Guidelines for Supporting Technology-based Learning Environments

July 2020

Council of the Great City Schools

ABOUT THE COUNCIL

The Council of the Great City Schools is the only national organization exclusively representing the needs of urban public schools. Composed of 76 large-city school districts, its mission is to promote the cause of urban education and to advocate for inner-city students through legislation, research, and media relations. The organization also provides a network for school districts sharing common problems to exchange information and to collectively address new challenges as they emerge in order to deliver the best possible education for urban youth.

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Overview and Purpose of this Report

COVID-19 has shined a bright light on the institutional inequities that exist in our public-school systems, especially in large urban environments with some of the highest concentration of students of color, English learners, and high poverty. These students have traditionally lacked access to the educational resources they need to be successful in the new technology-based environment, including Internet connections, devices, and computers. Despite substantial district efforts to provide teachers and students with computing devices and internet access, many inner-city students still do not have a device or Internet access to connect with educational resources, their teachers, and other students months after the initial school closures.

This crisis therefore presents school district leadership with the opportunity to address these historical gaps in access and find solutions that could transform schools and make a difference in the lives of urban students nationwide. The COVID-19 experience has created an awareness that schools will look different when they reopen for the 2020-21 school year and beyond. Districts are planning to use distance/virtual learning or some part of it with face-to-face conventional classroom instruction in a new hybrid learning environment well into the future. Blended learning is becoming a viable option for teaching and learning. Teachers and administrators are developing the skills to engage, differentiate, and empower students. But to sustain and grow these new learning opportunities districts will need take a longer-term strategic approach, attending to the systems, process automations, and support services necessary to address the challenges inherent in a technology-based learning environment.

To make these changes, districts will need to adapt and improve both the business and process of urban education. A detailed roadmap for cross functional teams at the highest executive levels and managed at appropriate department levels will be required for a successful transition from the classic brick and mortar environment to a virtual one.

To this end, the Council convened a working group of Chief Information Officers with extensive experience managing information and instructional technologies. The working group was charged with identifying crosscutting challenges and hurdles districts may face and developing suggestions, ideas, and recommendations to help address them as member school plan for the upcoming school year. Specifically, the document identifies the challenges and accompanying recommendations in the areas of **organizational structure; systems; instruction;** and **technology infrastructure**. The report then offers a discussion of the three stages of systems improvement: **awareness, adaptation,** and **transformation**.

While the challenges may be daunting and without precedent, the Council is confident that the Boards of Education, Superintendents, executive leadership, management, and staff of the Great City Schools will, once again, make the critical changes necessary to carry them through the upcoming school year and redefine the future of public education in our nation's largest urban school districts. The goal of our large urban school districts is not to return to normal, but to reshape our educational systems into a new model that meets the needs of today's and tomorrow's students.

Organizational Challenges and Recommendations

Organizational Challenges

Over the course of peer reviews conducted over the past 25 years in member school districts across the country, the Council has identified several common issues around organizational structures and operating processes that could limit a school system's ability to successfully transition to a new technology-based learning environment. In particular, the Council has found that many districts—

- Lack a formalized position within the overall governance structure for technology units, limiting the ability of these units to set strategic priorities and allocate resources accordingly. As a result, efforts to meet the district's long-term technology goals and objectives are often undercut by ad hoc investments in "bright shiny objectives," which create more problems needing solutions and promote a cycle of reactive, disconnected endeavors.
- Lack the requisite enterprise-level support for developing major strategic projects and initiatives, such as an infrastructure with network and computer systems that would be required as the backbone of a new learning environment. For example—
  - In some districts, Information Technology (IT) Departments are not positioned as a direct report to the Superintendent to ensure that technology issues are articulated and considered at the enterprise or senior executive level.
  - In other districts, IT Departments are headed by Chief Information or Technology Officers (CIO/CTOs) who are not digital strategists or architects in identifying and developing action plans that solve problems and meet district goals and objectives.
- Lack a top-level portfolio management process to coordinate and control major authorized projects and initiatives so there is a balanced and optimized approach to meeting a district's strategic goals and objectives.

