# California Digital Learning Integration and Standards GuidanceGlossary, References, and Appendices

Adopted by the State Board of Education May 12, 2021

## Glossary of Key Terms

**Active Learning**

An approach to learning where the student is actively engaged in their learning process, rather than passively receiving information. This can include both hands-on learning as well as minds-on learning, especially in online learning. Activities for active learning online may include, but are not limited to, simulations, games, writing, problem solving, reflection, discussion, debate, and more.

**Assessment for Learning**

Collecting moment-by-moment and day-by-day data aligned with learning goals with the goal of improving learning and informing instruction.

**Assessment as Learning**

Engaging students in self-assessment of the learning goals often using success criteria.

**Assessment of Learning**

Analyzing information about learning to make judgements about student performance and achievement at the end of a period of instruction.

**Asynchronous Learning**

Asynchronous learning occurs without direct, simultaneous interaction of participants such as videos featuring direct instruction of new content students watch on their own time.[[1]](#footnote-1) Asynchronous learning can happen within a structured schedule (e.g., weekly deadlines within a course). Asynchronous learning might include collaborating with others, completing formative assessments, consuming content (e.g., watching videos), participating in discussion boards, or project-based learning.

**Blended Learning**

Combination of in-person and distance instruction[[2]](#footnote-2) and integrates both activities to create a comprehensive learning experience (Horn & Staker, 2014).

**Culturally and Linguistically Responsiveness Teaching**

An approach that leverages the strengths that students of color bring to the classroom to make learning more relevant and effective. A major goal of Culturally and Linguistically Responsiveness Teaching is to reverse patterns of underachievement for students of color. Culturally Responsive Teaching requires teachers to recognize the cultural capital and tools that students of color bring to the classroom and to utilize their students’ cultural learning tools throughout instruction.[[3]](#footnote-3)

**Digital Citizenship**

Signifies the attributes needed to engage with technology for the betterment of society as a whole. Includes responsible legal and ethical use of technology, online etiquette or netiquette, appropriate behavior for self and with others, digital identity, and more.

**Digital Literacy**

Includes the ability to find, evaluate, use, share, analyze, create, and communicate using digital technologies in a safe and secure way. More broadly, it can also stand for the ability to use digital technologies to learn and work in society.

**Distance/Online Learning**

Instruction in which the pupil and instructor are in different locations and pupils are under the general supervision of a certificated employee of the local educational agency. Distance learning may include but is not limited to all of the following:

* Interaction, instruction, and check-in between teachers and pupils through the use of a computer or communications technology
* Video or audio instruction in which the primary mode of communication between the pupil and certificated employee is online interaction, instructional television, video, telecourses, or other instruction that relies on computer or communications technology
* The use of print materials incorporating assignments that are the subject or written or oral feedback (*EC* 43500(a))[[4]](#footnote-4)

Distance learning can take on many forms, but in this context, distance/online learning programs are facilitated formal learning experiences that are institutional-based (not self-study programs) that include interactive communication (online or otherwise) where students and teachers are physically separated from each other (Rice, 2006).

**Hybrid Learning**

Hybrid learning is used to describe situations in which students learn part-time with a teacher in a physical school classroom and part-time online.

**Information Literacy**

The access of informationefficiently and effectively by reading and understanding essential content of a range of informational texts and documents in all academic areas. See California's Model Library Standards for more information.[[5]](#footnote-5)

**Learner Agency**

Students’ autonomy of their learning experience. This involves providing students with voice and choice based on their passions and interests, which allows them to take ownership and have more buy-in, investment, motivation, and engagement in what they are learning. In an online environment, teachers can support students in learning ways to advocate for themselves by using communication tools.

**Learning Management System**

A software platform that manages delivery of instructional content, tracks assignments, and reports progress.

**Relationship Skills**

One of the CASEL 5, relationship skills, is the ability to establish and maintain healthy and supportive relationships and to effectively navigate settings with diverse individuals and groups. This includes the capacities to communicate clearly, listen actively, cooperate, work collaboratively to problem solve and negotiate conflict constructively, navigate settings with differing social and cultural demands and opportunities, provide leadership, and seek or offer help when needed. Some additional components that fall under relationship skills include the following:

* Communicating effectively
* Developing positive relationships
* Demonstrating cultural competency
* Practicing teamwork and collaborative problem-solving
* Resolving conflicts constructively
* Resisting negative social pressure
* Showing leadership in groups
* Seeking or offering support and help when needed
* Standing up for the rights of others

**Responsible Decision-Making**

One of the CASEL 5, responsible decision-making, is the ability to make caring and constructive choices about personal behavior and social interactions across diverse situations. This includes the capacities to consider ethical standards and safety concerns and to evaluate the benefits and consequences of various actions for personal, social, and collective well-being. Some additional components that fall under responsible decision-making include the following:

* Demonstrating curiosity and open-mindedness
* Learning how to make a reasoned judgment after analyzing information, data, and facts
* Identifying solutions for personal and social problems
* Anticipating and evaluating the consequences of one’s actions
* Recognizing how critical thinking skills are useful both inside and outside of school
* Reflecting on one’s role to promote personal, family, and community well-being
* Evaluating personal, interpersonal, community, and institutional impacts

**Restorative Practices**

Includes alternative, non-punitive strategies for behavior management that emphasize inclusiveness, problem-solving, and relationship building. These may include mindfulness strategies, meditation, yoga, and reflection, as well as student and educator spaces, such as zen zones, calm corners, or wellness rooms. Restorative practices can help students whose trauma responses caused by adverse experiences may cause them to behave in ways that can be seen as out of the usual.

**Self-Awareness**

One of the CASEL 5, self-awareness means the ability to understand one’s own emotions, thoughts, and values and how they influence behavior across contexts. This includes capacities to recognize one’s strengths and limitations with a well-grounded sense of confidence and purpose. Some additional components that fall under self-awareness include the following:

* Integrating personal and social identities
* Identifying personal, cultural, and linguistic assets
* Identifying one’s emotions
* Demonstrating honesty and integrity
* Linking feelings, values, and thoughts
* Examining prejudices and biases
* Experiencing self-efficacy
* Having a growth mindset
* Developing interests and a sense of purpose

**Self-Management**

One of the CASEL 5, social awareness, is the ability to understand the perspectives of and the ability to empathize with others, including those from diverse backgrounds, cultures, and contexts. This includes the capacities to feel compassion for others, understand broader historical and social norms for behavior in different settings, and recognize family, school, and community resources and supports. Some additional components that fall under social awareness include the following:

* Identifying and using stress management strategies
* Exhibiting self-discipline and self-motivation
* Setting personal and collective goals
* Using planning and organizational skills
* Showing the courage to take initiative
* Demonstrating personal and collective agency

**Social Awareness**

One of the CASEL 5 is social awareness, which is the ability to understand the perspectives of and the ability to empathize with others, including those from diverse backgrounds, cultures, and contexts. This includes the capacities to feel compassion for others, understand broader historical and social norms for behavior in different settings, and recognize family, school, and community resources and supports. Some additional components that fall under social awareness include:

* Taking others’ perspectives
* Recognizing strengths in others
* Demonstrating empathy and compassion
* Showing concern for the feelings of others
* Understanding and expressing gratitude
* Identifying diverse social norms, including unjust ones
* Recognizing situational demands and opportunities
* Understanding the influences of organizations and systems on behavior

**Social Emotional Learning (SEL)**

Process through which all young people and adults acquire and apply the knowledge, skills, and attitudes to develop healthy identities, manage emotions and achieve personal and collective goals, feel and show empathy for others, establish and maintain supportive relationships, and make responsible and caring decisions.

**Student Engagement**

A students’ commitment, effort, and investment in learning. Includes subcategories of behavior, cognition, and emotion (Henrie, Halverson, & Graham, 2015).

**Synchronous Learning**

Synchronous learning takes place in real-time, with delivery of instruction and/or interaction with participants such as a live whole-class, small group, or individual meeting via an online platform or in-person when possible.[[6]](#footnote-6) It involves students and teachers interacting with content and each other at the same time during live sessions. Synchronous learning might include text-based chat, live discussions, or video conferencing sessions (e.g., Google Meet, Zoom).

**Transformative SEL**

Transformative SEL is a process whereby young people and adults build strong, respectful, and lasting relationships that facilitate co-learning to critically examine root causes of inequity and develop collaborative solutions that lead to personal, community, and societal well-being. This form of social and emotional learning (SEL) is aimed at promoting social justice through increased engagement in school and civic life. It emphasizes the development of identity, agency, belonging, curiosity, and collaborative problem solving within the Collaborative for Academic, Social, and Emotional Learning (CASEL) framework.

**Trauma-informed Practices**

Trauma-informed practices in education include having an understanding of and responsiveness to the impact that trauma can have on the learning process. These practices emphasize physical, psychological, and emotional safety, including cultivating a learning environment that builds trust, empowerment, choice, and voice, and acknowledges and combats cultural, historical, and gender issues. Also included is a sense of support and belonging from peers (Hopper et al., 2010). Understanding trauma starts with acknowledging events, experiences, and their effects on body, mind, and psyche. Also important is a knowledge of the four R’s of trauma:

* ***Realize*** the impact of trauma and what can be done to help those impacted;
* ***Recognize*** signs and symptoms that result from trauma;
* ***Respond*** by bringing together policy, procedures, and practices that are aligned with trauma-informed approaches; and
* ***Resist Re-traumatization*** by knowing students and potential triggers.

