To: Colorado School District Superintendents, Colorado State Board of Education Members, Local District School Board Members, and Colorado Legislators
From: A+ Colorado and Education Reform Now
Date: May 14, 2020
Subject: Memorandum on Online, Virtual Education Programs

Overview: Online, Virtual Education Programs

Educators globally are navigating an unprecedented situation of delivering academic and nonacademic content to students remotely. Distance learning is not new, but the scale is vast and all communities are confronting how to effectively support students. In this context, it is not surprising that Colorado educators and districts may be turning toward current online education providers to either supplement or replace previous curriculum. Students and families may be making decisions to switch from their previous school to online, virtual programs[1]. Additionally, recently announced federal competitive grants encourage the creation of virtual schools.

Online, virtual programs are inevitable and decisions regarding learning environments moving forward require nuanced consideration of the variability of outcomes, limitations of these models, and the disproportionate impact these programs have on highly-impacted communities. Indeed, given the novelty of remote learning, few rigorous studies exist to assess the efficacy of this type of learning[2]. Based upon these stark realities, we have summarized some of the research that exists and make recommendations to offer quality, student-centered online, virtual programming for the next school year.

We explore the following themes in the research:
- [Student Experiences in Online, Virtual Programs](#)
- [Impact of Online, Virtual Programs on Student Learning](#)
- [Variability of Outcomes in Online, Virtual Programs Nationally](#)
- [Emerging Lessons in Successful Online, Virtual Programs](#)
- [Outcomes in Online, Virtual Programs in Colorado](#)
- [Governance of Online, Virtual Programs](#)

Key findings and emerging lessons learned include:
- Student experience is vastly different in virtual schools as compared to brick-and-mortar schools. It is therefore important that the state ensure that schools are tracking student interactions and engagement with synchronous

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[1] Cavanaugh et al. (2009) identified three main types of online programs currently operating at the K–12 level: (1) statewide supplemental programs (an online school that supports face-to-face classes), (2) district-based programs (an online school operated by the school district—could be a single-district or multidistrict program), and (3) cyber charter schools (virtual schools that act as their own school district). Cavanaugh, C., Barbour, M. K., & Clark, T. (2009). Research and practice in K–12 online learning: A review of literature. *International Review of Research and Open and Distance Learning, 10*(1).

[2] Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). *Evaluation of evidence based practices in online learning: A meta-analysis and review of online learning studies*. Washington, DC: U.S. Department of Education.

instruction, tracking assignment completion and activity online, and integrating students who struggle to access and utilize online programming.

- The research regarding the impacts from online, virtual programs is at best mixed and largely negative. This is particularly true for students of color, students with disabilities, and other vulnerable student populations. School districts and policymakers at all levels must pay particular attention to the impact of online, virtual programs for these students.
- There is some variability in outcomes for students in online schools which suggests important differences in online experiences and quality. The research indicates that prioritizing opportunities for synchronous learning is important for the vast majority of students in our K-12 system. Additionally, online, virtual programs should offer rigorous coursework that may exceed standard scope and sequence instruction.
- There is a need for tighter oversight into remote learning, both to strengthen our collective understanding of what works in online settings and to set expectations for student learning through online delivery.
- We strongly recommend the development of a learning agenda to ensure students are supported equitably and successfully through online, virtual programs.

During this mandated time of distance learning, and as schools and districts likely continue to grapple with the need to deliver instruction remotely, it is important that we ensure high quality learning experiences for each Colorado student.

