JOHNS HOPKINS
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Online Teaching for K-12 Schools: What the Research Says

Key Best Practices for Schools and Teachers

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In the spring of 2020, schools across America are challenged with a critical issue: How to continue to foster student learning given sudden, and often indefinite school closures. Though digital learning is now used widely across the K-12 landscape, understandably, educators vary considerably in their comfort with shifting rapidly to fully online instruction. Figuring out not only *how* to continue instruction, but how to continue instruction *most effectively*, is the key challenge educators everywhere are facing.

In this context, experts from the Center for Research and Reform in Education at Johns Hopkins University highlight several key guidelines that schools and teachers might consider as they shift to online instruction. Grounded in the latest research on what makes for effective online teaching for K-12 students, this set of best practices can be used to guide educators as they shift to online teaching in the months ahead.

Best Practice #1: As much as possible, make learning collaborative for students

A bevy of research supports the effectiveness of collaborative and cooperative learning strategies (Gillies, 2016; Slavin, 2009). Strategies that involve students discussing and sharing ideas, working together toward a common goal, or strategically socializing in ways that enhance learning are well-supported in the research literature on how people learn (Dirksen, 2012; O'Connor, 1998; Okita, Bailenson, & Schwartz, 2008; Saloman & Perkins, 1998; Slavin, Hurley, & Chamberlain, 2003). Interestingly, research has found that the effectiveness of these strategies *in particular* translates well to digital learning environments (Means et al., 2010; Robertson & Riggs, 2018). With digital instruction, teachers can easily fall into the habit of relying too heavily on assigning independent work to students (Robertson & Riggs, 2018) which can be both isolating and disengaging for learners. Fortunately, nearly all Learning Management Systems (LMS) from Blackboard to Schoology, now include robust features that enable teachers to assign group work and foster student collaboration. Use them as much as you can! Through the use of group assignments, student team competitions, jigsaws, group learning simulations, and class discussions through message boards and live chats, research suggests that not only does the online setting become less isolating for students, but that engagement and learning are enhanced as well (Hanover Research, 2015; Robertson & Riggs, 2018; Smith & Brame, 2018).

> "The opportunity to work with other classmates closely on an assignment provides the chance to learn a great deal from others. It is important to always actively engage online learners in the course content. Team projects inherently bring a social

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aspect to the forefront. There will be opportunities for team meetings, sharing, and time to contribute to an overall project which will make learners feel more connected to others in the online course." (Budhai & Skipwith, 2017, p. 61)

Best Practice #2: Communicate, communicate, communicate!

By its very nature, digital instruction happens across space. Though this serves as a key advantage to online learning in that students can have access to instructional content at any place and time, it also requires that additional attention be paid to maintaining the interpersonal connections that students form naturally in school. A comprehensive examination of K-12 online instructional practices conducted by Hanover Research (2015) highlighted the distinct importance of frequent, consistent, and individualized check-ins between teachers and students:

"The transition from face-to-face instruction to instruction in an online learning format requires instructors to take on new roles and responsibilities that vary from those of a traditional classroom setting. To facilitate a quality online course, teachers must adapt their pedagogy to make it appropriately engaging for distance learners. According to the research, the presence of meaningful communication and effective instruction is central to students' engagement." (p. 15)

As outlined by these researchers, The International Association for K-12 Online Learning (iNACOL/Aurora Institute) provides numerous guidelines for what this communication should look like. Student emails and messages should be answered within 24 hours, weekly progress checks should be recorded for students individually, and monthly conferences should be conducted one-on-one with students and their parents. Other researchers have highlighted the importance of communicating immediate feedback on student work to shape learning (Bigge & Shermis, 2004; Driscoll, 2000; Slavin, 2009). Fortunately, digital learning environments can actually make this process easier for teachers: "Online learners generally have greater access to instructors via email and are able to have questions answered by their peers in a timely fashion on discussion boards. In addition, online tests and quizzes can be constructed with an automatic grading capability that provides timely feedback" (Smith & Brame, 2018). By taking advantage of these LMS features and adhering to the guidelines established by iNACOL, teachers can create far more engaging and interpersonally rich learning experiences for students while teaching online.

Best Practice #3: Leverage aspects of technology that kids already use and enjoy -- Gamification and learning

For many kids, the most inherently interesting facet of online learning is that it has a different 'feel' than school. They're using a computer or a tablet, they're at home rather than in a classroom, and many of the instructional programs they use can feel a lot like they are playing a video game. Although there are certainly examples of digital learning programs that sacrifice quality instructional content for the sake of 'fun' – increasingly makers of digital curricula are learning to effectively balance effective teaching with engaging game-like features. Furthermore, a fast-growing body of research has demonstrated the effectiveness and benefits of game-based learning (Budhai & Skipwith, 2017; Connelly et al., 2012; Hamari et al., 2016). In fact, recent research has found that educational video games can be an effective means of increasing

engagement in learning, can facilitate deep immersion or "flow states" in engaging with an instructional activity, and can enhance both long-term interest and learning outcomes (Hamari et al., 2016). Other research also suggests that game-based learning can indirectly cultivate skills such as problem-solving, lateral thinking, and concentration (Budhai & Skipwith, 2017). Why does "gamification" appear to influence learning in so many different ways? Hamari and colleagues (2016) suggest that many of the features of *effective games* overlap with the features of *effective lessons*:

> "In an ideal educational game setting, students learn how to solve complex problems. The problems within a game typically start off easy and then progressively become more difficult as players' skills develop. Players are motivated to learn, in part because learning is situated and occurs through a process of hypothesizing, probing, and reflecting upon the simulated world within the game. In addition, the goals are clear, and information becomes available to players at just the time that it is needed to reach each goal. Making sense of that information becomes a goal intrinsic to gameplay." (p. 170)

Given this growing body of research, strategically selecting and providing students with instructional games can be an effective means of leveraging online teaching in a way that enhances both engagement and learning.

Best Practice #4: Make sure that the class website is organized, works, and is set-up to support learning

When teachers engage in digital instruction, one of the aspects that can be easy to overlook is the importance of making sure that the 'class website' is well-organized, up-to-date, and designed in a way that maximizes learning. Research suggests that this is often an important driver of students' engagement in using digital content (Blomeyer, 2001; Clements, Pazzaglia, & Stafford, 2015; Smith & Brame, 2018). Regardless of where students are in the K-12 age spectrum, the class website acts as the central hub where they access content, post assignments, and interact with classmates. In many ways this web portal can actually serve as an alternate for the physical classroom space itself. E-learning students will inevitably spend a great deal of time navigating the website, and their engagement can be easily diminished if it is confusing or lacks functionality (Clements, Pazzaglia, & Stafford, 2015). Making sure that links to content work correctly, that information on the site is up-to-date, organized, and clearly labeled, and that site features such as homework uploads and messaging applications work properly are all important things to attend to. Making sure that the layout of the page is visually and functionally consistent with an easy-to-read typeface also matters (Hanover Research, 2015). Several research-based design principles can also be employed to help set up digital content in a way that greatly enhances learning. As Ardito and colleagues (2004) point out:

> "Effective e-learning systems should include sophisticated and advanced functions, yet their interface should hide their complexity, providing an easy and flexible interaction suited to catch students' interest." (p. 80)

The organization of the class portal should be built around key subjects and objectives, and should supply students with a clear path to navigate and independently locate resources (Hanover Research, 2015; Shea et al., 2003; Smith & Brame, 2018). Attention should also be paid to highlighting essential material, reducing extraneous or distracting website features, and avoiding redundancy in posting materials and resources (Mayer, 2018; Mayer & Fiorella, 2014). Strategically breaking the material that is posted on the website into small, manageable chunks and scaffolding material appropriately is also of high importance (Linden et al., 2003; Marzano, 2007; Smith, 2008). Through attending to principles such as these and paying close attention to the facets discussed above, more efficient and engaging e-learning can occur. In most school districts, educational technology specialists can help teachers with technical matters in the short term and in building more effective classroom websites over time.

Best Practice #5: Variety and flexibility matter – Differentiate instruction and utilize multimodal forms of teaching

One facet that differentiates e-learning from traditional forms of instruction is the flexibility that digital modes have with regard to presentation. With digital learning, teachers are not bound to the limitations of print-based materials, but rather have options for interactive presentations, videos, audio, and other multimodal means of teaching (Clark, 2002; Sankey, Birch, & Gardiner, 2010). Likewise, students are provided with this same set of diverse options when it comes time to demonstrate their learning (Dean, Hubbell, Pitler, & Stone, 2012). It is important for teachers to take advantage of this flexibility. Research on instructional approaches such as differentiated instruction (Tomlinson et al., 2003), and Universal Design for Learning (Rappolt-Schlichtmann, Daley, & Rose, 2012; Rose, Meyer, & Hitchcock, 2005) have demonstrated the utility of using strategic, multimodal types of teaching. In particular, a growing body of research has found support for an instructional approach that differentiates modes of instructional presentation, provides multiple entry points for students to engage with content, and is flexible in terms of how students demonstrate learning (Rappolt-Schlichtmann, Daley, & Rose, 2012; Rose, Meyer, & Hitchcock, 2005). The use of non-linguistic representations of information, whether they be through images, graphic organizers, or videos have long been found to be an effective means in helping students to form a deeper understanding of concepts as well (Beesley & Apthorp, 2010; Dean, Hubbell, Pitler, & Stone, 2012; Marzano, 2007; Medina, 2008).