Recommendations

- Elevate the Chief Information Officer (CIO) to the senior executive level as a direct report to the Superintendent, ensuring that this CIO is a member of the district's enterprise-wide governance structure. The core functions of the governance structure should be to—
  - Develop or select the framework of a new learning environment that includes distance/virtual learning—or some part of it—with face-to-face conventional classroom instruction in a new hybrid learning environment based on the academic goals and priorities of the school system.
  - Allocate resources for the core elements and activities that will drive the rollout and further development of the learning environment throughout the 2020-21 school year and beyond.
  - Delay or stop all non-critical activities so there is a razor-sharp focus on supporting the new environment.

- Fill the CIO position with a digital strategist who has the skills to build collaborative relationships with other cabinet leads and design and implement an educational system that supports district goals. This leader should be capable of creating, maintaining, and enhancing the network and computing infrastructure and integrating the various software systems that are required for new learning environments. At a minimum, the functions of this role would include—
  - Recruiting key department staff who have the technical abilities—such as network and data administration skills—and soft abilities—such as communication skills—to create a collaborative working environment and provide on-going administrative support for the critical work that needs to be done.
  - Acting as a change agent by transforming legacy processes through the adoption of new digital instructional models and optimization of the digital experience of faculty, students, and parents.
  - Supporting the superintendent and district leadership in the development of short-term and long-term initiatives and projects that align with and achieve district goals through the establishment and leadership of the district's Enterprise Project Management Office (EPMO). Examples of critical projects that could respond to the COVID-19 crisis might include—
    - An enterprise asset management system, including an asset registry, a computerized maintenance management system and other modules, e.g., inventory or materials management, to ensure a coordinated approach to optimize costs, reduce risks, service level performance, and sustainability of the infrastructure.
    - A consolidated service desk with established roles, clear protocols, and a tiered support model with a single point of contact. (See technology infrastructure recommendations for more details.)
  - Partnering with instructional leadership to design and implement an instructional enterprise architecture bringing together transactional systems, interoperability, and data visualization to deliver near real time information and analysis that could transform the interactions with teachers, learners, and content.
  - Establishing and modifying district policies and processes to allow for the effective adoption of new and emerging technologies, including--
    - Development of a cloud strategy to shift from traditional and legacy computing environments to Platform, Software, and Infrastructure as a Service (PaaS, SaaS, IaaS) that would provide more agility and reduce operational costs associated with managing multiple data centers and the ongoing resources required to maintain them.
- Create a top-level Enterprise Project Management Office (EPMO) with the authority to—
  - Organize district resources in a way that is aligned to the vision, strategy, goals, and objectives of the executive leadership team.
  - Use processes, methods, and application packages to manage, monitor, and assess the progress of all existing and new projects and initiatives.
  - Make strategic decisions across all projects to ensure the start-up, maintenance, and enhancements to the new learning environment are completed on time and on budget.
- Establish a multi-disciplinary "Technology Standards Committee" to—
  - Identify standards for all enterprise systems and application development.
  - Ensure that current and future licensing terms and conditions for systems, such as LMS, SIS and Formative Assessments meet the infrastructure standards for functionality, interoperability, privacy, data ownership, etc.

Systems Challenges and Recommendations

Systems Challenges

Many districts have multiple, independent, and competing systems and applications for taking attendance, delivering instruction and assignments, supporting student-teacher interactions, and assessing student progress. Many of these are stand-alone computer processes or software applications specifically tailored for a function, e.g., classroom management at a specific grade level, which do not integrate with other processes or are not scalable so additional functions can't be added without disrupting existing activities.