Student Experiences in Instruction in Online, Virtual Programs

Research confirms that that student experience is very different in virtual schools as compared to brick-and-mortar schools. Research by Mathematica shows that "students in the typical online charter school have less synchronous instructional time in a week than students in a brick and mortar school have in a day," meaning that student-teacher interactions are very different in online school settings than in face-to-face instruction. Indeed, the median instructional time students spend with teachers at the elementary level was 4 hours per week, and 3 hours per week at the middle and high school level. Seventeen percent of online high schools offered no synchronous instructional time, and a plurality (23%) of online high schools offered 0.1 to 2 hours in synchronous instruction per week.[3] In a separate study of the North Carolina Virtual Public School, Ingerham (2012) found the students in the study primarily interacted with course content over student-teacher or student-student interactions,

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[3] Gill, B., Walsh, L., Smither Wulsin, C., Matulewicz, H., Severn, V., Grau, E., Lee, A., Kerwin, T. (2015). "Inside Online Charter Schools: A Report of the National Study of Online Charter Schools." Cambridge, MA: Mathematica Policy Research. Retrieved April 27, 2019 from https://www.mathematica.org/our-publications-and-findings/publications/inside-online-charter-schools, 11.

there was significant idle time, and many students navigated to other websites either simultaneously or alternatively to the online, virtual platform.[4]

And while this synchronous instruction is provided, The National Education Policy Center at the University of Colorado Boulder finds 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."[5] Indeed, in Mathematica's review, student attendance in synchronous instruction was monitored in only 58% of schools. Instead, most online schools monitored student engagement and participation through course assignments and activity in the online system.[6] Information about curriculum is even thinner. A vast majority use curriculum provided by an external provider or from their affiliated network, but there is little research on the specific curriculum. The importance of tracking student participation and engagement in online, virtual programming is significant - teacher-student interactions, the number of times a student logs on, and the length of time a student spends within the virtual platform greatly impact student performance.[7]

Taken together these findings suggest that in understanding student experience through remote learning, either provided by current online schools, or in district's own distance learning, it is important that the state ensure that schools are tracking student interactions with synchronous instruction, and/or tracking assignment completion and activity in online resources. Both of these can help schools, districts, and the state understand which students are receiving online instruction and engaging with work. This is particularly important given findings that principals of online schools find student engagement to be their biggest challenge.[8]

The Impact of Online, Virtual Programs on Student Learning

The research around the impact of online schooling on learning is at best mixed, and largely negative. A study by CREDO that compares online students to their "virtual twin" in a brick and mortar school, finds that average academic gains of online students in math are -.25 standard deviations below the average academic gains of students in face-to-face instruction, and -.10 standard deviations in reading. The authors calculate that this is equivalent to online students receiving 180 fewer days of learning in math,

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[4] Ingerham, L. (2012). Interactivity in the online learning environment: A study of users of the North Carolina virtual public school. *Quarterly Review of Distance Education, 13*(2), 65-75.

[5] Molnar, A., Miron, G., Elgeberi, N., Barbour, M.K., Huerta, L., Shafer, S.R., Rice, J.K. (2019). Virtual Schools in the U.S. 2019. Boulder, CO: National Education Policy Center. Retrieved April 27, 2019 from http://nepc.colorado.edu/publication/virtual-schools-annual-2019. (41).

[6] Gill et al. (2015). "Inside Charter Schools." Mathematica Policy Research, 21.

[7] Liu, F., & Cavanaugh, C. (2012). Factors influencing student academic performance in online high school Algebra. Open Learning: The Journal of Open, Distance and e-Learning, 27(2), 149–167; Roblyer, M. D., Davis, L., Mills, S., Marshall, J., & Pape, L. (2008). Toward practical procedures for predicting and promoting success in virtual school students. American Journal of Distance Education, 22(2), 90–109.

[8] Gill et al. (2015). "Inside Charter Schools." Mathematica Policy Research, 35.

and 72 fewer days of learning in reading, compared to their peers receiving in-person instruction. In looking at students in Colorado specifically, the study found only slightly less severe results, where the state's online students' academic growth was on average -.19 standard deviations in math and -.07 standard deviations in reading from in-person peers.[9]

A report from the Thomas B. Fordham institute uses a different methodology to look at the impact of online schools on student learning. The study focuses solely on students in Ohio, and rather than looking at growth, looks at the achievement of students on content assessments, controlling for students' prior assessment performance. Holding all else equal, including prior achievement, the Ohio study also finds that students in online school perform worse than students attending brick and mortar schools.[10]