Fortunately, the affordances of instructional technology can make flexible, multimodal forms of teaching such as these easier and more robust (Dean, Hubbell, Pitler, & Stone, 2012; Sankey, Birch, & Gardiner, 2010). In fact, guidelines for leveraging these approaches to digital pedagogy are even incorporated in the National Standards for Quality Online Teaching (VLLA & QM, 2020). As with other elements of digital instruction, it is important to consider a variety of design principles when creating multimodal presentations. Adding graphics to accompany words, placing text directly adjacent to graphics, and explaining graphics with audio can all be advantageous when done strategically (Clark, 2002). On the flip side, gratuitous or redundant visuals, texts, and sounds should be avoided (Clark, 2002). Keeping these instructional strategies and principles in mind, educators should certainly consider the ways in which they can leverage technology for more differentiated teaching:

"With each passing day, it is easier to assume that our students will need communication skills far beyond the basic ability to convey ideas with the written word. Teachers, therefore, must be cognizant of how they model the use of images, video, music, and sounds to convey information in ways that increase understanding. In this way, teachers not only provide good examples for 21st century learners but also leverage the power of nonlinguistic representation for making sense of new information." (Dean, Hubbell, Pitler, & Stone, 2012, p. 75)

Best Practice #6: Be strategic in leveraging the affordances that technology can provide – Use of simulations

When engaging in digital instruction, it is important that teachers thoughtfully consider the ways that technology can be used to provide learning experiences to students that they may not otherwise have. In particular, use of experiential simulations, virtual field trips, and virtual problem-solving activities are all ways that technology can be leveraged to make learning more relevant, engaging, and authentic. As Mouza (2008) highlights:

"Use of computers can also change what students learn by providing exposure to ideas and experiences that otherwise would be inaccessible. Such opportunities are particularly useful in developing the higher-order skills of critical thinking, analysis, and inquiry that are necessary for success in the 21st century." (p. 449)

Research is beginning to uncover many of the benefits that these novel uses of instructional technology can afford. A variety of different studies on learning simulations and virtual field trips have found positive influences on student engagement and learning (Gredler, 2004; Henderson, Klemes, & Eshet, 2000; Poland, 1999). When designed well, these types of learning activities aim "to motivate the learner to engage in problem solving, hypothesis testing, experiential learning, schema construction, and development of mental models" (Lunce, 2006, p. 37). Whether it be exploring a tropical rainforest using virtual reality (Poland, 1999), uncovering and studying fossils through a computer simulation (Henderson, Klemes, & Eshet, 2000), or conducting virtual science-experiments in physics classes (Swaak & de Jong, 2001; Van Joolingen & de Jong, 1996), research has found that well-done simulated learning activities can be both engaging and effective (Gredler, 2004; LeJeune, 2002; Lunce, 2006). In fact, some research suggests that problem-solving scenarios in simulations can be just as effective as real experience, particularly in science (Horowitz & Christie, 2000; Swaak & de Jong, 2001; Van Joolingen & de Jong, 1996). Beckem and Watkins (2012) highlight the many benefits of these types of learning experiences:

"Simulations empower learners to acquire new knowledge and build upon existing competencies that are entirely driven by their experiences within the environment. Incorporating simulations in education supports the shift towards a student-centered approach where students are more in control of how and when they learn. These experiences enable students to move beyond merely remembering, understanding and applying concepts to a higher order process of analyzing, evaluating and synthesizing information to formulate new knowledge. Their ability to inspire intrinsic motivation makes simulations a tremendous asset to any blended learning program seeking to better engage and retain students." (p. 62)

Taken in combination, these research findings highlight some of the unique affordances of instructional technology. Not only can technology facilitate more individualized and flexible forms of instruction, but it can also help provide students with authentic learning opportunities that may otherwise be unattainable. Imaginative use of technology leverages these unique affordances to create learning experiences that go beyond what might be feasible with traditional instruction alone.

Best Practice #7: Don't forget that it's not the technology, it's the quality of instruction that makes a difference

Perhaps the most fundamental conclusion that research on online instruction has produced is that technology, in and of itself, is not the driver of improvements in student learning. Rather, it is the *quality of digital instruction* that drives learning (Howell, 2001; Mayer, 2018). Educators can often lose sight of this facet during the transition to e-learning. Digital learning initiatives can be expensive, and understandably, district leaders and school administrators may be impatient to see a return on the investment. They want to see that the technology they purchased is used extensively – whether that be a new set of laptops for students, a new SMARTBoard, or a new online math or reading program. In these instances, it is understandable that teachers may feel pressure to 'jump in with both feet' even though they may not yet be fully comfortable with digital teaching. This being said, however, research is conclusive in demonstrating that what's important for student learning is not the technology itself, but rather *how it is used* (Howell, 2001; Mayer, 2018). Simply put, those instructional techniques that are effective when teaching students in-person are also typically going to be effective when teaching online.

Through online instruction teachers can just as easily, if not more so, engage students in a wide-variety of activities that are well-grounded in contemporary research on how people learn. Aside from those discussed thus far in this best practices brief, many others appear to be particularly well-suited for online instruction. For instance, research-based activities such as those that involve students summarizing information (Anderson & Hidi, 1988; Hidi & Anderson, 1986; Marzano, Pickering, & Pollack, 2001), engaging in elaborative encoding (Llewellyn, 2013; Staszewski, 1990), or using advanced-organizers or note-taking techniques (Beecher, 1988; Marzano, 2007) would all appear to be uniquely well-suited for helping students engage with content presented to them digitally. With a bit of creativity, these instructional activities along with many others that have been employed since long before laptops were introduced, are well within the online teacher's toolbox. Remember: "Learning is caused by instructional methods rather than instructional media" (Mayer, 2018, p. 152). Keep this principle in mind and your students will continue to learn a great deal, even though they might not be in school.

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