The multiplicity of these systems and applications have significant organizational impacts, including—

- School Board and community members who find it difficult to determine if quality teaching and learning is happening because access, analysis, and visualization of the data is controlled by administration.
- Separate logins that make it difficult for parents and students to access, navigate and obtain information needed for course work, e.g., assignments completed, quizzes, and test scores.
- Use of highly customized instructional materials that are not scalable for use in other classrooms or grade levels; purchased content materials that cannot be customized for different types of users or grade levels; "free" applications that may create security and privacy issues; and content on the Internet that has questionable value and does not align with standards.
- Creation of workarounds that are temporary changes or solutions to specific systems' problems and that may later impede a proper solution if the changes are not flagged and may even break the functionalities that the systems was originally intended to perform.

There are therefore multiple benefits to be realized—and challenges to overcome—in the transition to a new learning environment that will use a single, integrated system to provide basic functionalities, e.g., attendance; access to instructional resources for teachers; remote learning opportunities for all students; and assessment of student progress to ensure a year's worth of growth for each academic year.

Recommendations

- Adopt a Learning Management System (LMS) to administer, track, report, and deliver appropriate grade-level instruction and resources. The LMS should be a single point of entry to access a district's educational applications and reduce the support requirements of many diverse systems. Specifically, the LMS should offer—
  - One system of instruction with various digital content, e.g., textbooks, supplemental content, digital courses, and applications.
  - A single sign-on that allows teachers, students, and parents to log in with an ID and password to any of a district's several related, yet independent, software systems.

- An operating system that can be simultaneously used by multiple users, e.g., teachers, students, parents, or any combination of these, while allowing some to disconnect to do work on their own while leaving processes running as others log into the system.
- Multiple interfaces, which allow information to be exchanged between teachers and students, computer hardware, software, peripheral devices, and any combinations of these.
- A roster interface system, which enables a secure exchange of key data, including student, course, and related enrollment information between various platforms, such as student information (SIS) and learning management (LMS) systems. (The district should leave room, however, for experimentation and innovation with alternative systems, but the school district should be assessing the efficacy of these systems as they emerge.)

- Leave room for experimentation and innovation at the school and teacher levels with alternative systems, but ensure that the school district is continually assessing the efficacy of these systems as they emerge.

Instructional Challenges and Recommendations

Instructional Challenges

Administrators and teachers, who have worked in a traditional face-to-face classroom structure, often lack the training and background for an immediate transition into a totally new role of observing and supervising, creating appropriate lessons, engaging and monitoring participation, informing practice, documenting progress, and publishing results in the new learning environment. Many districts, for example—

- Have not defined strategies to capture data on remote learning when students access resources, how much time they spend on lessons, and what progress students are making. Therefore, there is no single location to view data to inform practice.
- Have not adopted an interoperability framework to create an operational data store for data analytics and visualization.
- Do not have the contractual rights to access data that is collected by subscribed systems.
- Do not understand the concepts of asynchronous and synchronous components of a course or lesson.
- Do not have anyone to do the analytics on the data, even if it is captured, so it remains in storage.

Recommendations

- Develop Interoperability standards to facilitate the integration and integrity of data and provide a platform for reporting and analytics, including—
  - A single-sign-on system so teachers and students can log in with an ID and password to the educational applications. (Cited above)
  - A rostering system so teachers can exchange key data, including student, course, and related enrollment information.
- Review challenges small children have in navigating systems and build modifications into the LMS to improve text-based navigation.
- Survey elementary school teachers and administrators to determine which applications are effective for small children.
- Create content-appropriate lesson templates that accommodate best practices across all grade levels.
- Develop PDF documents, resources, and materials for multiple subjects, including art, music, and computer science that can be downloaded, printed, or mailed to parents.
- Acquire tools for monitoring, reporting, and analyzing student usage, including assignments completed, quizzes, standards, and quality of work completed.