In assessing access to online coursework in Florida, researchers find mixed evidence on students' performance in virtual versus face-to-face classes, and little evidence that online courses were a viable strategy to close yawning achievement gaps in the state.[11] Furthering this line of understanding, a randomized study of outcomes for high school students in Chicago found that students who took an online credit-recovery course for Algebra I fared worse than those students who took a face-to-face Algebra I credit-recovery course, and were less likely to recover credit than their in-person peers.[12]

Finally, virtual online opportunities negatively impact students of color, students with disabilities, and other vulnerable student populations. For example, the lack of culturally responsive course content and the lost opportunities for social interaction among highly-impacted communities negatively impacts student outcomes.[13] Additionally, given the lack of structure and hands-on support to assist in learning, online, virtual programs depend on significant care-giver participation to ensure students receive vital instruction in a virtual environment.[14] For students with disabilities

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[9] Woodworth, J., Raymond, M., Chirbas, K., Gonzalez, M., Negassi, Y., Snow, W., Van Donge, C. (2015). "Online Charter School Study." Stanford, CA: Center for Research on Education Outcomes (CREDO). Retrieved April 27, 2020 from https://credo.stanford.edu/publications/online-charter-school-study. 23-26.

[10] Ahn, June. (2016). Enrollment and Achievement in Ohio's Virtual Charter Schools. Thomas B. Fordham Institute. Retrieved April 27, 2020 from https://fordhaminstitute.org/national/research/enrollment-and-achievement-ohios-virtual-charter-schools, 32.

[11] Brian Jacob, Dan Berger, Cassandra Hart, & Susanna Loeb. (2016). Can Technology Help Promote Equality of Educational Opportunities? *RSF: The Russell Sage Foundation Journal of the Social Sciences, 2(*5), 242-271. doi:10.7758/rsf.2016.2.5.12 (266)

[12] Heppen 2017 Jessica B. Heppen, Nicholas Sorensen, Elaine Allensworth, Kirk Walters, Jordan Rickles, Suzanne Stachel Taylor & Valerie Michelman (2017) The Struggle to Pass Algebra: Online vs. Face-to-Face Credit Recovery for At-Risk Urban Students, Journal of Research on Educational Effectiveness, 10:2, 272-296, DOI: 10.1080/19345747.2016.1168500

[13] Kumi–Yeboah, A., Dogbey, J., & Yuan, G. (2018) Exploring factors that promote online learning experiences and academic self-concept of minority high school students, *Journal of Research on Technology in Education, 50(*1), 1-17. doi: 10.1080/15391523.2017.1365669

[14] Alamri, A., & Tyler-Wood, T. (2017). Factors affecting learners with disabilities-instructor interaction in online learning. Journal of Special Education Technology, 32(2), 59-69; Hasler Waters, L., & Leong, P. (2014). Who is

and families managing multiple roles within the home, the need for parent training and participation to shift from the role of parent to teacher is untenable.[15] More importantly, data regarding student outcomes has limited applicability to students with disabilities due to certain methodological concerns (e.g. failure to consider IEP goals/objectives/accommodations, failure to adequately track the use of accommodations embedded in the online program, and limited use of accommodations required by IEPs).[16]

Variability in Outcomes in Online, Virtual Programs Nationally

Yet there is some variability in outcomes for students in online schools, pointing out that there are important differences in online experiences and quality. For example, the National Education Policy Center's findings by and large show the poor performance of online schools. The researchers do find that in Colorado, of the 23 virtual schools that received an accountability rating, 57% were rated unacceptable, and 43% were rated acceptable. When looking nationally, the researchers were able to break down ratings more granularly based on school governance model (something they were broadly unable to do in Colorado given the smaller sample size and limited number of schools that received ratings). Nationally, NEPC finds that district-operated online schools were more likely to receive acceptable accountability ratings than charter-operated online schools. More schools without involvement of Education Management Operators (EMOs) received acceptable ratings (59%) compared to schools with EMO involvement (50%). More striking was that only 30% of schools nationally operated by a for-profit organization received an acceptable accountability rating by the state in which they operated. This is particularly important to understand because schools that were part of an education management organization (both for-profit and nonprofit) tend to enroll more students than district-run online schools; EMOs operate 34% of virtual schools across the country, and enroll nearly 65% of all online students. K12 and Connections, two of the largest EMO providers enrolled 30% of all online students in 2017-18. [17]

