Title: 5348 Technology and education reform – the case study of Guyana

Author: David Haggie

Organisation: GradeMaker Ltd.

Email address: dhaggie@grademaker.com

Key words: Data, Authoring technology, School improvement

Abstract:

This paper reports an ongoing system-wide project in Guyana to introduce a National scale data portal for schools' use, and to implement item banking software for exam production. The data portal project began in 2016 and now pulls together national and international assessment data for all pupils across all phases of school education. The project generated the country's first value added scores for pupils and has produced a national pupil database.

Following a series of training sessions, the system is now being embedded in daily inspection and school management processes.

In 2018, the service was extended to include item banking software for exams development, to improve quality control and security. Item banking represents a move away from traditional paper construction processes. Along with the new technology, training and capacity development services were provided to upskill authors. Training will be followed by remote quality assurance and mentoring, delivered online via the authoring system. This innovative model offers an efficient model for skills development.

In the next phase of the project, 'topic' data from the authoring system will be exported to the portal so formative topic level performance reports can be provided to help schools further with their planning and skills development.

This project is being delivered with World Bank support and is led by GradeMaker Ltd with support from FFT Education and AlphaPlus consulting.

5348: Technology and education reform – the case study of Guyana

Guyana background

Guyana is situated on the north east coast of South America. The topography is very varied. A narrow coastal region is flat, drained by a network of canals, bordering shallow, muddy seas rich in alluvial deposits left by the wide winding rivers which drain the forests inland. 90% of the country's 765,000 population live in this strip of land, with some – even those in the capital Georgetown – living below sea level protected from the sea by dams. Inland are long river valleys and forested, generally inaccessible hills which dominate the country.

By comparison with South America, the country is relatively poor, with a GDP per capita of US$4,000. Agriculture and mining dominate the economy, although oil finds may change the country's economic fortunes. The World Bank estimates that over 80% of the country's exports in 2014 came from sugar, gold, bauxite, shrimp, timber and rice, and diversification has been difficult. Economic progress has been made, however, with average annual growth in the period 2005-14 of over 4%: the benefits of growth however have not been equally felt, with inland Amerindian people being much more likely to experience poverty than better educated people settled on the coast, particularly in the bigger towns.

Education is a key component in the government's growth strategy which seeks to diversify the economy in part by developing a skilled workforce. The government considers too that education holds the key to reducing poverty and inequality, particularly between 'coastal' and 'riverine' regions and the 'hinterland'. Children growing up in the Guyanese interior, far inland, have much lower attainment than those in the best connected coastal towns: given the correlation between attainment and income, trying to improve the quality of education in these hard-to-reach areas is a key objective for policy. At the tertiary level the policy goal is to build expertise in health, science and technology to drive development and economic growth.

Education at the heart of investment policy

Guyana's education system has enjoyed strong government backing for 20 years. The World Bank reports there is 'near-universal primary education enrollment', with expansion too at secondary. In 2016 education represented 17.5% of the total fiscal budget, and the country has received further support from the World Bank and UNICEF.

The government however accepts there is more to be done. Delivering high quality teaching and learning, raising skill levels and addressing regional and ethnic disparities in attainment are complex challenges and further work is needed to realise the government's vision.

At the level of assessment and data, these concerns translate quickly to some specific priorities, for example:

- As the curriculum moves to focus more on higher order skills, valid and reliable measurement of these attributes is required, potentially demanding deeper expertise in assessment.

- It is desirable that there is a system for analyzing the performance of different schools, regions and groups in order to assess progress, potentially requiring new analytical

technology and capacity building for school leaders and principals in working with data

- In order to keep the focus on assessment and added value processes, the process of delivering assessment needs to be reliable and efficient.

The first project: trialling a data portal

GradeMaker first met with the Education Ministry in 2016, engaging with the Planning Department to look at the way performance data was collected and used.

GradeMaker Ltd is the technology division of the Stephen Austin Group, a global exam printing company which handles 1,750,000,000 pages of confidential assessment materials annually.

The ministry planning team included highly capable, motivated people who drew on the data from exams set domestically (by the NCERD division) and internationally (by the Caribbean Examinations Council) in order to inform the ministry of outcomes.

Given the mixed sources and technology available, it was difficult in this period to 'match' data sets together and so it was not possible to understand the progress made by students across a phase of education; it was also not possible to see at the 'topic' or 'skill' level how students and schools were performing. The result was a system which was focused on attainment measures and did not have access to potentially more insightful measures of progress, and skill acquisition. Bespoke analysis was sometimes difficult.

