CORE FUNCTION	EFFECTIVE	INDICATOR
Dimension A	Instructional Excellence and Alignment	The district provides and supports digital-age classrooms and learning opportunities through relevant and necessary materials, resources, and tools. (6830)

Explanation: Effective leadership and decision-making are crucial to providing and supporting the digital infrastructure essential for student-centered, digital-age classrooms and learning opportunities. Districts need well thought-out and systematic planning processes to ensure that teachers have the tools and resources they need to enhance student learning. These plans should include ways to monitor implementation and measure the effectiveness of digital learning initiatives such as personalized learning. Districts must ensure students have the necessary digital tools, and schools must have adequate broadband access to ensure high-quality learning is taking place consistently. Districts must also see that schools have access to timely support to fix technology issues, and that as much as possible, digital materials, resources, and tools are aligned with each other to support student learning.

Questions: *What process does the district use to select devices and other digital technologies? Who is involved in the decision-making process? Do all students have access to a device both at school and at home? Do all schools have sufficient broadband access for students and teachers to use the digital tools provided? How does the district monitor classroom implementation of the digital tools, materials, and resources provided? Have evaluation tools and rubrics been modified to assess personalized learning implementation? Are online learning programs and learning management systems capable of providing real-time and actionable information about student progress? How does the district monitor and respond to technology issues that arise at each school? What evidence is there that digital tools and programs are aligned with one another? Does the district have a strategic plan for developing and maintaining digital-age classrooms and learning opportunities? Does the plan address the need for robust infrastructure/systems and how to ensure data privacy/security of students and staff, how sufficient resources for technology will be provided, and how partnerships can support digital-age classrooms and learning opportunities?*

In order to expand students' competencies to better prepare for college and/or career, many researchers and educators are calling for *student-centered* instructional approaches that individualize instruction to meet each student's strengths and challenges, while continuing to hold high expectations for all learners (Friedlaender et al., 2014; Le, Wolfe, & Steinberg, 2014). Personalized Learning (PL) is based on enhancing the degree to which K-12 education is student-centered to ensure positive and equitable learning outcomes for all students. To implement PL at scale, the use of technology is often (but not always) essential (Patrick, Kennedy, & Powell, 2013). Technology in digital-age classrooms can amplify the reach and the role of teachers by providing immediate feedback and scaffolding, easy small group formation based on students' learning needs, easier collaboration on projects (e.g., Google Docs), and enhanced capacity for creation of learning products (Education Elements, n.d.). The teachers' role is never replaced (Redding, 2016), but may shift towards a focus on higher-level tasks and critical thinking (Education Elements, n.d.). Districts implementing PL must ensure that teachers have the tools, resources and materials to support their work in digital-age classrooms as they provide personalized learning opportunities for students that maximize their learning.

Providing Digital Age Classrooms and Learning Opportunities that Foster Personalized Learning

The tools and programs used in digital-age classrooms play a key role in improving instruction and personalizing learning;

however, schools need leadership and decision making that focuses on selecting appropriate tools and programs, monitoring implementation, and assessing effectiveness for student learning. Schools must match their digital learning needs with appropriate devices and programs that promote learning for all students through a comprehensive digital infrastructure (Grant & Basye, 2014; Thigpen, 2014). Bingham, Pane, Steiner, & Hamilton (2018) describe the breadth of the role of technology in developing and delivering PL within digital-age classrooms:

> PL models, such as blended learning, often rely on digital curricula, learning management systems, and technological devices to deliver content, provide multiple learning opportunities and modalities, and manage and analyze student data (Bingham, 2016). The use of digital course content and assessment and technological devices to deliver content is meant to increase teachers' capacities to personalize students' pacing and learning paths and make the process of designing and delivering PL more manageable for teachers… [so they are] …more readily available for targeted one-on-one instruction. (pp. 459–460)

Strong leadership capable of developing this infrastructure along with a shared vision of all community members is required in order for technology to truly transform learning (U.S. Department of Education, 2016).