Additionally, the CREDO study points to variability in online schools. Two-thirds of online charter schools showed significantly weaker results in reading compared to their brick-and-mortar peers. In another 32% of online schools, the school quality as

teaching? New roles for teachers and parents in cyber charter schools. *Journal of Technology and Teacher Education, 22*(1), 105–128.

[15] Smith, S. J., Burdette, P. J., Cheatham, G. A., & Harvey, S. P. (2016). Parental role and support for online learning of students with disabilities: A paradigm shift. J*ournal of Special Education Leadership, 29*(2), 101-112.

[16] Connell, M. W., Johnston, S. C., Hall, T. E., & Stahl, W. (2017). Disconnected data: The challenge of matching activities to outcomes for students with disabilities in online learning. *Journal of Online Learning Research, 3*(1), 31-54.

[17] Molnar, A. et. al (2019). "Virtual Schools in the U.S. 2019," National Education Policy Center. 20, 32-36.

measured by student growth was no different than in brick and mortar schools. Only 2% of online schools were significantly stronger than their brick and mortar counterparts. In math there was less variability: 87% of online schools were significantly weaker than the brick-and-mortar comparison group, and 13% were no different. No schools saw significantly stronger outcomes for students in math.[18]

Emerging Lessons in Successful Online, Virtual Programs

The research on broad outcomes for students in online settings is dismaying given the necessity of remote learning during our current public health crisis. In looking for promising research and practices, there are some emerging lessons. One is that, according to NEPC research blended schools seemed to support students toward important learning outcomes more-so than did online schools; for example, the graduation rate for blended learning schools was over ten points higher (62%) than virtual schools (50%).[19] This could suggest that combining remote learning with in-person instruction is important, and could provide some guidance on how districts should think through continued remote learning. Taken alongside findings of the limited synchronous instruction in online schools, the benefit of discourse in online learning[20], and the strong likelihood that blended learning likely has more synchronous instruction than completely online schools, **prioritizing opportunities for synchronous learning is likely important for the vast majority of students in our K-12 system.**

Some positive research around online schooling has pointed to increased access for students. A study of eighth-grade students in Maine and Vermont showed that students who took an online Algebra I class scored higher on the assessment of algebra skills than those attending schools without the online program and who only had access to the standard eighth-grade curriculum delivered in person. Students who took the online Algebra I course were also more likely to take advanced math courses in the future as compared to students without access.[21] A strong takeaway is the importance, and opportunity, of **facilitating student access to more rigorous coursework** than might be offered through standard scope and sequence.

[18] Woodworth, J. et al (2015). "Online Charter School Study." CREDO, 35-36.
[19] Molnar, A. et. al (2019). "Virtual Schools in the U.S. 2019," National Education Policy Center. 36.
[20] Choi, J. & Walters, A. (2018). Exploring the impact of small-group synchronous discourse sessions in online math learning. Online Learning, 22(4), 47-64. Retrieved May 5, 2020 from https://olj.onlinelearningconsortium.org/index.php/olj/article/view/1511/428
[21] Heppen, J. B., Walters, K., Clements, M., Faria, A., Tobey, C., Sorensen, N., & Culp, K. (2012). Access to Algebra I: The effects of online mathematics for grade 8 students (NCEE 2012–4021). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved April 30, 2020 https://ies.ed.gov/ncee/wwc/Docs/QuickReview/algebra_032712.pdf