**Well-being**

A mental, physical, or emotional state of health and contentment.

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##

## Appendix A: Full Literature Review

### ISTE’s California Digital Learning Integration and Standards Guidance Project Literature Review

Prepared by Caitlin Clause McLemore, Ed.D.

#### Introduction

ISTE’s California Distance Learning Curriculum and Instructional Guidance project, funded by the Sacramento County Office of Education (SCOE), aims to draft a curriculum and instructional guide for critical subject areas related to distance learning. Specifically, the guide aims to address factors related to distance learning such as administering meaningful assessments, deciding between asynchronous and synchronous instruction, ensuring well-being, bolstering social and emotional learning skills, determining instructional time, and understanding subject-specific guidelines. The primary goal of this literature review is to identify research-based best practices for educators in distance learning in general, along with the previously identified relevant factors. ISTE and its partners will use this literature review to inform the California Distance Learning Curriculum and Instructional Guidance project, which will include a formal, written report.

#### Research Objective

The primary research objective for this literature review was to identify research-based best practices for educators in distance learning to inform ISTE’s development of the California Distance Learning Curriculum and Instructional Guidance project. The literature review focused on critical variables related to distance learning such as administering meaningful assessments, deciding between asynchronous and synchronous instruction, ensuring well-being, bolstering social and emotional learning skills, determining instructional time, and understanding subject-specific guidelines.

#### Search Methodology

The following databases were used to locate sources for inclusion in the literature review:

* Gale Academic OneFile
* Google Scholar
* Michigan Virtual Learning Research Institute Research Clearinghouse for K-12 Blended & Online Learning
* Quality Matters (QM) Research Library

##### Search Terms

The following search terms were entered into the databases listed above to conduct a comprehensive search for relevant meta-analyses and systematic reviews:

* “K–12” AND:
	+ “Distance education”
	+ “Distance learning”
	+ “Online learning”

##### Inclusion Criteria

We applied the following inclusion criteria to the articles resulting from the search:

1. Must be a meta-analysis or systematic review
2. Must be peer-reviewed (e.g., scholarly journal article, conference proceedings) or from a reputable source (e.g., educational research organization, a government department)
3. Must be published in 2000 or later
4. Must include study populations of K-12 students or teachers
5. Must relate to distance learning instructional design or pedagogical practices
6. Must be relevant to the aims of the California Distance Learning Curriculum and Instructional Guidance project

Due to the volume of individual research studies with relevant research, we limited our search to meta-analyses and systematic reviews. Meta-analyses collect individual research studies with a particular focus to calculate an overall effect size from the collected studies (Card, 2012). Systematic reviews gather an extensive collection of individual research studies with a particular focus to create an overall summary of information gathered from the collected studies. Meta-analyses provide a quantitative or numerical summary of relevant literature, while systematic reviews provide a qualitative or non-numerical summary of relevant literature. Meta-analyses and systematic reviews provide insight into an estimate of effect sizes and overall findings from relevant research.

For this literature review, included studies were required to be peer-reviewed or published through a reputable source (e.g., a government or research organization). The included studies were also required to be published in 2000 or later to provide updated technological information. Additionally, study populations were required to include K-12 students or teachers, at minimum, and several focused solely on the K-12 environment. The final inclusion criteria ensured a focus on the primary goal of the literature review, to determine best practices related to distance learning instructional design and pedagogical strategies as determined by the aims of the California Distance Learning Curriculum and Instructional Guidance project.

#### Search Processes

After conducting initial database queries, a list of potential sources was reviewed to ensure they met the inclusion criteria. In addition to research specifically focused on K-12 online and blended learning, this literature review also included sources that addressed or explored elements related to the overarching project topics, such as serving students with disabilities, engaging students in online learning, and identifying teacher characteristics specific to online pedagogy. Based on these criteria, a total of 23 articles remained for consideration in the review (see References). This included six meta-analyses, 16 systematic reviews, and one source that included both a systematic review and meta-analysis (Means et al., 2010). Three of the six meta-analyses and 12 of the 16 systematic reviews focused specifically on K-12 students or teachers. The rest of the sources included K-12 students or teachers within a broader scope (e.g., K-12 and higher education or adult learners).

Systematic reviews were published in peer-reviewed scholarly journals, by educational research organizations (e.g., Marzano Research, Michigan Virtual Learning Research Institute), in educational conference proceedings (e.g., Society for Information Technology and Teacher Education), or by the U.S. Department of Education. All meta-analyses were published in peer-reviewed scholarly journals (5) or by the U.S. Department of Education (2).

#### Literature Summary

This section includes a summary of the literature. A glossary of terms used in subsequent sections of the literature review is included in the Supplementary Materials. Table 1 includes a summary of results from meta-analyses and Table 2 includes a summary of results from systematic reviews. For more information about the characteristics and effect sizes of the meta-analyses, see Supplementary Materials.

**Table 1. Summary of Results from Meta-Analyses Included in Review**

| Article | Purpose | Findings |
| --- | --- | --- |
| Cavanaugh, 2001 | Effectiveness of K-12 distance education on student learning outcomes | Student academic achievement is comparable in different settings of distance learning and traditional instruction. |
| Bernard et al., 2004\* | Comparison research in distance education | No significant differences found in overall comparison of instructional settings. |
| Cavanaugh et al., 2004 | Effect of distance learning on K-12 student outcomes | The effectiveness of distance learning and in-person classroom instruction is comparable. |
| Bernard et al., 2009\* | Comparison research in distance education | Quality course design and student interactions have a positive impact on student learning. |
| Means et al., 2009\* | Comparison of learning contexts (online, blended, face-to-face) | Students in blended/online learning environments performed better, on average, than students in face-to-face instruction. Differences may be due to instructional content, pedagogical methods, and time. |
| Means et al., 2013\* | Comparison of learning contexts (online, blended, face-to-face) | Students in blended/online learning environments performed better, on average, than students in face-to-face instruction. Differences may be due to instructional content, pedagogical methods, and time. |
| Larwin & Erickson, 2016 | Effectiveness of distance education on achievement for K-12 students with disabilities | Students with disabilities performed better online compared to those in face-to-face instruction, but worse than students without disabilities in the same online courses.Effective communication and high-quality student-teacher interactions are ultimately what impact student learning outcomes. |

\*included all learners (not just focused on K-12)

**Table 2. Summary of Results from Systematic Reviews Included in Review**

| Article | Study purpose | Key findings |
| --- | --- | --- |
| Rice, 2006 | Examining student and teacher characteristics and qualities in distance education | Some learners succeed online and some do not. Understanding student success comes from a learner-focused, not tool-focused, approach.Teacher quality may be the most influential factor in student success. |
| Barbour & Reeves, 2009\* | Exploring the benefits and challenges of virtual schools and identifying student characteristics of online learners | Learning is a social experience.Typical characteristics of online learners include autonomy and independence, but K-12 students need more guidance and structure. |
| Cavanaugh, Barbour, & Clark, 2009 | Examining K-12 online learning including benefits and challenges, educator roles, and learning models. | Mixed results determining the advantages or disadvantages of online learning models. Online learning might result in better outcomes, but there is no guarantee of effectiveness. |
| Means et al., 2009\* | Comparison of learning contexts (online, blended, face-to-face) | Blended/online learning environments resulted in comparable student learning outcomes when compared with face-to-face instruction. |
| Vasquez & Straub, 2012 | Examining online learning research related to students with disabilities and teachers | Students with disabilities performed better when familiar with content, tools, and through exposure to accessible websites.Educators and researchers need to identify accessible online instructional methods. |
| Hasler-Waters, Barbour, & Menchaca, 2014 | Describing and evaluating the effectiveness of online charter schools | Lack of evidence of effectiveness with full-time online learning as compared to traditional schools. |
| Barbour, 2015 | To challenge the expansion of full-time, K-12 online learning programs | Lack of reliable research evidence to support the expansion of full-time online learning. Student performance in full-time charter or virtual schools sometimes indicates lower or mixed results compared to traditional schools. |
| Henrie, Halverson, & Graham, 2015\* | Measuring student engagement in technology-mediated learning | Student engagement levels provide information about student academic and social outcomes, helps identify students who need additional support, and provides evidence of activity, course, or tool quality. |
| Brodersen & Melluzzo, 2017 | Determining the effectiveness of differentiated learning programs on student achievement outcomes in K-12 online, blended, and face-to-face learning programs | Blended learning programs that exhibited a statistically significant effect on student achievement outcomes: Cognitive Tutor Algebra 1, LeapTrack, READ 180, Time to Know.All blended learning programs used online information to inform in-class instruction. |
| Martin, Ahlgrim-Delzel, & Budhrani, 2017\* | Examining characteristics of synchronous online learning (e.g., content, student characteristics) | Modern technology tools provide synchronous learning opportunities that “enable communication, collaboration, and critical discussion” (p. 12). |
| Barbour, 2018 | To explore how higher education blended and online learning research can inform K-12 blended and online learning | Learning analytics can help to evaluate pedagogical effectiveness.Online educators hold multiple roles of teacher, facilitator, and designer. |
| Pulham & Graham, 2018 | Comparing K-12 online and blended teaching | Instructional design is critical to online learning.In blended learning, it is important to integrate online and face-to-face instruction. Successful teachers in blended learning environments exhibit a commitment to change, growth mindset, and self-reflection.Dynamic digital materials are adaptive, interactive, and personalized. |
| Pulham, Graham, & Short, 2018 | Comparing teaching competencies for blended, online, and face-to-face learning | Research indicates that teachers need different skills to be successful in blended, online, and face-to-face learning environments, but often these differences are not acknowledged within teacher competencies or preparation programs. |
| Arnesen et al., 2019 | Examining K-12 online learning research | K-12 online learning research includes high-quality scholars that are also influential in the broader fields of distance learning and educational technology.Top K-12 online learning research topics include assessment, creating and evaluating distance education programs, student characteristics, student achievement outcomes, and teacher preparation. |
| Hu et al., 2019 | Examining K-12 online learning research published in the Journal of Online Learning Research | The majority of K-12 online learning research focuses on context comparison. The Journal of Online Learning Research is the leading publication for K-12 online learning research. |
| Arnesen et al., 2020 | Examining low and uncited K-12 online learning research | Low and uncited K-12 online learning research often focuses on international and rural school settings, but also explores general benefits and challenges. |
| Barbour, 2020 | K-12 online learning research | “It does not matter if the student is separated by time, place, path, and/or pace from their teacher or other students. As long as the appropriate conditions for learning are present, learning will occur” (p. 15). |