Considerations for selection of digital technologies. Districts often lack a systematic process and therefore run into significant issues once teachers and students begin using technology, such as software compatibility with devices and how they should be used to support instructional goals. School leaders and instructional technology teams must consider a variety of factors, including broadband access, device availability, device use policies, and the capacity of online programs to capture and report accessible and actionable student data. It is critical that teachers and students have fast and reliable internet access in order to use a wide range of digital tools, including learning and content management systems, video streaming, social networks, cloud capabilities, and online communication and videoconferencing tools (Thigpen, 2014; U.S. Department of Education, n.d.). Many schools still lack sufficient broadband to take advantage of modern digital tools to promote learning (Education Superhighway, 2015); similarly, many homes lack high speed connectivity, leaving many children, particularly those in low-income, non-white and rural communities, without the capacity to use digital tools for homework and school projects (Chuong & Schiess, 2016; Thigpen, 2014). While recent federal initiatives have addressed broadband inequities and narrowed the gap in access, many schools still need to consider both school and home broadband access when selecting digital technologies to ensure that they will be usable in both settings.

School leaders must also consider how many digital devices to purchase and policies for their use. Recent literature suggests that a one-to-one ratio of devices to students combined with effective implementation is likely ideal for improving student outcomes. For example, a recent meta-analysis of research on one-to-one laptop programs found these programs, when well-integrated with curricula and with plenty of professional development for teachers, led to increased achievement, enhanced student engagement and enthusiasm, and more student-centered and project-based instruction (Zheng, Warschauer, Lin, & Chang, 2016). However, schools must consider whether there is sufficient funding to pay for devices, enough bandwidth to support all students using their devices simultaneously, and how to distribute and manage so many devices (Herold, 2016). Some schools have implemented "bring your own device" (BYOD) policies to allow and encourage students to use their personal digital devices for learning at school. Schools implementing BYOD policies need strong leadership and substantial planning in order to avoid potential pitfalls that can arise with these policies. Some examples include inequity (some students' families may not be able to afford a device for their children), student distractions that can inhibit learning, lack of security features to secure student data, and students using a range of different devices with different capabilities, which can cause an instructional burden for teachers (U.S. Department of Education, 2016).

Monitoring implementation of digital technologies and programs and their impact on learning. School leaders must work with experienced peer mentors to assess and guide online or blended teaching practices (or hybrid approaches combining both elements along with traditional, direct instruction) in order to successfully implement personalized learning practices within their schools (Horn, 2015). The rapid pace of technological change requires teachers using these approaches continually learn and innovate within their work with students (Powell, Rabbitt, & Kennedy, 2014). Teachers implementing online or blended approaches may shift from primarily being conveyors of knowledge to coaches or mentors that encourage student ownership of their learning. Digital learning can also allow teachers to focus on encouraging critical thinking and application of knowledge, since digital content can successfully address the foundational levels of

Bloom's taxonomy, such as memorization (Powell et al., 2014). Therefore, in order to assess the classroom implementation of these approaches, school leaders and experienced peer mentors must utilize tools and techniques that appropriately capture key teacher behaviors that are reflective of sound instructional blended or online teaching (see Education Elements, 2014 for an example of a rubric to measure these behaviors). School leaders will likely need to rethink walk-through tools and better align them to identify effective blended teaching practices (TNTP, 2014a). An additional priority is measuring "off-stage" teacher activities to capture data on collaboration, data analysis, and planning (TNTP, 2014b). For example, school leaders can observe teachers as they examine formative data gathered from online assessments and determine their proficiency in both understanding and acting on the assessment data to enhance student learning.

School leaders should also ensure that online learning programs used by the school generate student data that reveals program use, student performance, and progress. Online learning programs used within *personalized learning systems* should provide easily accessible student data to the student and his/her teacher (and often parents); this data then drives instruction as the student masters goals and achieves standards (Glowa & Goodell, 2016). Some schools and districts have developed online personalized learning plans that consist of daily actionable goals, action steps, and competencies. Students develop these plans in partnership with their teachers, and document how they will meet established goals. These plans can contain assessment data and are used to document academic growth; they also may allow teachers (and school leadership) to capture data on non-academic skills and competencies (Educause, 2016). Data or learning dashboards provide a single place that "integrates information from assessments, learning tools, educator observations, and other sources to provide compelling, comprehensive visual representations of student progress in real-time" (U.S. Department of Education, 2016). These dashboards can provide data in easily accessible formats tailored to various stakeholders (e.g., students, parents, etc.); they can also suggest resources to help students continue their learning and provide early detection of students who are struggling and may be at risk for failure or drop-out.