Outcomes in Online, Virtual Programs in Colorado

As previously stated, studies find that student outcomes in online schools in Colorado are lower than in brick and mortar schools. CREDO found that the state's online students' academic growth was lower compared to in-person peers.[22] NEPC found that the majority of online schools with data on student outcomes in Colorado received unacceptable ratings.[23] Recent data affirms these findings that outcomes for students in online, virtual schools tend to be lower than outcomes for students in in-person settings; in 2019, on average, online schools earned 56% of eligible SPF points on Colorado's School Performance Framework compared to non-online schools that earned, on average, 63% of eligible SPF points.[24]

It is also helpful to explore assessment results in online, virtual schools compared to results in brick and mortar schools. A caveat when exploring this data is the participation rate; participation in state required assessments that helps educators, policymakers, and the public compare student mastery of academic content, is generally lower in online schools than in brick-and-mortar schools. In 2019, about 63% of students in grades 3-8 in online schools participated in the Colorado Measures of Academic Success (CMAS) assessment compared to 95% of their peers in brick-and-mortar schools. There is wide variation in those participation rates; most schools see participation rates between 31% and 85%.[25]

Figures 1 and 2 show that, when looking at CMAS results in both English Language Arts and in Math, students, on average, score lower than their peers in non-online schools. CMAS scores are also aligned with "performance levels" that help make sense of the scores. In English Language Arts, the average score for students in non-online schools has increased from 740 in 2016 to 744 in 2019, inching slowly toward 750, the cut score for Meeting Expectations on the tested grade level standards. For students in online schools, scores have also increased from 725 which is the cut score between Level 2 (Partially Meeting Expectations) and Level 3 (Approaching Expectations) in 2016 to 728 in 2019. The relative pattern holds in Math, though average scores are lower than in English Language Arts in both in-person and online schools, and improvement has been

[22] Woodworth, J. et al (2015). "Online Charter School Study." CREDO, 23-26.
[23] Molnar, A. et. al (2019). "Virtual Schools in the U.S. 2019," National Education Policy Center. 20, 32-36.
[24] Analysis by A+ Colorado, based on final School Performance Frameworks released publicly by the Colorado Department of Education.
[25] Analysis by A+ Colorado, based on data from the Colorado Department of Education. This range refers to the interquartile range of participation rates, meaning that a quarter of schools saw participation rates below 31%, half of schools saw participation rates between 31% and 85%, and a quarter of schools had participation rates higher than 85%.

slower. The average student in in-person schools scores within Performance Level 3; the average student in online, virtual schools scores within Performance Level 2.[26]

Figure 1: Average Student Scores on CMAS English Language Arts in Brick-and-Mortar Schools Compared to Online Schools in Colorado