The team also lacked a facility to share data directly with the wider community of inspectors, regional officials, and principals in a form which would allow them to interrogate the underlying data themselves, enabling them to ask the questions which were most relevant to their situation and thereby facilitating genuine reflection and building data literacy.

Given these challenges, in 2016 a project was set up to create a live data portal housing much of the key assessment data available to the Ministry.

This included data relating to:
- The system (regions, inspectorate zones, schools)
- Pupils (including gender)
- Assessments (at Grade 6, 11 and 13). Initially only one year of Grade 6 and 13 results data was loaded and three years of Grade 11 data. Pupil data was loaded as first name, second name, date of birth, gender and exam result. Using fuzzy matching, this made it possible to generate longitudinal attainment reports at Grade 11, and to show 'progress' at Grade 13 (by matching current with prior attainment). Grade 6 data was to be captured at item level (if item level data was available) to demonstrate 'topic reporting'.

Data was securely transferred by SFTP to GradeMaker's data partners, FFT Education who matched the data and loaded it to the data portal. They created a baseline set of reports for review with the team in Georgetown, leading to further refinement and enrichment of the solution.

A series of user trials then followed, including representatives from each region in Guyana to get fully inclusive feedback.

In order to preserve confidentiality, the software as configured so users from a particular school or region could only see reports directly relating to their own span of control. National and regional comparators were provided so that users could not drill down to school or pupil level where their role did not require this level of access. As well as providing logins for these wider stakeholders, ministry officials were provided with logins directly to the database with access to the analytics tool (enabling them to create further bespoke reports as required).

The data trial becomes a national service

Following this trial phase, the service was extended to national scale.

In order to achieve this:
- Further data was added to the system, so full longitudinal reporting is available at all levels
- Further exam data sets have been added, for example at Grade 9, and extensive additional data matching has been carried out. Generating a clean national database was a key goal of the project.
- Additional reports have been added, for example focusing on key national benchmarks.
- Extensive training was carried out, working with Planning department officials. As capacity grew, the Ministry was able to train end users in working with the system independently.
- Annual data feeds were provided so the portal remains fully up to date, housing a matched, clean national database.

The dialogue with the Ministry extended to consideration of how data can be used to inform planning and school improvement work, with modelling of ways in which: regional offices can use the data portal prior to inspections to evaluate performance and identify successful areas and opportunities for improvement; school principals can use data to identify relevant priorities for year-on-year improvement focus.

The reports in the system have been seen as useful and innovative, for example Guyana's first ever 'value added' reports showing student progress across a phase of education, and reports on categories such as 'most improved schools', STEM, gender etc.

The data portal is now well established and a programme of training and rollout has been underway across Guyana's regions to embed usage.

The project extends: the World Bank programme

As the data project was getting off the ground the Government of Guyana and the World Bank were developing an Education Sector Improvement Project (dated April 7, 2017).

This project included a focus on integrated curriculum reform which itself included a strand directed at 'national assessment capacity'.

This assessment strand included objectives which tied closely to the data work already underway, for example capacity-building activities for school administrators and teachers on interpreting and using the student examinations results, and the provision of software for the analysis of the results of national student examinations by the NCERD Measurement and Evaluation Unit.

It also included additional objectives which related directly to exam development. In this category were goals such as aligning new exams to the new curriculum framework (requiring tight mapping of items to topics/skills), building capacity in the NCERD team in assessment design, and in particular, helping the team design examination items to measure higher-level thinking.

The second GradeMaker project

Following a procurement process, GradeMaker was selected to work with the Ministry to deliver support for the national assessment capacity strand.

In doing this GradeMaker was supported by a set of partners:
- FFT Education Ltd (data analysis partner)
- AlphaPlus consultancy Ltd (assessment training partner)
- Speedwell (scanning partner)

The project outline comprised the following elements

1. The provision of technology to support exam authoring. This strand proposed the deployment of the GradeMaker Pro exam authoring system, to be used both as a tool within which to conduct the authoring process (using an item banking model), and as a platform to receive ongoing remote user training).