- Identify processes and develop digital tools that principals can use to improve supervision of both teachers and students.
- Develop a portfolio of digital professional development resources with best practices to enhance on-line instruction.
- Provide resources on how to evaluate quality online courses.
- Review software subscription and licensing terms to ensure the district has full access and ownership of the data that is collected by the system.
- Acquire an operational data store (ODS) with dashboards that capture and integrate transactional data from one or more production or source systems into a single structure or data base so the district can report and monitor teacher proficiency and student progress in a new hybrid learning environment.
- Create cross-departmental digital content review teams to—
  - Inventory content available in the district and eliminate duplicates.
  - Identify, prioritize, and publish district approved applications and content for grade level use.
  - Ensure that each of the enterprise systems, e.g., SIS, LMS, Formative Assessments have appropriate functional owners.
  - Create a life-cycle plan for enterprise systems that identifies upgrades, maintenance costs over time, training, and enhancements.
  - Adopt required content and interoperability standards for the selection and acquisition of content.
- Build a professional development portfolio of online teacher-training programs into the district LMS that includes—
  - Social Emotional Learning and the ability to develop personal presence online when training teachers.
  - Pedagogical and content skills.
  - Templates for grade-level and content-area courses.
  - Templates to enroll staff, coordinate communications, and develop skills to advise teachers on best practice.
  - Opportunities for school-based practitioners to innovate with alternative technology.
  - Professional development opportunities for students and parents to familiarize themselves with technology provided through the district for instructional purposes. Several districts are providing professional development for parents through their Parent Universities.

Technology Infrastructure Challenges and Recommendations

A district's information technology infrastructure is made of the physical hardware computer and network devices, software applications, and resources that provide the data, information, and learning resources for administrators, teachers, and all students, including special education, bilingual, medically fragile, and other at-risk children in the new learning environment. The development, maintenance, and sustainability of this infrastructure will require that—

- The physical components of this environment, i.e., hardware, networks, and software, are designed to be secure and to maintain the integrity of the overall infrastructure.
- Cost-effective changes are made to the physical devices, so that alterations to the network and data used by district staff and students can be made quickly without negatively affecting the continuity of instruction.
- IT staff have the tools to provide end-user support and manage assets and, based on best practices and interoperability standards, maintain, and update the critically important parts of the infrastructure.

Device Distribution and Management

There were multiple lessons learned when districts distributed large numbers of computer devices to students' homes during the spring continuity phase that will need to be addressed in this new learning environment. For example, in some instances—

- There was no clear ownership of the devices, e.g., the IT department or the schools, and the process for tagging, configuration, distribution, and tracking of devices was sometimes poorly documented.
- Processes designed to support devices located in school buildings were not able to support devices located in students' homes.
- It was difficult or impossible to refresh, maintain, troubleshoot, repair, or collect devices once they were distributed to students' homes.
- Devices were vulnerable to virus attacks because devices could not receive automated security updates in homes where connectivity was not available.
- It was difficult to identify support needed in students' homes because districts do not always have accurate contact information with home addresses, emails, and cell phone numbers.[1]

1 This would be most evident in high-poverty and highly mobile communities where English is not spoken, or for students needing continuous instruction or living with separated or divorced parents or in shelters, or temporary situations such as with grandparents and relatives.

Accessibility

There were also multiple lessons learned in efforts to provide internet access and adequate bandwidth to support students and parents in their homes. For example—

- Many districts purchased and distributed mobile "hot spots" that were dependent on strong cellular signal availability. In some cases, students were required to be within 100 to 300 feet of a hot spot located on a school bus in outdoor areas, such as parking lots, and many other students lived in areas where there was no available cellular signal.
- Vendors were willing to promote unlimited Internet but reduced data speeds after a certain amount of data used, making connectivity slow and frustrating.
- Extending a district's Wi-Fi to neighborhoods exposed it to cybersecurity risks and increased safety and supervision concerns in some neighborhoods.
- Some service providers offered free or reduced connectivity for a limited fixed time but recurring monthly fees for internet devices was a requirement that could not be sustained by many families.