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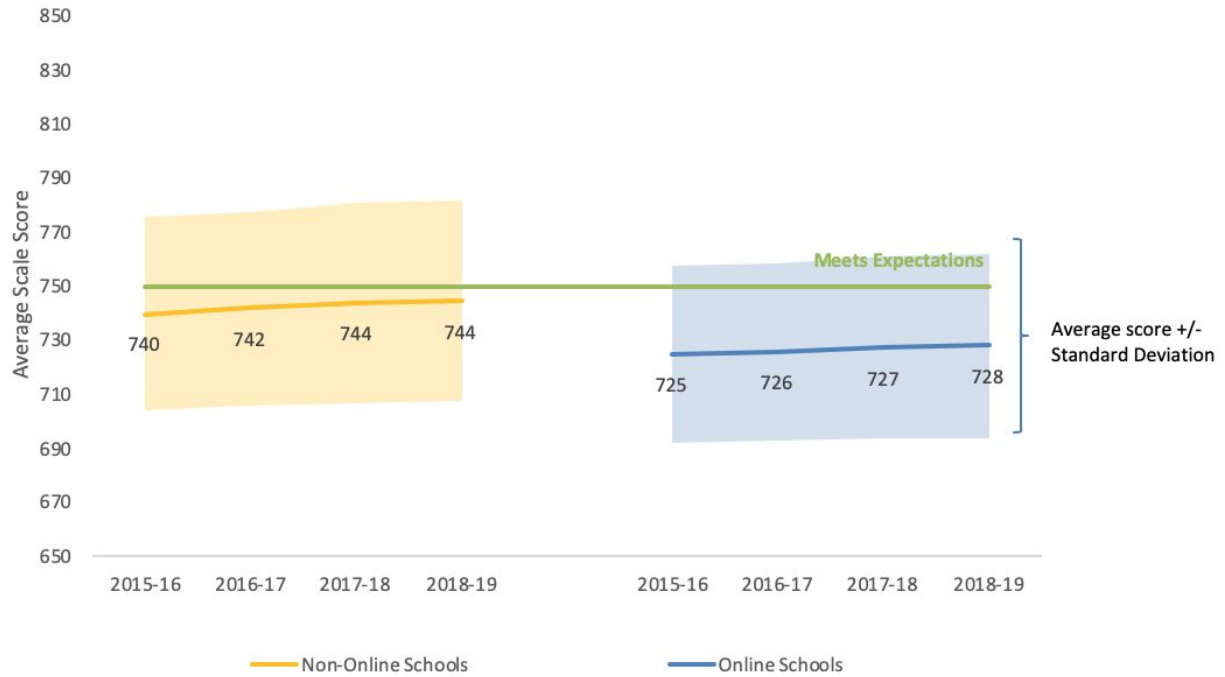
[26] Analysis by A+ Colorado, based on data accessed through the Colorado Department of Education's Data Lab tool. Retrieved May 1, 2020.

Figure 2: Average Student Scores on CMAS Math in Brick-and-Mortar Schools Compared to Online Schools in Colorado
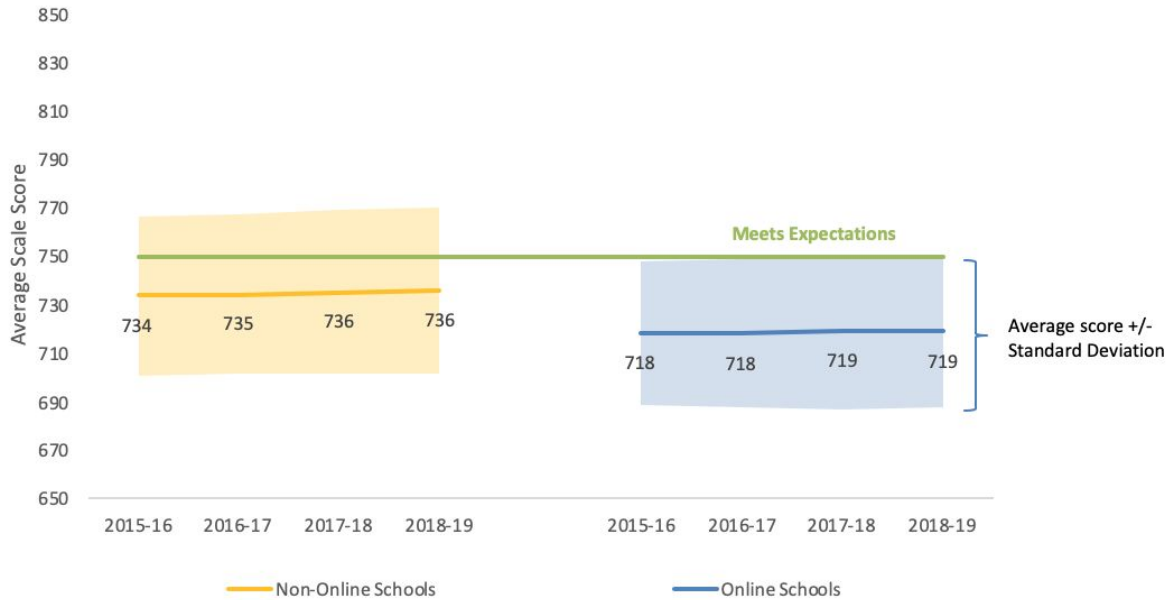
Though scores tend to be lower in online, virtual schools in Colorado than in brick-and-mortar schools in the state, there is also variability in those outcomes. Figure 3 shows that average scores in English Language Arts in online schools in 2019 range from 696 (Level 1: Did Not Meet Expectations) to 755 (Level 4: Meeting Expectations) and higher than scores in the average brick-and-mortar school. In Math, the ends of the range are similar; however the range of average scores in virtual online schools is lower, narrower and more tightly clustered, as seen in Figure 4.[27]