\*included all learners (not just focused on K-12)

#### Research Findings

To summarize research findings, we integrated findings from both meta-analyses and systematic reviews into one comprehensive section. Topics include general findings on K-12 distance learning, benefits, effective pedagogical strategies, asynchronous vs. synchronous learning, assessment, teacher quality, student characteristics, and challenges. Not included in the initial sections but noted in the research findings section are citations to chapters from the Handbook of Research on K-12 Online and Blended Learning (Kennedy & Ferdig, 2018). Each chapter within the Handbook serves as a literature review around key topics, highlighting research-based best practices.

#### Distance learning is comparable to traditional classroom instruction

Some sources found a modest improvement in student learning outcomes in online learning environments (Barbour & Reeves, 2009; Means et al., 2013), while others found a lack of evidence of effectiveness when comparing full-time online learning with traditional instruction (Hasler-Waters, Barbour, & Menchaca, 2014; Barbour, 2015). However, in most of the meta-analyses that compared blended or online learning to traditional classrooms, overall effect sizes were small and often close to zero (Cavanaugh, 2001; Bernard et al., 2004; Cavanaugh, 2004; Means et al., 2009). These results indicated no difference in the impact of instructional setting on student achievement, engagement, or other student learning outcomes. For more information on effect sizes, see Supplementary Materials.

Though overall effect sizes were small, the effect sizes reported within individual studies varied widely. As such, researchers in both meta-analyses and systematic reviews surmised that factors of course quality, instructional design, meaningful interactions, pedagogical methods, and student characteristics contributed a greater impact on student learning than differences in instructional setting (Bernard et al., 2004; Cavanaugh et al., 2004; Bernard et al., 2009; Cavanaugh, Barbour, & Clark, 2009; Larwin & Erickson, 2016; Pulham & Graham, 2018). This sentiment was best expressed by Barbour (2020), who stated that “it does not matter if the student is separated by time, place, path, and/or pace from their teacher or other students. As long as the appropriate conditions for learning are present, learning will occur” (p. 15). Rather than focusing on where learning happens, the focus should be on “who is teaching, who is learning, and how that learning is accomplished” (Rice, 2006, p. 440).

#### K-12 distance learning is unique

Due to the developmental needs of young learners, K-12 distance learning cannot (or rather, should not) replicate higher education (Cavanaugh et al., 2004). For example, K-12 students may find synchronous instruction more beneficial as it is “better suited to their academic schedules and their need for spontaneous guidance and feedback” (Bernard et al., 2004, p. 33). As they are still developing as learners, K-12 students need additional guidance and support in online learning environments, particularly in developing intrinsic motivation (Vazquez & Straub, 2012) and social skills (Rice, 2006).

#### Benefits of distance learning

* The most referenced benefit to distance learning included expanding access to opportunities that students would not otherwise be able to access (Cavanaugh, 2001; Cavanaugh et al., 2004; Barbour & Reeves, 2009; Means et al., 2009; Vazquez & Straub, 2012; Means et al., 2013; Hasler-Waters, Barbour, & Menchaca, 2014; Arnesen et al., 2020). Distance learning provides opportunities to serve diverse student populations. For example, students with health issues that prevent them from attending in-person schools can take online courses, or students in rural locations have access to a wider variety of course offerings.
* Distance learning facilitates skill development of digital age skills, such as collaboration, critical thinking, metacognition, and self-reflection (Cavanaugh et al., 2004; Means et al., 2009; Means et al., 2013). This occurs through increased opportunities for interactive (Means et al., 2013) and reality-based (Cavanaugh, 2001) learning.
* Distance learning provides students with increased flexibility and choice (Rice, 2006; Barbour & Reeves, 2009; Means et al., 2009; Vazquez & Straub, 2012; Hasler-Waters, Barbour, & Menchaca, 2014; Pulham & Graham, 2018; Arnesen et al., 2020). With online courses, students can choose a learning path that works best for them. Additionally, students can often adjust their course schedules to accommodate other timing constraints.
* Distance learning also increases exposure to diverse perspectives (Cavanaugh, 2001) and increases student motivation (Barbour & Reeves, 2009).

#### Learning is a social experience

Based on Interaction and Social Presence theory, online learning requires a variety of social interactions (Garrett Dikkers, 2018; Moore, 1989). Quality student interactions increase cognitive engagement, which in turn improves student outcomes including content retention (Rice, 2006; Barbour & Reeves, 2009; Bernard et al., 2009; Henrie, Halverson, & Graham, 2015, Larwin & Erickson, 2016; Garrett Dikkers, 2018).

Student interaction types include student-student (how students interact with their peers), student-teacher (how students interact with their teachers), and student-content (how students interact with course content).

* The most effective student-teacher interactions focused on critical and higher-order thinking, rather than content (Bernard et al., 2009). Consistent, positive relationships with teachers can improve retention rates in online learning, particularly for at-risk students (Rice, 2006).
* High-quality, positive student-student interactions facilitate increased motivation and improved cognitive processes (Bernard et al., 2009).

A common concern with online learning is a lack of social interaction, particularly with younger students. To address this concern, teachers should utilize technology tools such as discussion boards and synchronous sessions (e.g., chat, video conferencing) to facilitate student-student and student-teacher interactions and decrease feelings of social isolation (Rice, 2006). Students report positive feedback on communication tools like chat or instant messaging in virtual learning spaces because it allows them to communicate and socialize with others, both in formal and informal conversation with their peers and teachers (Barbour & Reeves, 2009).

In addition to online communication tools, some social support strategies that can benefit students include “the encouragement of reflective thinking” and “dialogue, interaction and extension of ideas with feedback from peers and mentors on emerging issues” (McLoughlin, 2002, p. 152).

Student emotional engagement includes students’ feelings about learning, as well as their social connections with other students (Henrie, Halverson, & Graham, 2015). Emotional engagement, along with behavioral and cognitive engagement, contributes to students’ academic achievement, persistence, and satisfaction as it helps students to develop social presence (Bernard et al., 2009).

Incorporating student support structures is critical for student success in online learning. These support structures include, but are not limited to, behavioral, affective, and cognitive domains, and these can include help from peers, educators, the community, outside experts, and family/caregivers (Borup et al., 2020). Additionally, at-risk students need academic, behavioral, and mental support through a caring community, positive school climate, and connection with others (Repetto, Spitler, & Cox, 2018).

#### Effective pedagogical strategies for impacting student learning outcomes in blended or online learning environments

* Students in online learning environments benefit from individualized instruction (Cavanaugh, 2001; Vazquez & Straub, 2012; Hasler-Waters, Barbour, & Menchaca, 2014; Pulham & Graham, 2018; Arnesen et al., 2020) and a student-centered approach to learning (Rice, 2006; Pulham & Graham, 2018).
* Student-centered learning includes:
	+ Opportunities for student-student collaboration (Means et al., 2009).
	+ Interactive lessons that facilitate digital age skills, such as collaboration, critical thinking, metacognition, and self-reflection (Cavanaugh, 2001; Means et al., 2009; Larwin & Erickson, 2016).
	+ Meaningful small group discussions (Cavanaugh, 2001; Vazquez & Straub, 2012) that use guiding questions (Means et al., 2010) based on real-life scenarios (Barbour, 2018).
* Using digital learning materials and tools can improve student learning outcomes through dynamic, interactive, multimodal, and personalized learning experiences (Bernard et al., 2009; Pulham & Graham, 2018). These materials and tools incorporate data-informed decision-making to guide instruction and help students better understand more complex concepts in an efficient manner. Examples of digital learning materials and tools include content-specific websites (e.g., Khan Academy, Newsela), collaboration and creation tools (e.g., Flipgrid, G Suite for Education, Screencastify, WeVideo), learning management systems (e.g., Blackboard, Brightspace, Canvas, Google Classroom), and more. Additionally, using student data from digital learning tools can provide useful learning analytics for determining pedagogical effectiveness (Barbour, 2018).
* Providing access to a learning coach or other local support is critical to student success in online learning (Borup, 2018; Barbour, 2015). Parents often serve in this role, yet they are unprepared to be successful in supporting students (Hasler-Waters, Barbour, & Menchaca, 2014). Thus, schools and teachers need to partner with students’ families to provide a community of support for online learners.
* In blended learning, it is important to make clear curricular connections between in-person and online learning activities (Cavanaugh, 2001; Brodersen & Melluzzo, 2017; Pulham & Graham, 2018).