Security

The spring continuity phase also raised concerns about security and data privacy protocols that will need to be addressed to guarantee a safe and security learning environment. For example—

- Fraudulent attempts to obtain sensitive information, such as usernames and password (Phishing) or threats to publish data or perpetually lock access to it unless a ransom was paid (ransomware attacks), could disable internet services for extended periods and could be extremely expensive to mitigate.
- The increased use of "free" applications and social media sites could expose districts to violations of data privacy and federal compliance about the personal information about children under 13 years of age (Children's Online Privacy Protection Act, COPPA), the exposure of children to explicit content online (the Children's Internet Protection Act, CIPA), and the disclosure of student education records (Family Educational Rights and Privacy Act, FERPA).
- The lack of a security framework that protects the process of selecting, preparing, extracting and transferring data (security migration), and tests the potential for unauthorized access to a district's systems and data (vulnerability and penetration tests), and a dedicated cybersecurity officer to set policies and procedures, enforce standards and respond to treats could expose a district to additional risks.

Recommendations

- Districts should create a comprehensive communications strategy using media, surveys, and direct contact with parents to obtain a clear picture of the type and number of student devices, e.g., desktops, laptops, netbooks, tablets, etc., and the broadband internet technologies that have the enhanced capabilities to allow students to participate in the new learning environment from their homes.

- Districts should acquire modern mobile device management (MDM) software to manage and optimize the functionality, security, and flexibility of its laptops, desktops and all other types of mobile devices, including mobile phones, smartphones, tablet computers, etc. Technology advancements in mobile device management software allow districts to—
  - Remotely provision the devices for students and update equipment, functions, and applications in a scalable fashion.
  - Apply filtering policies at the device level based on student age group and regardless of internet service.
  - Ensure the user equipment is configured to a consistent standard set of applications and functions appropriate for student use.
  - Apply the necessary upgrades and security patches to the devices.
  - Remotely diagnose and troubleshoot equipment.
  - Inventory, monitor, and track the location, status, and ownership of equipment, and locate and disable those that are stolen or pawned.
  - Monitor the use of devices and the participation of students to identify connectivity or other challenges.
  - Integrate device information into the district's asset and service management applications.
- Districts should leverage partnerships with city and county officials, and community organizations to obtain—
  - Discounted and affordable rates with the internet service providers and cell phone companies that provide internet connectivity for students in low income families.
  - Cost-free wireless access and landlines or wireless, satellite and microwave internet in hard to serve areas where wired internet is not readily available.
- Districts should have an enterprise asset management system that develops, operates, maintains, upgrades, and disposes of its computer and network systems; and ensures a coordinated and sustainable approach to manage costs, support interoperability standards, remove traditional silos in department functions, and increase the service performance of the systems.
- Districts should consider a consolidated districtwide service desk with established roles, clear protocols, and a tiered support model using a single point of contact for students, parents, faculty, and staff. This service desk should employ customer relationship management software to assist in troubleshooting, providing users with answers to questions, and solving known problems. The expanded services could be provided by--
  - Expanding operational hours for an "all-call service desk" with language support that is triggered based on customer's needs (e.g., device management, academic, or technical).
  - Training high school students to provide basic support and perform basic repairs.
  - Developing programs, partnerships, and internships with local colleges and universities.
  - Training school staff to reduce the demand on the service desk and field technicians during normal hours.
  - Outsourcing service functions to reduce cost and increase service levels.
  - Using Artificial Intelligence (AI) systems to handle repetitive support requests.

- Districts should review their cybersecurity policies to ensure they encompass the risk assessment standards of the National Institute of Standards and Technology (NIST); the information security standards of the International Organization for Standardization (ISO 27001); and the best practice solutions for cyber defense of the Center for Internet Security (CIS).