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[27] Analysis by A+ Colorado, based on data from the Colorado Department of Education.
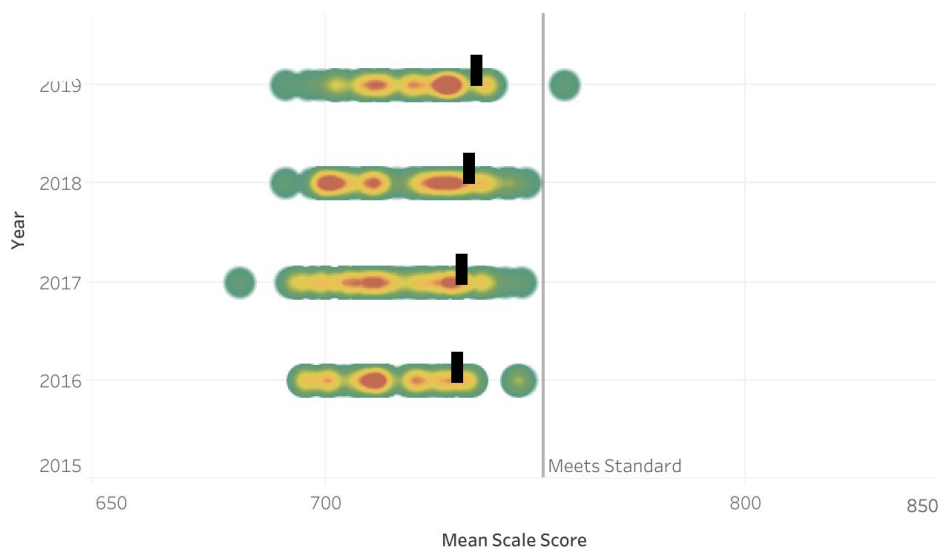
Figure 3: Average Student Scores in CMAS English Language Arts in Each Online School in Colorado
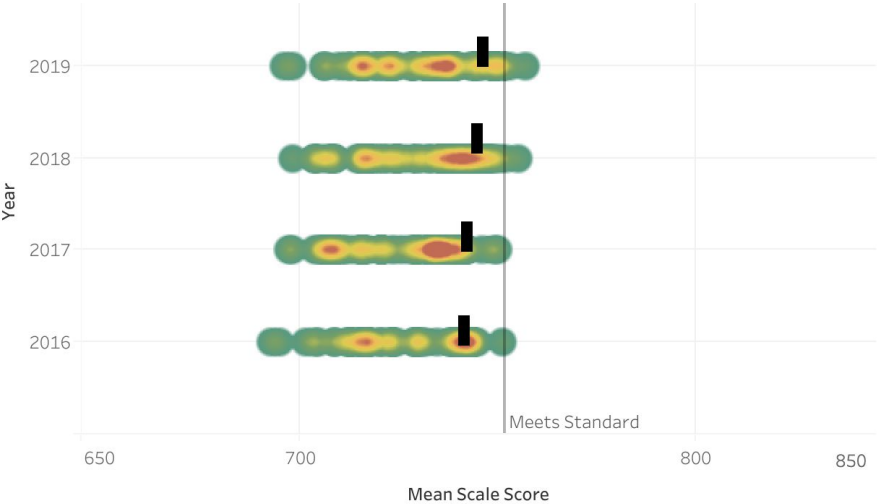
How to Read this Chart:

Each circle represent one online school. The more schools concentrated at a specific score, the more red the dots appear. The grey line represents the score required to meet grade level standards. The black line is to offer a comparison of the mean scale score for all schools in the state.