#### Asynchronous vs. synchronous learning

In general, effect sizes for student achievement favored asynchronous learning over face-to-face instruction but favored face-to-face instruction over synchronous learning (Bernard et al., 2004). With asynchronous learning, students exhibited improved achievement and attitudes but lower retention rates.

For asynchronous learning, researchers found that a focus on active learning, collaboration, project-based learning, and quality course design was more impactful than which technology materials and tools were used (Bernard et al., 2004). For synchronous learning, researchers found the biggest impact on student learning when it was utilized to “enable communication, collaboration, and critical discussion” (Martin, Ahlgrim-Delzel, & Budhrani, 2017, p. 12).

Regarding student development, younger children need more guidance and support in developing communication skills in virtual spaces (Rice, 2006; Barbour & Reeves, 2009). Teachers can utilize Vygotsky’s zone of proximal development to design activities and opportunities for social interaction that are developmentally appropriate (Barbour & Reeves, 2009).

#### Teacher quality may be the most influential factor in student success, regardless of setting.

As stated by Rice (2006), technology “cannot substitute for well-designed instruction and opportunities to engage in purposeful, interactive learning activities” (p. 440). Teacher competencies contributing to student learning include providing meaningful feedback (Cavanaugh, Barbour, & Clark, 2009), exhibiting a growth mindset, and engaging in self-reflection (Pulham & Graham, 2018).

In addition to teaching duties, educators in online courses also hold multiple roles, depending on the setting, such as instructional designer and technology support (Barbour, 2018). An exemplar of online course design, the Florida Virtual School (FLVS) supports educators through collaborative teams that include an educator, but also instructional designer, web designers, technology support, and other support staff to ensure a successful learning experience for students (Barbour & Reeves, 2009).

#### Assessment in online learning environments

Assessment in online learning should include formative and summative assessment to determine student learning outcomes, including product, process, and progress (Barbour, 2018; Pulham & Graham, 2018). Online assessments should utilize technology tools to provide individualization and personalization utilizing multiple data sources (Pulham & Graham, 2018). Some examples of formative assessment in online learning environments include discussion participation, e-portfolios, and self-testing (Barbour, 2018).

#### Characteristics of successful online learners

Successful online learners exhibit independence through individual characteristics, such as autonomy (Barbour & Reeves, 2009), high levels of motivation (Barbour & Reeves, 2009), persistence (Cavanaugh et al., 2004; Rice, 2006), responsibility (Rice, 2006; Barbour & Reeves, 2009), and self-regulation (Cavanaugh et al., 2004; Rice, 2006). Additionally, sufficient access to technology and skills for using available technology contributed to a successful online learning experience (Rice, 2006).

Concerning students with disabilities, researchers found that these students performed better in online learning environments compared to similar students in face-to-face instruction, but performed worse than students without disabilities participating in the same online courses (Larwin & Erickson, 2016). Instructional strategies found to help improve the learning outcomes of students with disabilities included student familiarity with the content topic and tools being used, as well as student exposure to accessible websites (Basham et al., 2018; Rice & Dykman, 2018; Vazquez & Straub, 2012).

Student engagement levels during participation in online courses can help to identify students who need additional support, provide evidence of quality (e.g., activity, course, tool), and indicate student academic or social outcomes (e.g., achievement, interaction with others, motivation to succeed, participation; Henrie, Halverson, & Graham, 2015).

#### Challenges of distance learning

Researchers found several challenges of online and blended learning:

* Access to the infrastructure, resources, and tools needed for participation (Rice, 2006; Barbour & Reeves, 2009; Arnesen et al., 2020). Investment in infrastructure is needed to adequately support online teaching and learning, including startup costs for implementation of blended or online learning programs.
* Accountability of students in completing coursework and schools in providing a quality learning experience (Rice, 2006; Barbour & Reeves, 2009). With students, the retention rates in online courses are often lower, meaning students drop out of these courses at higher rates (Hasler-Waters, Barbour, & Menchaca, 2014).
* Teacher preparedness for online teaching (Arnesen et al., 2019; Archambault & Kennedy, 2018; Dawson & Dana-Fichtman, 2018). Teachers often do not receive appropriate training for blended or online learning within teacher preparation programs. This creates a gap between teachers’ ability and comfort level to teach in a digital learning environment.

#### Challenges and Considerations

* Meta-analyses include quantitative results from a large collection of research studies, meaning information is summarized which thus reduces the methodological issues present in individual studies (Card, 2012). However, meta-analyses can vary in quality based on their inclusion criteria.
* Some of the systematic reviews and meta-analyses focused on all learners rather than a specific focus on K-12 students. Thus, results from these studies may not be as applicable to K-12 students or teachers due to their unique developmental needs.
* Most of the systematic reviews and meta-analyses we examined reported a wide variability of effect sizes within individual studies. Furthermore, individual studies often included numerous variables. For brevity purposes, we only included the overall effect sizes for major variables.
* To provide a comprehensive literature review, we included sources that were not published in peer-reviewed scholarly journals. However, we only included additional studies from reliable publication sources, such as educational conference proceedings, government, and non-profit educational research organizations.
* Although we are confident that the list of sources, systematic reviews, and meta-analyses is comprehensive, due to the broad scope of the project and its goals, this literature review is likely not exhaustive of all related literature. Rather than presenting a definitive conclusion on the effectiveness of distance education, the goal of this literature review was to identify best practices for curriculum and instruction in online learning environments.

#### Conclusion

This literature review identified several research-based best practices for educators in distance learning. In general, research findings from both quantitative and qualitative studies indicated no significant difference between instructional settings (e.g., blended, distance, in-person). Rather, course quality, instructional design, meaningful interactions, pedagogical methods, student characteristics, and support structures provide more meaningful impact on student learning outcomes (Bernard et al., 2004; Cavanaugh et al., 2004; Bernard et al., 2009; Cavanaugh, Barbour, & Clark, 2009; Larwin & Erickson, 2016; Pulham & Graham, 2018). These factors can be present (or not) in any instructional setting. As such, educators should focus their attention on effective pedagogical strategies to design high-quality, meaningful, and supportive learning experiences. In an online learning environment, this includes preparing educators for online teaching, understanding the benefits and challenges of digital spaces, balancing asynchronous and synchronous learning activities, implementing engaging and motivating activities for active learning, supporting students in personalized ways, designing meaningful formative and summative assessments, and guiding students to develop habits for successful online learning.

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### Supplementary Materials

#### Glossary

* Asynchronous learning involves students and teachers interacting with content and each other at different times. Asynchronous learning can happen within a structured schedule (e.g., weekly deadlines within a course). Asynchronous learning might include collaborating with others, completing formative assessments, consuming content (e.g., watching videos), discussion board participation, or project-based learning.
* Synchronous learning involves students and teachers interacting with content and each other at the same time during live sessions. Synchronous learning might include text-based chat, live discussions, or video conferencing sessions (e.g., Google Meet, Zoom).
* Blended learning includes both in-person and online learning and integrates both activities to create a comprehensive learning experience (Horn & Staker, 2014).
* Distance/online learning can take on many forms, but in this context of this literature review we considered distance/online learning programs that facilitated formal learning experiences, were institutional-based (not self-study programs), included interactive communication (online or otherwise), and where students and teachers were physically separated from each other (Rice, 2006).
* Online charter school: K-12 program publicly funded and governed by the state, where most of the schooling occurs online (Hasler-Waters, Barbour, & Menchaca, 2014).
* Student engagement: A students’ commitment, effort, and investment in learning. Includes subcategories of behavior, cognition, and emotion (Henrie, Halverson, & Graham, 2015).

#### Characteristics of Meta-Analyses Included in Review

| Study | Variable(s) | # primary studies | Overall sample size | Date range of primary studies |
| --- | --- | --- | --- | --- |
| Cavanaugh, 2001 | Achievement | 19 | 929 | 1980-1998 |
| Bernard et al., 2004 | Achievement | 232 total11 K-12 studies | 57,019 | 1985-2002 |
| Bernard et al., 2004 | Attitude | 232 total11 K-12 studies | 35,365 | 1985-2002 |
| Bernard et al., 2004 | Retention | 232 total11 K-12 studies | 3,744,869 | 1985-2002 |
| Cavanaugh et al., 2004 | Student outcomes | 14 | 7561 | 1999-2004 |
| Bernard et al., 2009 | Achievement/attitude | 74 | N/A | 1985-2006 |
| Means et al., 2009 | Context comparison | 45 | N/A | 1996-2008 |
| Means et al., 2009 | K-12 learners | 5 | N/A | 1996-2008 |
| Means et al., 2013 | Context comparison | 45 | N/A | 1996-2008 |
| Means et al., 2013 | K-12 learners | 5 | N/A | 1996-2008 |
| Larwin & Erickson, 2016 | Achievement | 7 | 24,031 (total)3,558 (students with disabilities) | 2005-2014 |