  Owing to its complexity, cybersecurity will be critically important in the new hybrid learning environment due to its reliance on computer systems, wireless networks (Wi-Fi), and the growth of smartphones and various devices that constitute the "internet of things." Some common countermeasures, techniques, and corrective action that can be taken to reduce, prevent, or eliminate a threat, vulnerability to an attack, and minimize the harm it can cause include—

  - Identifying, classifying, storing, securing, retrieving, tracking, destroying or permanently preserving employee and student records.
  - Reviewing and renegotiating application and software licensing contracts on data ownership, access, data use and privacy policies.
  - Using strong passwords and a multi-factor authentication method to control access or privileges to specific functions within the systems.
  - Controlling access or privileges only to the specific functions within the overall system.
  - Conducting risk assessments and using audit trail tracking to identify the mechanism and extent of a security breach when it occurs.
  - Having controls to maintain confidentiality, integrity, availability, accountability, and assurance.
  - Creating threat prevention, detection, and response measures, such as firewalls, to shield access to internal network services; user account access controls to protect systems files and data; and intrusion detection systems (IDS) to detect network attacks in-progress.
  - Using scanners or running penetration tests against the computer and network to identify vulnerabilities.
  - Providing end user security training to address the commonly recorded forms of errors, such as poor password management, the inability to recognize misleading URLs, and to identify fake websites and dangerous email attachments.

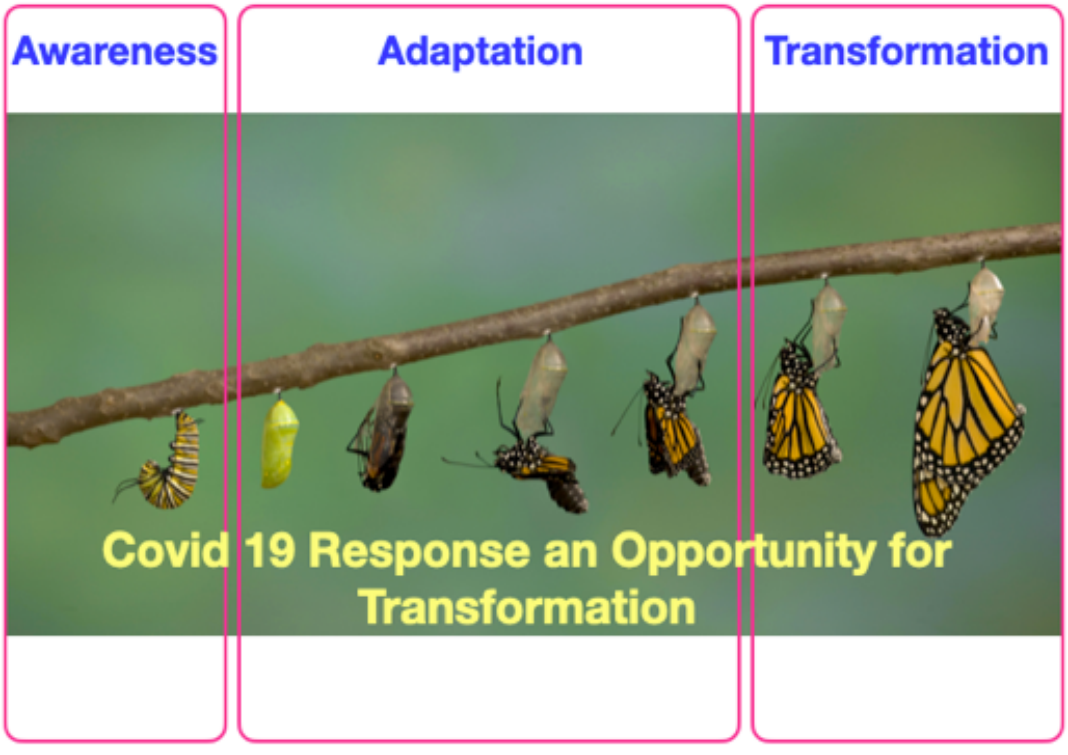
- Districts should employ preventive or counter measures to protect their computer and networks systems from theft or damage to their hardware, software, or electronic data. These measures will also protect the district against the disruption or misdirection of the services provided by systems, which could be caused by weaknesses in their design, implementation, operation, or internal control.