Potential Pitfalls and Recommendations for Districts

Unfortunately, leadership in providing digital-age classrooms can be a challenge as schools attempt to implement the types of complex and large-scale changes to structures and systems necessary to incorporate personalized learning practices (Bingham, 2016; Bingham et al., 2018; Education Elements, n.d.; Gross & DeArmond, 2018; Pape & Vander Ark, n.d.), and very little research is available to guide district leaders (Haynes & Shelton, 2018; Watson & Murin, 2014). For example, many individual (e.g., beliefs about, and comfort with, technology), structural (changes necessary to current practices), and contextual factors (e.g., quality of technology resources) likely impact whether, to what degree, and how teachers use technology in the classroom to implement PL strategies (Cuban, 2012; Ertmer, 2005; Groff & Mouza, 2008). A recent qualitative analysis of 28 schools implementing technology-based PL models found several challenge areas, including the failure of a school's infrastructure and available technology to fully align with teachers' needs (Bingham et al., 2018). The researchers found that schools often lacked proper structural support for high levels of technology use. For example, teachers and students dealt often with technology problems (e.g., outdated hardware, inconsistent internet access) despite increases in school connectivity and availability of digital devices, content, and learning platforms. In addition, finding sufficient numbers of high-quality digital resources was an issue. This led to alignment issues in the areas of data compilation/analysis, standards alignment and alignment to student level, as well as alignment among digital resources and curricula. One administrator described the data analysis challenge:

> This is a big challenge: how to aggregate our data and make it usable. We use a million different programs and systems and they don't talk to each other. We use Powerschool for grades, the School Runner behavior management system, Google Docs for after-school rosters and detention, Illuminate for assessment and Exit Ticket for formative assessment and they don't talk … so there is not one place I can go to look up a kid and see all their data—grades, attendance, the last time someone talked to a parent. (Bingham et al., 2018, p. 472)

The researchers recommend ensuring that structural supports such as adequate bandwidth are in place *prior* to PL implementation, and that schools have access to learning platforms that are capable of integrating data from multiple sources. Schools also need the right people in the right places to support digital age classrooms. In a study of lessons learned from schools and districts who had successfully leveraged technology for school improvement, Levin and Schrum

(2013) found that technology support at the school site and personnel capable of doing professional development directly with teachers served as ideal conditions for leveraging technology for school improvement. Other successful strategies included rapid-response district support teams, and school help desks operated by high school students who were enrolled in an elective course.

Some experts suggest phasing in PL components and their accompanying technology slowly (e.g., starting with a few schools or a few grades) to test and refine implementation (Chuong & Schiess, 2016; Pape & Vander Ark, n.d.). Implementation planning is critical for providing and supporting digital-age classrooms, and this process should include goal setting (short- and long-term), detailed roadmaps for fulfilling goals, important milestones and timelines, and how human, financial, and time responsibilities and resources will be divided (The International Society for Technology in Education [ISTE] Essential Conditions, 2016). Education leaders must "build teams and systems to implement, sustain and continually improve the use of technology to support learning" (ISTE Standards for Education Leaders, 2012). Education leaders should strive to:

- Lead teams to collaboratively establish robust infrastructure and systems needed to implement the strategic plan;
- Ensure that resources for supporting the effective use of technology for learning are sufficient and scalable to meet future demand;
- Protect privacy and security by ensuring that students and staff observe effective privacy and data management policies; and,
- Establish partnerships that support the strategic vision, achieve learning priorities and improve operations.

(ISTE Standards for Educators, 2012)

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Additional Resources

For a district self-assessment tool and video playlist on readiness for implementing personalized learning see: https://tech.ed.gov/assessment/leaders/

For planning tools to evaluate school/district progress toward technology integration see: https://id.iste.org/connected/standards/essential-conditions/implementation-planning?_ga=2.221800401.834496396.1564578037-1383153127.1564339639