#### Effect Sizes from Meta-Analyses Included in Review

| Study | Variable(s) | Mean effect size |
| --- | --- | --- |
| Cavanaugh, 2001 | Achievement | 0.147 |
| Bernard et al., 2004 | Achievement | 0.0128 (overall)-0.1022 (synchronous)0.0527 (asynchronous) |
| Bernard et al., 2004 | Attitude | -0.0812 (overall)-0.1846 (synchronous)-0.0034 (asynchronous) |
| Bernard et al., 2004 | Retention | -0.0573 (overall)0.0051 (synchronous)-0.0933 (asynchronous) |
| Cavanaugh et al., 2004 | Student outcomes | -0.028 |
| Bernard et al., 2009 | Student interactions on achievement/attitude (overall) | 0.38 |
| Bernard et al., 2009 | Student-student | 0.49 |
| Bernard et al., 2009 | Student-teacher | 0.32 |
| Bernard et al., 2009 | Student-content | 0.46 |
| Means et al., 2009 | Online & blended learning vs. face-to-face classroom instruction | 0.20 |
| Means et al., 2009 | K-12 learners | 0.1664 |
| Means et al., 2013 | Online & blended learning vs. face-to-face classroom instruction | 0.20 |
| Means et al., 2013 | K-12 learners | 0.1664 |
| Larwin & Erickson, 2016 | Achievement | -0.015 |
| Larwin & Erickson, 2016 | Students with disabilities online vs. students with disabilities face-to-face | 0.497 |
| Larwin & Erickson, 2016 | Students with disabilities online vs. students without disabilities online | -0.561 |

## Appendix B: Digital Tools Matrix[[7]](#footnote-7)

The chart below organizes digital tools referenced in the guide by type, cost, publisher, grade-level, description, and how teachers and students may use them in service of learning.

| **Tool** | **Tool Type** | **Description** | **Teacher Use** | **Student Use** |
| --- | --- | --- | --- | --- |
| **Adobe Spark**Publisher: AdobeURL: <https://spark.adobe.com>Cost: Free and premiumGrades: K-12 | * Audio creation
* Video creation
* Digital storytelling
* Infographics
 | Adobe Spark is an integrated suite of media creation applications. It is comprised of three separate design apps: Spark Page, Spark Post, and Spark Video. | * Create graphics, short videos, and web pages.
 | * Create graphics, short videos, and web pages.
* Create engaging and creative components for a project or assignment.
 |
| **Bamboozle**Publisher: BamboozleURL: <https://www.baamboozle.com>Cost: Free and premiumGrades: K-8 | * Assessment
* Gamification
 | Bamboozle is a game-based learning platform that offers engaging activities for learners. | * Create or use pre-made assessment-based activities in a gamified environment.
 | * Utilize game-based assessment activities assigned by teachers.
 |
| **Edji**Publisher: EdjiURL: https://edji.itCost: Free and premiumGrades: K-12 | * Note-taking and annotation
* Knowledge organization and sharing
* Assessment
* Synchronous text discussion
 | Edji is a collaborative classroom reading tool used to check students' understanding of shared articles. | * Create or use pre-made articles and issue them to students for reading comprehension.
* View real time reflections and thoughts of students while they are reading an article.
* Allow students to view peer insights.
 | * Annotate an assigned article individually or collaboratively with classmates.
* Leave notes on highlighted using text and/or audio.
 |
| **Edpuzzle**Publisher: Edpuzzle Inc.URL: <https://edpuzzle.com>Cost: Free and premiumGrades: K-12 | * Video streaming
* Video sharing
* Interactive assessment
 | Edpuzzle is a video assessment tool capable of assessing student understanding using questions placed throughout the Edpuzzle video. | * Create or use pre-made videos from the publisher’s website.
* Create videos with different question types to quickly assess student understanding.
 | * Interact with an assigned video through different question types created by the teacher.
* Rewind videos to review information if unsure of a question.
 |
| **Edulastic**Publisher: Snapwiz IncURL: <https://edulastic.com>Cost: Free and premiumGrades: K-12 | * Assessment
 | Edulastic is an online tool with technology-enhanced assessment items, which offer an insight into student learning and growth. | * Create or use pre-made assessments from the publisher’s platform.
* Use question types linked to state standards to track student learning and growth.
 | * Gain familiarity with the flow and style of typical state assessments.
 |
| **Flipgrid**Publisher: MicrosoftURL: ~~https://info.flipgrid.com/ [~~Link no longer available]Cost: FreeGrades: K-12 | * Video creation and editing
* Audio creation and editing
* Video sharing
* Audio sharing
* Discussion forum
* Screen recording
* Multimodal production
 | Flipgrid is a video response system which allows students to record verbal responses to questions posed in class. | * Create "grids" to facilitate video discussions.
* Use grids to function as a virtual message board.
* Pose questions, called "topics" that appear in a tiled grid display.
 | * Respond to classroom questions through video or audio.
* Respond creatively through the use of images, text, and whiteboarding.
 |
| **Formative**Publisher: FormativeURL: <https://goformative.com/>Cost: Free and premiumGrades: K-12 | * Lesson authoring
* Assessment
* Online whiteboarding
 | Formative is a web-based tool that allows teachers to create digital formative assessments, tasks, or assignments that are easily accessible from any electronic device. | * Create classroom assessments with multiple question types to gain real time analytics and check for student understanding.
 | * Respond to different question types with text, audio, or digital ink.
 |
| **Insert Learning**Publisher: Insert LearningURL: <https://insertlearning.com/>Cost: Free and premiumGrades: K-12 | * Synchronous text discussion
* Assessment
 | Insert Learning is a web- based tool that allows teachers to insert different question types on any web page. | * Insert questions, discussions, and comments directly into any website.
* See when students go to a website, view their responses to questions and discussions, and check for understanding.
 | * Actively learn through engagement with questions embedded directly into website.
* Respond to questions, discussions, and take notes directly on a web page.
 |
| **Kahoot!**Publisher: Kahoot!URL:<https://kahoot.com/>Cost: Free and premiumGrades: K-12 | * Assessment
* Gamification
 | Kahoot! is a game-based learning platform. Its learning games, "Kahoots", are user-generated multiple-choice quizzes that can be accessed via a web browser or the Kahoot! application. | * Create or use pre-made games to assess student understanding through gamified assessments.
* Use games to be run synchronously as a whole class activity or assigned as an asynchronous student-paced activity.
 | * Learn content through a gamified learning platform.
* See the question on teachers’ projected screen and choose their answer from their own device.
* See each question point value and compete to see who can answer the most questions correctly.
 |
| **Loom**Publisher: Loom IncURL: <https://www.loom.com/> Cost: Free and premiumGrades: K-12 | * Video creation and editing
* Video sharing
* Screen recording
 | Loom is a video and screen recording tool which can be initiated from the Loom website, chrome extension, or Gmail response. | * Record messages for students and/or screen record “how to” guides to ensure student understanding.
* Communicate through video messages rather than through text alone with the publisher’s Gmail integration.
 | * Record a video response and/or showcase digital work through screen recording features.
* Send video answers to teachers rather than through text alone.
 |
| **Mote**Publisher: MoteURL: <https://www.justmote.me/>Cost: Free and premiumGrades: K-12 | * Synchronous text discussion
* Audio creation
* Accessibility
 | Mote is a Chrome extension that lets users easily add voice notes and feedback to shared documents and assignments. | * Leave verbal feedback into the comments section of any Google application.
* Use student voice to automatically transcribe audio messages and place it text alongside the original voice note.
 | * Listen to a voice note left by the teacher.
* Read the transcribed message in text if they cannot hear the voice note.
* Have the voice transcribed into a different language.
 |
| **Nearpod**Publisher: RenaissanceURL: <https://nearpod.com/>Cost: Free and premiumGrades: K-12 | * Lesson authoring
* Knowledge organization and sharing
* Video sharing
* Assessment
* Presentations
* Digital pinboard
 | *Nearpod is a digital tool capable of creating* interactive lessons, videos, and formative assessments. | * Create interactive lessons using previously made PowerPoint or Google Slide presentations.
* Create or use pre-made lessons directly from the publisher’s platform.
* Embed multiple question types at any point during the lesson to check for understanding.
 | * Become more engaged with a lesson through multiple question types like “Draw It”, VR Field Trips, or free responses.
* Take notes during the presentation through the built-in note feature.
 |
| **Padlet**Publisher: PadletURL: <https://padlet.com/>Cost: Free and premiumGrades: TK-12 | * Audio sharing
* Video sharing
* Synchronous text discussion
* Discussion forum
* Digital pinboard
 | Padlet is a digital tool which can be used by students and teachers to post notes on a common page. The notes posted by teachers and students can contain links, videos, images, and document files. | * Use digital tools to generate collaborative ideas and checks for understanding.
* Create running lists of resources throughout the year or a one-time discussion board for the day.
 | * Respond to text, voice, video, images, or any combination of the above.
* Interact with other students’ messages, upvote, like, or comment.
 |
| **Pear Deck**Publisher: Pear Deck IncURL: <https://www.peardeck.com/>Cost: Free and premiumGrades: K-12 | * Audio sharing
* Video sharing
* Lesson authoring
* Presentation
* Interactive assessment
 | Pear Deck is an interactive presentation tool used to actively engage students in individual and social learning. Teachers can use Pear Deck to create interactive presentations that allow students to work independently to respond to various questions throughout the 'deck'. | * Create interactive lessons from previously made PowerPoint or Google Slide presentations.
* Embed multiple question types at any point during a lesson to check for understanding.
 | * Become more engaged with a lesson through multiple question types like drawing, free response, fill in the blank, and true or false.
 |
| **Quizalize**Publisher: Zzish LtdURL: <https://www.quizalize.com/>Cost: Free and premiumGrades: K-12 | * Interactive assessment
* Gamification
 | Quizalize is a gamified assessment tool with standards-tagged quizzes. Teachers receive instant data on student mastery and can automatically assign differentiated follow-up activities. | * Use quizzes with standards-tags to efficiently track mastery data.
* Use the Quizalize platform to automatically assign different resources to students depending on their quiz score.
 | * Become more engaged with a lesson through a gamified assessment platform.
 |
| **Quizizz**Publisher: Quizizz IncURL: <https://quizizz.com/>Cost: Free and premiumGrades: K-12 | * Interactive assessment
* Gamification
* Presentation
* Lesson authoring
 | Quizizz allows teachers to create gamified quizzes, lessons, presentations, and flashcards for students. | * Create or use pre-made games to assess student understanding through gamified assessments.
* Use games, run synchronously or asynchronous, as a whole class activity or assigned to students individually.
 | * Learn content through a gamified learning platform.
* Move at set pace through assessments.
* See each question with a point values so that entire classes can compete to see who can answer the most questions correctly.
 |
| **Screencastify**Publisher: ScreencastifyURL: <https://www.screencastify.com/>Cost: Free and premiumGrades: K-12 | * Video creation and editing
* Video sharing
* Audio creation and editing
* Audio sharing
* Screen Recording
 | Screencastify is a video and screen recording tool which can be initiated from the Screencastify website or Chrome extension. The videos can be stored on the Screencastify website or automatically updated to Google Drive. | * Record messages for students and/or screen record “how to” guides to ensure student understanding.
* Automatically upload the videos to Google Drive, and then link the file as video comments onto any student work or embed into Google Slides.
 | * Record a video response and or showcase digital work through screen recording features.
* Automatically upload videos to Google Drive, and send video answers to teachers, rather than through text messages alone.
* Link files as a video response in other Google tools (e.g., Google Slides).
 |
| **Seesaw**Publisher: SeesawURL:<https://web.seesaw.me/>Cost: Free and premiumGrades: TK-5 | * Audio creation and editing
* Audio sharing
* Video creation and editing
* Video sharing
* Online whiteboard
* Lesson authoring
* Digital storytelling
 | Seesaw uses built-in multimodal tools to capture what students know in Seesaw’s digital portfolio. Teachers see all stages of student thinking and progress, enabling them to better adjust their instruction. | * Assign work pages and activities to students or observe student commentary in their digital portfolio.
 | * Complete activities assigned by teachers or capture what they have learned through their digital portfolio.
* Add images, take pictures, and leave audio or video answers.
 |
| **Soundtrap**Publisher: SpotifyURL: <https://www.soundtrap.com/>Cost: Free and premiumGrades: K-12 | * Audio creation and editing
* Audio sharing
* Digital storytelling
 | Soundtrap is an online digital audio workstation that allows users to create music or podcasts. Each project can be shared with others to work collaboratively on their creation. | * Ask students to work creatively on collaborative projects, such as podcasts or music.
 | * Demonstrate knowledge through the creation of music or a podcast.
* Work collaboratively on a shared project.
 |
| **WeVideo**Publisher: WeVideo IncURL: <https://www.wevideo.com/>Cost: Free and premiumGrades: K-12 | * Video creation and editing
* Video sharing
* Digital storytelling
* Multimodal production
 | WeVideo is an online video creation suite that allows users to create creative videos. Each project can be shared with others to work collaboratively on their creation. WeVideo is capable of utilizing greenscreen technology for an added opportunity for creativity. | * Ask students to work creatively on collaborative projects such as videos to demonstrate understanding or to demonstrate creativity.
 | * Demonstrate knowledge through the creation of a video or movie.
* Work collaboratively on a project from different devices and different locations at the same time.
 |
| **Whiteboard.fi**Publisher: Kahoot!URL: <https://whiteboard.fi/>Cost: Free and premiumGrades: K-12 | * Online whiteboard
* Interactive assessment
 | Whiteboard.fi is an instant formative assessment whiteboarding tool for providing live feedback and immediate overview of student understanding. | * Create a whiteboard room in minutes with limited setup time.
* Use a whiteboard platform for all subjects and grade levels.
 | * Demonstrate knowledge by writing on a personal digital whiteboard that gives teachers an opportunity to provide real-time feedback.
 |

