms (although many would argue that several of the "theoretical terms" were not actual theories).[152] As Lokey-Vega and her colleagues concluded, "the work has just begun as we stretch our field to seek and understand instances of success and test well-supported historically-important distance learning theories, such that we can build a body of best-practice literature founded on theory."[153] Simply put, research in the field of K-12 online and blended learning is largely atheoretical.

Postmodern Turn

In describing the issue of postmodernism, Saba described two different types of post-modernism: 1) European postmodernism, which tends to search for the *different* in a seemingly endless process of deconstructing the components of a particular field; and 2) American postmodernism, which seeks to find relationships among different, even unrelated concepts to generate what we would call a systems approach.[154] The deconstruction of the field of virtual and blended education is probably best illustrated by the fact that the main professional association for practitioners of K-12 online and blended learning (i.e., iNACOL) has a current focus on separating online learning from blended education, and then advocating for a personalized learning approach that is assessed through a competency-based education model using the pedagogical strategies of blended learning.[155] This fragmentation can also be seen in the lack of historical perspective that exists within the research into K-12 online learning that ignores lessons from the research into other forms of K-12 distance education (e.g., instructional film, educational radio, correspondence education, educational television programming, educational satellites, and audiographics or telematics); and K-12 blended learning often ignores lessons from the research into K-12 online learning, as well as the research and literature that focuses on various forms of technology integration. Further, virtual and blended education does not have the basic building blocks (e.g., validated instruments, models/frameworks, theories, etc.) described in the previous subsection to create the explanatory systems that might help us understand the relationship between different aspects of virtual and blended education. This lack of a theoretical perspective to guide research is evidence that virtual and blended education is also lacking from the perspective of an American postmodern approach.

Summary and Recommendations

Over the past decade, the annual NEPC reports have established several trends that have been consistent with the literature in the broader field of K-12 online and blended learning. For example, the literature has consistently shown that students in virtual schools and blended schools generally underperform their brick-and-mortar counterparts. The literature has suggested that virtual schooling – and, to a lesser extent, blended schooling – is more cost effective than brick-and-mortar schooling. But the actual practice of virtual and blended education continues to outpace the availability of useful research, much of which is

methodologically flawed, contextually limited, or suffering from overreaching conclusions. However, even in areas where the literature has provided guidance, legislators and policymakers have consistently failed to pass bills or create regulatory regimes that would provide additional oversight and accountability to online and blended schools.

In this examination of the state of research into K-12 virtual and blended education, it has been suggested that the field is immature. First, there is considerable inconsistency in the way both virtual and blended education are defined and operationalized – often to the point that these terms have become meaningless as a way to provide a shared understanding for the reader. Second, the lack of a consistent terminology, as well as a belief that the medium has defined the starting point for the field, has meant that research has often not built on what is already known in the field, particularly the broader field. Third, there are few examples of validated instruments being used as data collection tools, and few researchers incorporate theory to guide their studies. Finally, the fragmentation of the field due to the confusing terminology that often prevents the historical perspective from being incorporated into research, as well as the absence of the basic building blocks – such as validated instruments and theory – to provide a systems view of the practice of K-12 online and blended learning, has created a postmodern failing. The bottom line is that the field of K-12 online and blended learning is found wanting in all of the measures of a mature discipline.

The current state of K-12 online and blended learning research makes it of little value in guiding policy. Based on this reality, recommendations arising from Section II:

- The growth and geographic reach of full-time, taxpayer-funded virtual schools should be regulated. At present there are serious questions about the effectiveness of many models of virtual schooling. Until these questions can be adequately addressed, policymakers should limit or consider a moratorium on their growth.

- Given the lack of understanding of what is actually happening in virtual education (e.g., the nature of and amount of teaching in the instructional model, the specific curriculum that is used, the learning that occurs, etc.), policymakers should require that any virtual school operating in their jurisdiction be required to provide the necessary information to examine the effectiveness of the virtual education that is actually being provided.