Figure 4: Average Student Scores in CMAS Math in Each Online School in Colorado

How to Read this Chart:

Each circle represent one online school. The more schools concentrated at a specific score, the more red the dots appear. The grey line represents the score required to meet grade level standards. The black line is to offer a comparison of the mean scale score for all schools in the state.

From a student achievement perspective, students in traditional brick-and-mortar buildings perform better on Colorado state assessments. Additionally, these same students participate in assessments at a higher rate. As Colorado districts and schools navigate remote learning, they should engage in thoughtful conversation to ensure online, virtual programs provide comparable learning experiences for students. Additionally, given the explosion of virtual programming available during the pandemic, decision makers must be thoughtful in the differentiation of online, virtual programs tha better support students to meet grade level expectations and seek input from educators and administrators in regarding past experiences with various programs.

Governance of Online, Virtual Programs

Given the negative and mixed research, there is an argument for tighter oversight into remote learning, both to strengthen our understanding of what works in online settings, and to set expectations for student learning through online delivery. The Center on Reinventing Public Education (CRPE) studied the current governance of online schools,

and set forth a number of recommendations that would be helpful as districts continue to deliver instruction remotely.[28] Particularly relevant recommendations include:
- Data transparency and accountability. Authorizers should leverage data already collected by online providers to monitor student attendance and performance.
- Customized enrollment. Online schools can provide alternatives for students. There is an opportunity for schools to focus, and to broaden access. For example, schools could focus on accelerated learning, classes not traditionally offered in brick-and-mortar schools given resource constraints, credit-recovery etc.

The National Education Policy Center offers a number of particularly relevant recommendations about the oversight and regulation of online, virtual programs that should inform our current experience:
- Require high-quality curricula
- Develop a comprehensive system of formative and summative assessments of student achievement, shifting assessment from a focus on time- and place-related requirements to a focus on student mastery of curricular objectives.
- Identify and maintain data on teachers and instructional staff that will allow education leaders and policymakers to monitor staffing patterns and assess the quality and professional development needs of teachers in virtual schools.[29]

Additionally, based upon our synthesis of existing literature, online, virtual programs must respond to considerable limitations in existing programming, including, but not limited to, the following:
- Significant oversight regarding student-teacher, student-student, and student-contact interactions within the online, virtual platform. In particular, online, virtual platforms must maximize direct face-to-face time with students and teachers to support students' social-emotional needs.
- Integration of culturally responsive pedagogical practices to support underserved and underrepresented communities.
- Proper care-giver trainings and supports as families assume the role of teacher-parent. These trainings and supports must include best practices for emerging multilingual learners and students with disabilities.

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[28] Pazhouh, R., Lake, R., and Miller, L. (2015). "The Policy Framework for Online Charter Schools," The Center on Reinventing Public Education. Retrieved May 1, 2020 from https://www.crpe.org/sites/default/files/crpe-policy-framework-online-charter-schools-final_0.pdf, 15-16.
[29] Molnar, A. et. al (2019). "Virtual Schools in the U.S. 2019," National Education Policy Center. 4-6.

Conclusion

The literature offers a helpful starting point for those considering online, virtual programming. First, given the lack of rigorous research regarding online, virtual programs and the reality that this type of programming will occur in the future, stakeholders must be acutely aware of and mitigate the limitations of online, virtual programs. In its review of online, virtual programs NEPC offers a recommendation that we unequivocally support:

> 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.[30]

We are in a time of new learning. Our students are accessing content and school in a way that few of them had done in the past. Our educators who work in brick and mortar schools are finding new ways to deliver content. Our systems, which by and large support face-to-face learning are learning new ways to support educators and students, and to assess what is working and what is not. At A+ and ERN we strongly believe as a state we must join this learning agenda, making decisions in the short term on what information we do have, and setting ourselves up for the medium to long-term so that every student in Colorado can access an excellent public education, in person or virtually.

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[30] Ibid.