## Appendix C: Section Resources[[8]](#footnote-8)

### Section A

#### Be Internet Awesome

Google provides free digital citizenship resources and lesson plans to help educators reinforce students’ digital citizenship skills. Google additionally provides helpful resources for parents/caregivers to reinforce digital citizenship from home.

[https://beinternetawesome.withgoogle.com](https://beinternetawesome.withgoogle.com/en_us/)

#### California Department of Education Distance Learning Webinar Series

Webinars include guidance for EL student instruction, English language development, and dual-language programs.

<https://www.cde.ca.gov/ls/he/hn/covid19webinars.asp>

#### CASEL’S SEL Framework

The CASEL framework addresses five broad, interrelated areas of competence and examples for each: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making.

[https://casel.org/wp-content/uploads/2020/12/CASEL-SEL-Framework-11.2020.pdf](https://casel.org/wp-content/uploads/2020/12/CASEL-SEL-Framework-11.2020.pdf%22%20%5Co%20%22CASEL%E2%80%99S%20SEL%20Framework%20)

#### Center for Equity for English Learners: *Equitable Distance Learning for English Learners: Design Principles*

Loyola Marymount University, as part of their Center for Equity for English Learners, released this resource that provides five design principles for supporting EL students in distance learning environments. Included in these design principles are creating explicit goals, outcomes, and digital modes; forming meaningful connections and engagement; maximizing comprehensibility; varying participation structures; and differentiating reflections and assessments.

~~https://soe.lmu.edu/media/lmuschoolofeducation/departments/ceel/documents/
Equitable%20Distance%20Learning%20for%20ELs%20Design%20Principles\_LMU%20CEEL%20May%202020%20A%C3%8C%C2%82.pdf~~ (Link no longer available)

#### Creating and Sustaining Family Partnerships in Distance Learning

Californians Together, along with EL RISE! (English Learner Roadmap Implementation for Systemic Excellence) and LMU’s Center for Equity for English Learners, hosted a webinar focused on connecting to and engaging with families to support EL students in online and blended learning. Strategies shared include engaging in meaningful dialoguing with families, goal setting with EL students, streamlining communications, providing flexible instruction options, ensuring culturally responsive and supportive communities, and more.

<https://www.californianstogether.org/?s=distance+learning>

#### *Critical Conditions for English Learners in Distance Learning*

EL RISE! published a resource that highlights areas where educators, schools, and districts can better support EL students. These include centralizing and building language in all lessons, harnessing formative assessment, leveraging flexible grouping, providing scaffolds and supports, affirming identity, investing in relationships, ensuring access, disrupting inequity, supporting home language, prioritizing oral language, implementing designated English language development, and making learning relevant.

[https://padlet-uploads.storage.googleapis.com/238062564/6dbfdc04cfe2920cd6dcc7eaf4789026/Critical\_Conditions\_for\_English\_Learners\_in\_Distance\_Learning.pdf](https://urldefense.proofpoint.com/v2/url?u=https-3A__padlet-2Duploads.storage.googleapis.com_238062564_6dbfdc04cfe2920cd6dcc7eaf4789026_Critical-5FConditions-5Ffor-5FEnglish-5FLearners-5Fin-5FDistance-5FLearning.pdf&d=DwMGaQ&c=SIStQSL0VMIUJoLS-Q8giiFlA-AKdP7tpJHyQh8DeXk&r=BfnQjom6mohDdSsLCteco5PjELv0MJo9-LwFxU3v06E&m=Tl9DUwCdQzzTxd-Oj3DqY-xomo22gSyJLR0qHBAIe8o&s=fLOdqNNTIqizCqEGOE8KLki2N1iQ3FVw9X9uQG7xJ_0&e=)

#### DigCitCommit

The DigCitCommit competencies take digital citizenship a step further than safe and healthy communication and comprehensively define the topic as being composed of five distinct competencies (Inclusive, Informed, Balanced, Engaged, and Alert) that educators can help students build.

<https://digcitcommit.org/>

#### Digital Citizenship Resources and Curricula

Common Sense Education provides free digital citizenship resources and lesson plans sorted by grade level to help educators reinforce students’ digital citizenship skills, ranging from digital identity and footprint to news and media literacy.

<https://www.commonsense.org/education/digital-citizenship/curriculum>

#### Educator Resources for Citing Sources

BrainPOP provides sample lesson plans and resources to help students in younger grades properly give attribution to online sources of information.

<https://educators.brainpop.com/lesson-plan/citing-sources-lesson-plan-create-dos-donts-list/?bp-topic=citing-sources>

#### Equity & Social and Emotional Learning: A Cultural Analysis

This brief examines how the CASEL SEL framework reflects issues of equity, including programs and practices that support the competencies to promote educational equity.

<https://casel.org/wp-content/uploads/2020/04/equity-and-SEL-.pdf>

#### Evaluating Online Sources

Learning for Justice provides lesson plans and resources to help students in grades 9-12 evaluate online sources of information for credibility, accuracy, and reliability.

[https://www.learningforjustice.org/classroom-resources/lessons/evaluating-online-sources](https://www.learningforjustice.org/classroom-resources/lessons/evaluating-online-sources%22%20%5Co%20%22Learning%20for%20Justice%3A%20Evaluating%20Online%20Sources)

#### Families in Schools

Families in Schools has curated a library of free resources, ranging from subject-specific digital tools, as well as tips for parents/caregivers to build positive technology habits and skills with young students.

~~https://www.familiesinschools.org/coronavirus-learning-resources-for-families/~~ [Link no longer available]

#### ISTE Standards for Educators

A collection of research-based standards based on best practices in digital learning to guide teachers in creating learning environments that empower and engage students by leveraging technology. Teachers can also watch videos of the ISTE Standards in classroom practice through the ISTE YouTube playlist.