- State and federal policymakers should create long-term programs to support independent research on and evaluation of virtual schooling, particularly full-time virtual schooling. More than twenty years after the first virtual schools began, there continues to be an inadequate research base of empirical, longitudinal studies to guide the practice and policy of virtual schooling.

The first two recommendations focus solely upon virtual schools, and not blended schools, because the research related to K-12 blended learning is still too nascent to provide any guidance. In fact, beyond the past four annual NEPC reports (including this report), there has been little systematic, large-scale examination of K-12 blended learning. However, the findings with respect to blended schools in these reports should also begin to raise similar questions about the effectiveness of many models of blended schooling.

Notes and References Section II

1   Glass, G.V & Welner, K.G. (2011). *Online K-12 schooling in the U.S.: Uncertain private ventures in need of public regulation*. Boulder, CO: National Education Policy Center. Retrieved February 23, 2019, from http://nepc.colorado.edu/publication/online-k-12-schooling, p. i.

2   Miron, G., Shank, C. & Davidson, C. (2018). *Full-time virtual and blended schools: Enrollment, student characteristics, and performance*. Boulder, CO: National Education Policy Center. Retrieved February 23, 2019, from http://nepc.colorado.edu/publication/virtual-schools-annual-2018, p. 40.

3   International Association for K-12 Online Learning. (2011). *The online learning definitions project*. Vienna, VA: Author. Retrieved February 23, 2019, from http://www.inacol.org/wp-content/uploads/2015/02/iNACOL_DefinitionsProject.pdf, p. 7.

4   International Association for K-12 Online Learning. (2011). *The online learning definitions project*. Vienna, VA: Author. Retrieved February 23, 2019, from http://www.inacol.org/wp-content/uploads/2015/02/iNACOL_DefinitionsProject.pdf, p. 5.

5   Barbour, M.K. (2013). The landscape of K-12 online learning: Examining what is known. In M.G. Moore (Ed.), *Handbook of distance education* (3rd ed.) (pp. 574-593). New York, NY: Routledge.

6   This is one of the reasons this report continues to be titled *Virtual Schools in the US: Politics, Performance, Policy, and Research Evidence*, because virtual school had been the dominant term to describe the field in the literature leading up to 2013.

      Molnar, A. (Ed.); Miron, G., Huerta, L., Cuban, L., Horvitz, B., Gulosino, C., Rice, J.K., & Shafer, S.R. (2013). *Virtual schools in the U.S. 2013: Politics, performance, policy, and research evidence*. Boulder, CO: National Education Policy Center. Retrieved February 23, 2019, from http://nepc.colorado.edu/publication/virtual-schools-annual-2013/

7   For example:

      Ahn, J. (2011). Policy, technology, and practice in cyber charter schools: Framing the issues. *Teachers College Record, 113*(1), 1-26;

      Ellis, K. (2008). Cyber charter schools: Evolution, issues, and opportunities in funding and localized oversight. *Educational Horizons, 86*(3), 142-152;

      Mann, B., & Baker, D.P. (2019). Cyber charter schools and growing resource inequality among public districts: Geospatial patterns and consequences of a statewide choice policy in Pennsylvania, 2002–2014. *American Journal of Education, 125*(2), 147-171.

8   For example:

      Klein, C., & Poplin, M. (2008). Families home schooling in a virtual charter school system. *Marriage & Family Review, 43*(3-4), 369-395;

      Torre, D. (2013). Virtual charter schools: Realities and unknowns. *International Journal of E-Learning & Distance Education, 27*(1). Retrieved February 23, 2019, from http://ijede.ca/index.php/jde/article/view/838/1498

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10   Graham, C. R. (2006). Chapter 1: Blended learning system: Definition, current trends, future directions. In C.J. Bonk & C.R. Graham (Eds.), *Handbook of blended learning* (pp. 3-21). San Francisco, CA: Pfeiffer.

11   There are four main models of blended learning: rotation model, flex model, self-blend model, and enriched-virtual model (with the rotation model having four types of rotation: station rotation, lab rotation, flipped classroom, and individual rotation).