  The preventive or counter measures should be formalized in a business continuity plan, which outlines the precautions or steps that should be taken to keep all essential aspects of the computer and network systems operating during adverse scenarios; and the policies, procedures and tools, i.e., disaster recovery and resilience planning, to enable recovery or continuation if there were a disruption of the computer and network systems that support the critical functions in the new learning environment.

Implementation Stages Leading to Improvement

The intent of this document is to identify current challenges and recommendations for districts to move forward. Each district is different, and the tactics deployed to transform practices will also be different. Transformation is like a marathon and it will likely take several years to change and enhance our education culture, organization, and human capacity. Therefore, districts should set expectations that are realistic and measurable based on what implementation phase they are in.

The road to systems change will likely pass through three stages: Awareness, Adaptation, and Transformation. These stages progress from simply augmenting current practices with technology to the final stage in which technology assists the district in transforming its instructional practices. Each phase has a set of expectations and appropriate metrics.



Awareness

This phase serves as a transitional period for individuals to better understand the desired state. This phase provides time for people to understand "the why" of needed changes and how processes will need to be altered or reinvented. Training is focused on why the change is necessary and how it will address district needs. Using Bloom's taxonomy, the focus is on knowledge and comprehension. Metrics should be geared toward successful implementation of technology—

- Successful implementation of systems
- Ease of access (single sign-on, rostering)
- Interoperability between systems
- Reliability and access for students and teachers, integration of applications
- Effective communication to and from stakeholders
- Percent of staff trained
- Effective access and use of systems by students and teachers
- Changing user attitudes

Adaptation

This phase serves as a transitional period for individuals to better integrate technology into their practice by providing time for the learner to understand how to convert their regular practices into the new model. As people are learning a new technology or system, they apply what they currently do in their work and replicate it in the new system. The Adapting Phase allows people to become comfortable learning the new system and analyzing the differences between current practices and the desired state. Often routine practices become automated and more efficient. Professional development focuses on incorporating the new system into a district's everyday activities and learning how to use and apply new resources. Metrics in the phase are geared to use and adoption, such as—

- Percent of time using new tools
- Improved user adoption and attitudes toward the change
- Reduction in complaints, frustration, and problem tickets
- Generation of new ideas for improvement
- Increased adoption and integration of assessments, content, and administrative tools
- Redefinition of policies and procedures, (attendance, time and place, scheduling, assessment).

A danger exists, however, that people will not move beyond this stage into the Transformation Phase. Without moving to the Transformation Phase, they risk doing the same things they have always done, but with more expensive equipment.

Ultimately, the district must move to transformation through a focus on how teachers, students, and administrators use creative methods to achieve the goals and objectives of change and not on learning new technology and skills. People are confident in the new skills they have mastered and how to integrate those skills and technology to achieve new levels of learning. In this phase, people are using technology to do things they would otherwise not be able to do.

Transformation

It is in this phase that users can change their definition and perceptions of how we do our work. Users have the skills and technology to meet goals and objectives with solutions they could not imagine in the first two phases of the implementation. It is in this phase that districts have changed teacher and student practices enough to compare academic performance. Performance is not based on comparisons to the old model of education but on expanded perspectives of what good teaching and learning should be about. School has moved from a noun describing a place to a verb capturing action. School should no longer be bound by room size, time of day, days in the year, and who does not have access, but focus instead on engaging students and preparing them for a future that is constantly changing.

Although this document points out the short-term immediate steps that should be taken, the overarching transformation of our educational systems will take years. We allow three years to build a new building from drawings to moving in, yet we expect transformation in teaching and learning to be completed after we purchase new computers or implement new software. Starting next school year most districts will be in the awareness phase that will be the foundation for the future.

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