<https://www.iste.org/standards/for-educators>

<https://www.youtube.com/playlist?list=PL6aVN_9hcQEH6D0zMdylQbDkSrV-MNOwD>

#### Khan Academy

Khan Academy provides free math lessons that are organized by grade level from Pre-K through eighth grade as well as by concept. For high school, specific courses are organized by subject area (e.g., Algebra 1, Geometry, Algebra 2) and by concept. This website also offers “Get Ready Courses” that prepare students for upcoming grade-level and course-based math concepts.

<https://www.khanacademy.org/>

#### Library of Congress Education Resources

The Library of Congress provides a collection of vetted educational resources and professional development for use in online and blended learning settings.

<https://www.loc.gov/education>

#### Math Learning Center

This website provides free access to digital manipulatives that students can use to visualize mathematics concepts.

<https://www.mathlearningcenter.org/apps>

#### National Archives Education Resources

The National Archives provide a collection of vetted educational resources, including primary historical documents, for use in online and blended learning settings.

<https://www.archives.gov/education>

#### National Standards for Quality Online Teaching

A collection of research-based standards developed via collaboration between the Virtual School Leadership Alliance and Quality Matters. These standards provide indicators for best practices in online learning to guide teachers in designing and facilitating online learning environments that cultivate meaningful learning.

<https://www.nsqol.org/the-standards/quality-online-teaching/>

#### News Literacy Must Include Social Emotional Learning

This article from the *School Library Journal* discusses how social-emotional learning competencies can be reinforced via news literacy instruction.

<https://www.slj.com/?detailStory=News-media-literacy-must-include-social-emotional-learning-SEL-librarians>

#### PBS Videos

PBS provides free access to a wide array of video content ranging from historical documentaries to news and public affairs.

<https://www.pbs.org/video/>

#### Smithsonian Open Access Resources

The Smithsonian provides millions of open access images that educators can download, share, and reuse for their classroom activities.

<https://www.si.edu/openaccess>

#### U.S. Department of Education: *Educator and Developer Toolkits on Using Digital Learning Resources to Support English Learners*

This toolkit offers guidance on designing educational technology with EL students in mind. It also includes vignettes and matrices of distance learning resources and digital support features relevant for EL students.

<https://tech.ed.gov/edtech-english-learner-toolkits/>

#### U.S. Department of Education: *Supporting English Learners through Technology: What Districts and Teachers Say about Digital Learning Resources for English Learners*

This report focuses on how districts and teachers identified digital learning resources (DLRs); how teachers have used DLRs; supports for and barriers to DLR use; and suggestions for improving the usefulness of DLRs in EL student instruction.

<https://www2.ed.gov/about/offices/list/opepd/ppss/reports.html#ells>

#### WestEd Webinar Series: Supporting Multilingual and English Learner Students During Distance Learning

Sponsored by the Region 15 Comprehensive Center at WestEd in collaboration with the California Teachers Association (CTA) and CDE, the webinar series includes topics, such as How to Support Young English Learners at Home with Language and Literacy Development, Lesson Planning for English Learners in Distance Learning Environments for Elementary and Secondary Educators, Communicating with Families of Newcomer English Learners During Distance Learning for Elementary and Secondary Educators, The Development of Oral Language in a Distance Learning Environment, Supporting Secondary English Learners in the Social Studies Classroom in a Distance Learning Environment, and Supporting Secondary English Learners in the Science Classroom.

[https://www.wested.org/wested\_event/supporting-multilingual-english-learners-during-distance-learning-webinar-series/](https://www.wested.org/wested_event/supporting-multilingual-english-learners-during-distance-learning-webinar-series/%22%20%5Co%20%22WestEd%20Webinar%20Series%3A%20Supporting%20Multilingual%20and%20English%20Learner%20Students%20During%20Distance%20Learning%20)

#### *A Vision for California’s Schools this Fall: Equity for Dual Language and English Learners in an Unprecedented Moment*

This resource was developed by a collaboration between Californians Together, The Education Trust-West, Early Edge California, Loyola Marymount University’s Center for Equity for English Learners, Sobrato Early Academic Language (SEAL), Advancement Project California, and California Association for Bilingual Education (CABE). This brief report focuses on providing state education leaders, local education leaders, and educators focus points for better supporting EL students. The expectations for California educators include maximizing live instructional time for EL students, prioritizing relationship building, differentiating assessments, committing to strategic and consistent family communication and engagement, adding time to educator schedules for additional support of EL students, as well as grouping in non-segregationary ways and in small groups to personalize language needs.

[https://west.edtrust.org/wp-content/uploads/2017/11/A-Vision-for-California's-Schools-this-Fall.pdf](https://west.edtrust.org/wp-content/uploads/2017/11/A-Vision-for-Californias-Schools-this-Fall.pdf%22%20%5Co%20%22A%20Vision%20for%20California%E2%80%99s%20Schools%20this%20Fall%3A%20Equity%20for%20Dual%20Language%20and%20English%20Learners%20in%20an%20Unprecedented%20Moment)

### Section B

#### CODAP

CODAP, or Common Online Data Analysis Platform, includes many data sets and distributions that students can examine and analyze as they consider measures of center and variability.

<https://codap.concord.org/>

#### Desmos

This free suite of math software tools includes graphic and scientific calculators and digital classroom activities.

<https://www.desmos.com/>

#### District-Curated Number Talks Resources

San Francisco Unified School District compiles a comprehensive page of resources for using number talks strategies in instruction.

<https://www.sfusd.edu/departments/mathematics-department-page/math-teaching-toolkit/math-teaching-strategies/signature-strategies/math-talks/math-talks-resources>

#### Esri GeoInquiries

Esri provides a number of free modules highlighting geometric applications in geospatial data analysis.

<https://www.esri.com/en-us/industries/education/schools/geoinquiries-mathematics>

#### How Does Project-Based Learning Work?

This Edutopia resource provides a step-by-step framework by which educators may approach the incorporation of project-based learning opportunities.

<https://www.edutopia.org/project-based-learning-guide-implementation>

#### Learning Variability Navigator

Digital Promise’s free online tool translates the science of learner variability into easily accessible learner factor maps and strategies to improve classroom practice. The navigator suggests a number of research-based, technology-empowered practices for both mathematics and reading.

<https://lvp.digitalpromiseglobal.org/>

#### Math Visuals

This page allows students to use and reference visuals that allow them to make direct links to materials and spaces they have immediate access to.

<https://mathvisuals.wordpress.com/>

#### NASA JPL

NASA’s Jet Propulsion Laboratory (JPL) provides a number of modules, lesson plans, and data activities premised on the geometry of detecting wildfires from space with remote sensing and satellite imagery.

<https://www.jpl.nasa.gov/edu/teach/activity/fired-up-over-math-studying-wildfires-from-space/>

#### NRICH

The NRICH Project from the University of Cambridge provides free access to a number of digital resources educators can use to facilitate mathematical reasoning and develop problem-solving skills.

[https://nrich.maths.org](https://nrich.maths.org/)

#### Number Paths

This page provides an overview of the number paths strategy to help younger students develop foundational mathematics concepts.

~~https://www.tapfun.com/blog/number-paths-a-fabulous-tool-for-kindergarten-and-first-grademath#:~:text=A%20number%20path%20is%20a,confidence%20and%20accurately%20solve%20problems~~ [Link no longer available]

#### Number Talks Video Resources

Inside Mathematics includes video examples of number talks from classrooms in grade one through grade seven.

<https://www.insidemathematics.org/>

#### Project-Based Learning for Remote Learning

PBLWorks provides strategies, sample projects, and digital tool suggestions for adapting project-based learning opportunities in online learning settings.

<https://www.pblworks.org/pbl-remote-learning>

#### Real World Math

This website provides a series of lesson plans and activities using Google Earth and Geometer’s Sketchpad for teaching many mathematical concepts.

<http://www.realworldmath.org/lesson-downloads.html>

#### Scratch

Developed by the Scratch Foundation, this online tool allows students of varying grade levels to program their own interactive stories, games, and animations.

<https://scratch.mit.edu/>

#### Slow Reveal Graphs

Educators can use various visualizations featured on this website to facilitate discourse about data and their implications.

<https://slowrevealgraphs.com/>

#### Spurious Correlations

Educators can use various visualizations featured on this website to show how seemingly correlating sets of data do not necessarily imply causal relationships.

[www.tylervigen.com/spurious-correlations](http://www.tylervigen.com/spurious-correlations)

#### Strategies for Using Digital Choice Boards in the Classroom

This article provides several strategies for using choice boards in online and blended learning spaces to offer students multiple ways of demonstrating their learning.

<https://www.teachthought.com/pedagogy/strategies-for-using-digital-choice-boards-in-the-classroom/>

#### Teach InCtrl

Educators may use the strategies on this page to help students build media literacy skills through mathematics instruction.

<https://teachinctrl.org/math/>

#### Toy Theater

Educators have many virtual manipulatives to choose from on Toy Theater to help students actively understand math concepts.

[https://toytheater.com/category/teacher-tools/virtual-manipulatives/](https://toytheater.com/category/teacher-tools/virtual-manipulatives/%22%20%5Co%20%22Toy%20Theater%3A%20Virtual%20Manipulatives)

#### What’s Going on in This Graph?

The *New York Times* provides various visualizations of real data, from vaccination rates to food preferences, that educators and students can discuss to foster a mathematics discourse.