The rotation model is one where a program is organized around different learning modalities – one of which is online learning. Students can rotate between different modalities of instruction based on their individual needs (i.e., individual rotation), through each of the stations provides in a single classroom (i.e., station rotation), through different classrooms or labs through the school (i.e., lab rotation), or as a group through a flipped classroom model (i.e., flipped classroom).

The flex model is where students complete most of their instruction online, but may interact with their teacher and/or other students for tutoring, small group instructions or group projects.

The self-blend model is described in a manner that is consistent with supplemental K-12 online learning (i.e., student takes some courses online and some courses in the classroom).

The enriched-virtual model is similar to the self-blend model, except that there is both online and classroom-based instruction in each individual course (i.e., not some course online and some in the classroom).

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Stalker, H., & Horn, M.B. (2012). *Classifying K–12 blended learning*. Redwood City, CA: Innosight Institute. Retrieved February 23, 2019, from http://www.christenseninstitute.org/wp-content/uploads/2013/04/Classifying-K-12-blended-learning.pdf

12   See page 6 of Section I – *Full-Time Virtual and Blended Schools: Enrollment, Student Characteristics, and Performance.*

13   Miron, G. & Urschel, J.L. (2012). *Understanding and improving full-time virtual schools: A study of student characteristics, school finance, and school performance in schools operated by K12 Inc.* Boulder, CO: National Education Policy Center. Retrieved February 23, 2019, from http://nepc.colorado.edu/publication/understanding-improving-virtual

14   For a more descriptive summary of the findings, as well as potential ideological bias of almost all of these studies, see:

Barbour, M.K., Mann, B., & Melchior, S. (2018). *CASTLE Brief No. 2 – A virtual shortfall: How full-time online learning models are not living up to the promise.* Denver, CO: University Council for Educational Administration's Center for the Advanced Study of Technology Leadership in Education. Retrieved February 23, 2019, from https://static1.squarespace.com/static/528fd1d3e4b023ca755e1561/t/5c51dfe340ec9aeb-41f03940/1548869604563/2018+-+CASTLE+Brief+02+-+Barbour+Mann+Melchior.pdf

15   See pages 3-4 of Section I – Full-Time Virtual and Blended Schools: Enrollment, Student Characteristics, and Performance.

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22   Ahn, J., & McEachin, A. (2017). Student enrollment patterns and achievement in Ohio's online charter schools. *Educational Researcher, 46*(1), 44-57.

23   National Alliance for Public Charter Schools, 50-State Campaign for Achievement Now, & National Association of Charter School Authorizers. (2016). A call to action to improve the quality of full-time virtual charter public schools. Washington, DC: Authors. Retrieved February 23, 2019, from http://www.publiccharters.org/wp-content/uploads/2016/06/Virtuals-FINAL-06202016-1.pdf, p. 4.

24   Miron, G., & Gulosino, C. (2016). *Virtual schools report 2016: Directory and performance review*. Boulder, CO: National Education Policy Center. Retrieved February 23, 2019, from http://nepc.colorado.edu/publication/virtual-schools-annual-2016, p. 5.

25   Freidhoff, J. R. (2016). *Michigan's K-12 virtual learning effectiveness report 2014-15*. Lansing, MI: Michigan Virtual University. Retrieved February 23, 2019, from https://mvlri.org/research/publications/michigans-k-12-virtual-learning-effectiveness-report-2014-15/

26   Ahn, J. (2016). *Enrollment and achievement in Ohio's virtual charter schools*. Washington, DC: Thomas B. Fordham Institute. Retrieved February 23, 2019, from https://edexcellence.net/publications/enrollment-and-achievement-in-ohios-virtual-charter-schools, p. 9.

27   Potts, K., & Donaldson, P. (2016). *Legislative brief: Virtual schools in Tennessee*. Nashville, TN: Offices of Research and Education Accountability. Retrieved February 23, 2019, from https://web.archive.org/web/20180803005205/https://www.comptroller.tn.gov/repository/RE/Virtual%20Schools%202016.pdf, p. 2.

