Digital Assurance for Next-Gen Education

Traditional Methods Fail to Test Digital Solutions Effectively

There’s a large scale digital push in education by governments, schools and the general public at large (e.g., a large school county tech enabled education transformation plan). These initiatives span the entire ecosystem from content design, to delivery, to assessments and reporting. Additionally, introduction of “Common Core” standards in the U.S. have standardized testing and resulted in significant automated digital assessment of students (15.6% surge of automated assessment following the onset of Common Core tests).

Unfortunately, significant failures have resulted in these initiatives leading to disastrous outcomes. For example, a large government county program was called off within two years due to access issues (less than 5% of students had consistent access to the curriculum), security issues (students easily hacking the iPads and using for general purposes though) and Wi-Fi problems in schools.

While content delivery using a cloud infrastructure has been a technological innovation in schools, last-mile delivery issues due to Wi-Fi inconsistencies forced most teachers to abandon the digital curriculum and continue teaching using a traditional approach.

Digitized assessments also introduce new complexities which are not seen in traditional paper-based testing. For example, evaluation of a simple math problem that requires students to draw a four-unit length straight line in 20x20 graph software has approximately a billion potential combinations to be tested (both positive and negative).

Simultaneous assessment of thousands of students together is another big challenge. A large testing firm paid huge fines as its assessment software crashed during assessments in Indiana when its system couldn't manage the load of thousands of concurrent students taking tests.

These kinds of issues arise when traditional QA techniques are used. The typical approach uses a project-centric approach which results in a myopic view of the individual systems in isolation and not the entire ecosystem in its entirety. A truly effective enterprise-wide digital QA strategy will help avoid these costly failures.

End-to-End Digital Quality Approach

Digital transformation of K-12 education spans across the entire education ecosystem from content creation to student administration to delivery to assessments to reporting. This ecosystem consists of multiple parts but true value is realized only when the entire ecosystem functions cohesively as one (whole is more than sum of parts).
Proposed QA Strategy

An effective enterprise-wide approach consolidates and maps all the digital QA services applicable to the individual systems of the education ecosystem at a sub-system level to create an over-arching digital QA strategy.

Our approach is comprised of three major components:

- Mapping the type of digital QA solutions applicable for each sub-system.
- Identifying the interdependencies between individual systems.
- Focused testing techniques to address digital-specific needs.

1. Mapping the type of digital solutions applicable at a sub-systems level:

Our over-arching QA strategy begins by mapping the different components of the ecosystem and the associated digital QA techniques for each. A snapshot of such a mapping is provided below.

This business process mapping provides the fundamental basis for creation of an effective digital QA strategy. Here, each of the individual components of the education ecosystem is mapped with the right set of applicable digital QA solutions. For example, all the sub-systems of reporting and assessments use data analytics extensively.
This analysis also provides a clear view of all the different technical teams needed and how each team can be leveraged. This gives the education providers and IT partners the flexibility to choose the right operating model (core-flex/ shared services/ managed services/ specialized services).

2. Identifying the interdependencies between individual systems

The interdependencies between the individual ecosystem components (as mapped in the ecosystem on the next page) provides the key links to be considered as well when performing testing. For example, content creation obtains feedback from delivery and reporting analytics. This feedback loop is essential to keeping the ecosystem current and up-to-date. However, this loop can be missed if the content creation section is tested in isolation.

This aspect of the QA strategy also provides a clear view of all stakeholders and how each one interacts with the system – from a content creator to student to teacher to administrative official to the government among others.

3. Focused testing solutions to address digital-specific needs

Specific challenges that arise due to digitization of education (like the ones mentioned earlier) need focused testing solutions to solve them. For example, the math problem of drawing a four-unit length line in 20x20 graph renders it impossible to test all combinations using traditional UI testing (even with UI automation). Such assessment systems require highly matured test automation at the SOA/ database trigger layers along with intelligent automated test data generation.

Similarly, continued focused performance monitoring/ tuning of the application server supported by elastic cloud capabilities are needed to address performance issues when very high loads (e.g., concurrent testing) is expected. Another example would be to create and test systems using intelligent real-life simulations of the client network systems (e.g., Wi-Fi and not just 2G/3G/4G).
Digitization of Education at a Large School County

A large school county district rolled out an ambitious technology-enabled education transformation plan for its school students in 2013. This rollout had partnerships with Apple (for iPads) and a large education provider (for content, delivery and assessment).

Within two years, the program was called off due to a lot of issues. A few major ones (from a technology standpoint) were:

- Less than 5% of the students had consistent access to the curriculum due to technical issues.
- Wi-Fi/ network capabilities at schools were not good enough to support an implementation of this scale.
- Students were able to easily hack the iPads and use it for general purposes (though they were not supposed to be able to).

Inconsistent Wi-Fi network capabilities across schools were not well tested (a key inter-dependency between content creation and delivery) and the device applications performed poorly. Last-mile delivery issues forced most teachers to abandon the digital curriculum and continue with the traditional one.

The education services provider had decided upon iOS as the only platform for their curriculum (from a mobile/ device standpoint), but it seemed that the company’s testing was not comprehensive enough.

The security put in the iPads was easily breached by students (key test in device testing). Hence, the performance of the iPads suffered quickly as too many apps were downloaded and installed.

While the key stakeholders publicly defended themselves with respect to the roll-out of the program, they did agree that there were challenges in the adoption. A well-defined enterprise-wide digital QA strategy would have helped identify many of the technical issues that were faced and would have avoided such a big backlash.
Quite a few similar instances can be discussed/analyzed in this fashion. The solution is to look beyond a myopic project based view and expand to an end-to-end ecosystem view that analyzes the system holistically.

In conclusion, it is becoming evident that adopting traditional QA is not sufficient in today’s increasingly digitized education sector. Education services providers need to change their QA model to enable successful and rapid launches of digital solutions for millennial students. With vast experience in executing such digital QA transformations and deep education expertise, Cognizant’s Quality Engineering & Assurance Practice is the right partner for your digital transformation journey.