<https://www.nytimes.com/column/whats-going-on-in-this-graph>

#### Wolfram Alpha

Among other features, Wolfram Alpha offers tools for students to create visual mathematical representations.

<https://www.wolframalpha.com/>

#### YouCubed

Youcubed is a platform for teachers and parents to find information on how to approach math from a very different angle by focusing on addressing the myths of the "math brain" and how to transform the latest research on math into accessible and practical forms to promote high levels of student engagement and achievement. The website includes: Ideas, Tasks, Data Science, Films, Courses, Evidence, Books, and News. YouCubed also provides activities, videos, and research findings for number talks and data talks.

<https://www.youcubed.org/>

### Section C

#### Apps and Websites for Special Education Programs

Common Sense Education has curated digital tools and resources for use with students with specific disabilities.

<https://www.commonsense.org/education/top-picks/apps-and-websites-for-special-education-programs>

#### AVID One-Pager

AVID suggests a strategy that students may use to process their reading through multiple modalities. This may be conducted in digital or analog environments.

~~https://www.alvordschools.org/site/handlers/filedownload.ashx?moduleinstanceid=18523&dataid=30429&FileName=One\_Pager\_Overview.pdf~~ [Link no longer available]

#### Embedded Supports to Differentiate Instruction for Struggling Students

LD OnLine, a national education service organization working in partnership with the National Joint Committee on Learning Disabilities (NJCLD), shares a number of key technology-empowered approaches grounded in the Universal Design for Learning framework.

<http://www.ldonline.org/article/61304/>

#### Fostering Collaboration in a Remote Learning Environment

This article from the International Literacy Association provides recommendations for encouraging authentic collaboration in online learning environments.

<https://www.literacyworldwide.org/blog/literacy-now/2020/08/25/together-apart-fostering-collaboration-in-a-remote-learning-environment>

#### Resources For Virtual Instruction and Online Learning

The National Council of Teachers of English provides several focused resources***—***including books, articles, and journals***—***to build ELA/literacy and ELD teachers’ knowledge of new digital tools and strategies they can use in online or blended learning settings.

<https://ncte.org/resources/resources-virtual-instruction-online-learning/>

#### Socratic Seminars

This webpage from the National Council of Teaching of English suggests ways that Socratic seminars for varying grade levels may be conducted in an online space.

<http://www.readwritethink.org/professional-development/strategy-guides/socratic-seminars-30600.html>

#### Teach InCtrl

Educators may use the strategies on this page to help students build media literacy skills through English language arts instruction.

<https://teachinctrl.org/english-language-arts/>

#### Teaching Adolescents How to Evaluate the Quality of Online Information

Educators may use the strategies on this page to help middle and high school students identify relevance, accuracy, bias, and reliability in the content they read.

<https://www.edutopia.org/blog/evaluating-quality-of-online-info-julie-coiro>

#### Virtual Field Trips

To help bring stories to life, teachers can create virtual field trips for their students using resources from Discovery Education to explore a setting in which a story takes place.

<https://www.discoveryeducation.com/community/virtual-field-trips/>

#### Virtual Literature Circles Create a Safe Space for Students

This Edutopia article shows how to conduct discussions centered in students' experiences that spark more text-to-self connections.

<https://www.edutopia.org/article/virtual-literature-circles-create-safe-space-students>

#### Word Prediction Technology: What It Is and How It Works

Understood.org provides an overview of how digital tools provide word-prediction ability that can help students with suggested words or phrases.

<https://www.understood.org/en/school-learning/assistive-technology/assistive-technologies-basics/word-prediction-technology-what-it-is-and-how-it-works>

## Appendix D: Mathematics Rubric Sample

The rubric below gives an overview of the Big Ideas for grade three. It connects the Drivers of Investigation to both the Big Ideas and the standards for mathematical practice (SMP). Periodically and throughout the school year, teachers can use a tool like this to assess and give feedback to students around their strengths and areas for growth. The teacher notes those indicators that the student has shown mastery, and which ones the student should focus on to further student learning. The final two columns are meant to be filled in by the teacher.

**Considerations for the final two columns to be completed by the teacher (TBT):**

**Student Strength:** What does the student understand in terms of this standard? What linguistic and cultural assets possessed by the students can I tap into to support all students, including those on the road to English proficiency, in their mastery of the content?

**Student Area for Growth:** What should the student focus on to strengthen their understanding of this standard?

| **Content Connections** | **Big ideas** | **Mathematical****Practice Standards** | **Indicators: The student...** | **Student Strength** | **Student Area for Growth** |
| --- | --- | --- | --- | --- | --- |
| Reasoning with Data | **Represent Multivariate Data** | **SMP1**: Make sense of problems and persevere in solving them.**SMP4**: Model with mathematics**SMP6**: Attend to precision | -Interprets appropriate meaning from graphs-Strategically organizes multivariable data-Creates graphs that clearly communicate information from data | TBT | TBT |
| Reasoning with Data | **Fractions of Shape and Time** | **SMP4**: Model with mathematics**SMP5**: Use appropriate tools strategically.**SMP6**: Attend to precision | -Creates data visualizations that clearly capture and communicate about data collected over time  | TBT | TBT |
| Exploring Changing Quantities | **Patterns in Four Operations** | **SMP3**: Construct viable arguments and critique the reasoning of others.**SMP5**: Use appropriate tools strategically.**SMP7**: Look for and make use of structure. | -Computes sums and differences within 1000-Justifies solutions using appropriate tools or models-Constructs arguments with clear reasoning to support solutions | TBT | TBT |
| Exploring Changing Quantities | **Number Flexibility to 100 for All Four Operations** | **SMP3**: Construct viable arguments and critique the reasoning of others.**SMP4**: Model with mathematics.**SMP5**: Use appropriate tools strategically. | -Computes products and quotients within 100 -Justifies solutions using appropriate tools or models-Constructs arguments with clear reasoning to support solutions | TBT | TBT |
| Taking Wholes Apart, Putting Parts Together | **Square Tiles** | **SMP2**: Reason abstractly and quantitatively.**SMP5**: Use appropriate tools strategically. | -Measures area using square tiles as tools-Connects the area of individual square tiles to area of entire shape’s area using fractions. | TBT | TBT |
| Taking Wholes Apart, Putting Parts Together | **Fractions of Shape and Time** | **SMP2**: Reason abstractly and quantitatively.**SMP4**: Model with mathematics**SMP7**: Look for and make use of structure | -Collects and organizes multivariable data in relationship to time-Creates connections that highlight the relationship between measures of time including minutes, quarter, and half hours. | TBT | TBT |
| Taking Wholes Apart, Putting Parts Together | **Fractions as Relationships** | **SMP2**: Reason abstractly and quantitatively.**SMP7**: Look for and make use of structure | -Interprets the relationship between the numerator and denominator of fractions-- especially in context-Recognizes and connects equivalent fractions to one another. | TBT | TBT |
| Taking Wholes Apart, Putting Parts Together | **Unit Fraction Models** | **SMP3**: Construct viable arguments and critique the reasoning of others.**SMP4**: Model with mathematics | -Uses visual models to compare unit fractions-Justifies arguments about unit fractions using visual models | TBT | TBT |
| Discovering Shape and Space | **Analyze Quadrilaterals** | **SMP2**: Reason abstractly and quantitatively.**SMP4**: Model with mathematics | -Compares quadrilaterals based on various features-Investigates how area and perimeter change when side lengths change.-Solves real world problems involving area and perimeter of quadrilaterals through modeling. | TBT | TBT |
| Discovering Shape and Space | **Fractions as Relationships** | **SMP2**: Reason abstractly and quantitatively.**SMP4**: Model with mathematics | -Creates visual representations that model fractions-Justifies how a model represents a fractional quantity by relating the numerator, denominator and visual. | TBT | TBT |
| Discovering Shape and Space | **Unit Fraction Models**  | **SMP3**: Construct viable arguments and critique the reasoning of others.**SMP4**: Model with mathematics | -Uses visual models to compare unit fractions by attending to differences in scale-Justifies arguments about unit fractions using visual models | TBT | TBT |

California Department of Education, November 2024

1. <https://www.cde.ca.gov/ls/he/hn/guidanceplanning.asp#definitions> [↑](#footnote-ref-1)
2. <https://www.cde.ca.gov/ls/he/hn/guidanceplanning.asp#definitions> [↑](#footnote-ref-2)
3. <https://www.cde.ca.gov/pd/ee/responsiveteaching.asp> [↑](#footnote-ref-3)
4. <https://www.cde.ca.gov/ls/he/hn/guidanceplanning.asp#definitions> [↑](#footnote-ref-4)
5. <https://www.cde.ca.gov/be/st/ss/documents/librarystandards.pdf> [↑](#footnote-ref-5)
6. <https://www.cde.ca.gov/ls/he/hn/guidanceplanning.asp#definitions> [↑](#footnote-ref-6)
7. Appendix B includes digital tools to support the implementation of the strategies and considerations identified in the *California Digital Learning Integration and Standards Guidance*. The digital tools are available free and premium, and their inclusion in the guidance are largely derived from interviews with California educators. LEAs exercise local control when selecting digital tools and resources. The digital tools listed should not be considered endorsements by the CDE. [↑](#footnote-ref-7)
8. Appendix C includes resources to support the implementation of the strategies and considerations identified in the *California Digital Learning Integration and Standards Guidance*. LEAs exercise local control when selecting digital tools and resources. The resources listed should not be considered endorsements by the CDE. [↑](#footnote-ref-8)