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This is not to suggest that research conducted by virtual school corporations or their advocacy organizations

represents poorly conducted research. For example, Pearson Education released a report examining student outcomes at Connection Academy schools where the methods were independently peer reviewed by SRI International, while the raw data and data analysis were independently audited by PricewaterhouseCoopers LLP (Pearson Education, 2018). Further, Choi and Walters (2018) chose to publish the results of their exploration of discourse as a pedagogical strategy for mathematical problem solving in a peer reviewed journal. However, it is also important to acknowledge what has been described as the 'developer effect,' which Wolf et al. (2019) outlined in their examination of approximately 170 studies since 1984 from the What Works Clearinghouse. These researchers found studies that had been conducted or funded by the creator of the intervention often found greater benefits for students than research in truly independent studies.

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Table 2. Summary of research related to the effectiveness of supplemental K-12 online learning

Study	Finding
Ballas & Belyk (2000)	Performance of virtual and classroom students in Alberta were similar in English and Social Studies courses, but that classroom students performed better overall in all other subject areas
Bigbie & McCarroll (2000)	Over half of the students who completed FLVS courses scored an A in their course and only 7% received a failing grade
Barker & Wendel (2001)	Students in the six virtual schools in three different provinces performed no worse than the students from the three conventional schools
Cavanaugh et al. (2005)	FLVS students performed better on a non-mandatory assessment tool than students from the traditional classroom
McLeod et al. (2005)	FLVS students performed better on an assessment of algebraic understanding than their classroom counterparts
Barbour & Mulcahy (2008)	Little difference in the overall performance of students based upon delivery model
Barbour & Mulcahy (2009)	No difference in student performance based upon method of course delivery

Chingos & Schwerdt (2014)	FLVS students perform about the same or somewhat better on state tests once their pre-high-school characteristics are taken into account.

Ballas, F.A., & Belyk, D. (2000). *Student achievement and performance levels in online education research study*. Red Deer, AB: Schollie Research & Consulting. Retrieved February 23, 2019, from http://web.archive.org/web/20051031044348/http://www.ataoc.ca/files/pdf/AOCresearch_full_report.pdf;

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McLeod, S., Hughes, J.E., Brown, R., Choi, J., & Maeda, Y. (2005). *Algebra achievement in virtual and traditional schools*. Naperville, IL: Learning Point Associates.

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Mulcahy, D.M., Dibbon, D., & Norberg, C. (2008). *An investigation into the nature of education in a rural and remote region of Newfoundland and Labrador: The Straits*. St. John's, NL: The Harris Centre, Memorial University of Newfoundland;

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Table 3. Methodological issues with the supplemental K-12 online learning samples in comparative studies

Study	Sample
Ballas & Belyk (2000)	Participation rate in the assessment among virtual students ranged from 65% to 75% compared to 90% to 96% for the classroom-based students
Bigbie & McCarroll (2000)	Between 25% and 50% of students had dropped out of their FLVS courses over the previous two-year period
Cavanaugh et al. (2005)	Speculated that the virtual school students who did take the assessment may have been more academically motivated and naturally higher achieving students
McLeod et al. (2005)	Results of the student performance were due to the high dropout rate in virtual school courses

Table 4. Description of supplemental K-12 online learner from the research

Study	Sample
Kozma et al. (1998)	Vast majority of VHS students in their courses were planning to attend a four-year college
Espinoza et al., 1999	VHS courses are predominantly designated as 'honors,' and students enrolled are mostly college bound
Haughey & Muirhead (1999)	Preferred characteristics include the highly motivated, self-directed, self-disciplined, independent learner who could read and write well, and who also had a strong interest in or ability with technology
Roblyer & Elbaum (2000)	Only students with a high need to control and structure their own learning may choose distance formats freely
Clark et al. (2002)	IVHS students were highly motivated, high achieving, self-directed and/or who liked to work independently
Mills (2003)	Typical online student was an A or B student
Watkins (2005)	45% of the students who participated in e-learning opportunities in Michigan were either advanced placement or academically advanced students

Ballas, F.A., & Belyk, D. (2000). *Student achievement and performance levels in online education research study*. Red Deer, AB: Schollie Research & Consulting. Retrieved February 23, 2019, from http://web.archive.org/web/20051031044348/http://www.ataoc.ca/files/pdf/AOCresearch_full_report.pdf;

Bigbie, C., & McCarroll, W. (2000). *The Florida high school evaluation 1999-2000 report*. Tallahassee, FL: Florida State University;

Cavanaugh, C., Gillan, K.J., Bosnick, J., Hess, M., & Scott, H. (2005). *Succeeding at the gateway: Secondary algebra learning in the virtual school*. Jacksonville, FL: University of North Florida;

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Espinoza, C., Dove, T., Zucker, A., & Kozma, R. (1999). *An evaluation of the Virtual High School after two years in operation*. Arlington, VA: SRI International. Retrieved February 23, 2019, from http://web.archive.org/web/20060221213716/http://ctl.sri.com/publications/downloads/evalvhs2yrs.pdf;

Haughey, M., & Muirhead, W. (1999). *On-line learning: Best practices for Alberta school jurisdictions*. Edmonton, AB: Government of Alberta. Retrieved February 23, 2019, from http://web.archive.org/web/20040322033301/http://www.phrd.ab.ca/technology/best_practices/on-line-learning.pdf;

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Mills, S. (2003). Implementing online secondary education: An evaluation of a virtual high school. In C. Crawford et al. (Eds.), *Proceedings of society for information technology & teacher education international conference 2003* (pp. 444-451). Chesapeake, VA: Association for the Advancement of Computing in Education;

Watkins, T. (2005). *Exploring e-learning reforms for Michigan: The new educational (r)evolution*. Detroit, MI: Wayne State University. Retrieved February 23, 2019, from http://web.archive.org/web/20051208000848/http://www.coe.wayne.edu/e-learningReport.pdf;

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the field. In M.G. Moore & W.C. Diehl (Eds.), *Handbook of distance education* (4th ed.) (pp. 521-542). New York, NY: Routledge, p. 528.

Table 5. Research into student performance in online credit recovery

Study	Finding
Hughes et al. (2015)	Likelihood of a student earning a grade of C or better was higher when a course was taken online than when taken face-to-face
Heppen et al. (2016)	Students stated online course more difficult and had more negative attitudes about mathematics
	Online students had lower algebra assessment scores, grades, and credit recovery rates
	Long-term outcomes were not significantly different
Stevens et al. (2016)	Less than 60% of online students received passing grade
	Online students had lower passing rates than those who take multiple courses in a semester
Stallings et al. (2016)	Little difference between success rates of online credit recovery and other credit recovery options
	Online students who did not subsequently drop out were more likely than other credit recovery students to graduate on time

Heppen, J., Allensworth, E., Sorensen, N., Rickles, J., Walters, K., Taylor, S., Michelman, V., & Clements, P. (2016). *Getting back on track: Comparing the effects of online and face-to-face credit recovery in algebra I*. Chicago, IL: American Institute for Research. Retrieved February 23, 2019, from http://www.air.org/sites/default/files/downloads/report/Online-vs-F2F-Credit-Recovery.pdf;

Hughes, J., Zhou, C., & Petscher, Y. (2015). *Comparing success rates for general and credit recovery courses online and face to face: Results for Florida high school courses*. Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southeast. Retrieved February 23, 2019, from http://ies.ed.gov/ncee/edlabs/regions/southeast/pdf/REL_2015095.pdf;

Stallings, D.T., Weiss, S.P., Maser, R.H., Stanhope, D., Starcke, M., and Li, D. (2016). *Academic outcomes for North Carolina virtual public school credit recovery students*. Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southeast. Retrieved February 23, 2019, from http://ies.ed.gov/ncee/edlabs/regions/southeast/pdf/REL_2017177.pdf;

Stevens, D., & Frazelle, S. (2016). *Online credit recovery: Enrollment and passing patterns in Montana Digital Academy courses*. Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Northwest. Retrieved February 23, 2019, from http://ies.ed.gov/ncee/edlabs/regions/northwest/pdf/REL_2016139.pdf;

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