2. Capacity development in exam authoring. In this strand AlphaPlus was to visit Guyana to carry out face to face training (for example in 'assessing higher order skills), and to carry out mentoring review online (via the GradeMaker Pro platform) to embed learning. Using technology in this way to provide follow-up training was proposed as an efficient model to embed learning (because it does not require unnecessary travel).

3. The development of an exam 'reference bank'. In this strand GradeMaker would digitise an agreed set of past papers, making it easier for authors of new work to see exactly how topics and skills had been assessed in the past, thereby informing the new writing process.

4. The provision of scanning systems to mark Grade 4,6,9 MCQ exams (pre-test and live). The aim of this strand was to replace a very traditional semi-manual model for MCQ marking with a scanning solution, thereby making marking substantially more efficient and generating item level data (which can be consumed in the data portal as 'topic' reports).

5. The provision of additional feedback reports for schools (MCQ papers). This strand would link the new item level results data (from 4., above) and the item mapping data (generated in 1., above, where items would be mapped to topics) to provide schools,

regions and the ministry with insight into performance at topic level for MCQ exams.

There were a number of dependencies in delivering these goals.

Governance needed to be established, in particular defining requirements for reporting to the World Bank and ensuring a senior Ministry official was able to take an oversight role on the project. This is particularly important as senior engagement helps drive the project forwards and makes it easy for all participants to unblock issues where required.

Discovery: before training could begin, or the authoring software be set up, a discovery phase was essential. This involves the exchange of key information such as syllabuses, past papers, processes etc., enabling plans to be constructed which are relevant and focused. Discovery included web-based meetings to agree steps (e.g. the focus of the first author training sessions).

Establishing the authoring technology required that relevant syllabuses were loaded to the system (so items could be mapped), and any additional data fields were created. It was necessary to agree the workflow items would go through (generally this was not complex for this project), and 'training' and 'live' sites needed to be set up. A 'download' template has been loaded ready for print output when tests are complete. While generally quick, this set-up stage is an important milestone.

Progress to date

The project has made significant progress, with work still to do.
- The first face-to-face author training sessions have taken place.
- The scanning system is in situ, awaiting final procurement of a supporting PC to manage data.
- The scanning forms are complete and otherwise this is ready for first live use.
- The data portal is in place and ready so 'topic' reports can be deployed as soon as the first scanning session is complete.
- The authoring software is in place, set up (live and training sites) and the first user training is complete. Content is now being generated by end users in the system with full mapping (ready for 'mentoring review').

The next steps are as follows:
- Mentoring review of new items is scheduled to take place (via the authoring platform)
- Further author training is planned (e.g. once paper construction commences).
- Topic report rollout will begin once scanning is full operational.

Commentary

This section sets out observations on the programme.

A connected system

It is particularly interesting to note how meeting the World Bank challenge requires such connected, system-wide thinking.

For example, delivering a national data portal requires more than just data portal technology. It demands skills in matching data (in a situation in which there is no UPN, and there are more than one supplier of assessment results); it requires valid and reliable assessment; it requires an effective user engagement model whereby principals from remote regions can be brought along with the programme successfully; it requires granular data sources (for topic analysis), which in term demands a re-engineering of the scoring model for MCQ exams; it requires engaged and skilful people in the core ministry team with a determination to make a difference.

Similarly, building skills in test production (using remote trainers) is made much easier when there is a technical environment available capable of remote access (making ongoing mentoring easier), and designed to generate data about test coverage at source (making the evaluation of coverage more straightforward). Targeted skill building itself is dependent on the availability of well thought through curriculum which itself reflects national priorities.

Recognising the challenge of delivering change

Introducing new curricula, new ways of managing the test authoring process, innovations in exam marking and rich data tools all represents forms of 'change', putting the experience of people at the centre of the programme.

In this programme, there has been strong leadership of change from within the Ministry (both at director and operational level), with a real desire to deliver improvement (unblocking issues, taking decisions, leading people). This is an essential condition of success.

Second, the Guyana team has recognised the importance of taking users with it in the change process. For example, in the most advanced programme strand (the data portal) this has involved bringing 'champion' users from across the country together for workshops, sending experts from the centre to the regions to run sessions, and gathering feedback as the work develops.

In any programme to introduce change in assessment, this combination of good leadership and attention to people's experiences is crucial. Most major innovations in assessment are 'change programmes' first and foremost.

Phasing implementation

This programme required good planning skills, understanding cross programme dependencies and therefore setting realistic goals and identifying early where an input was on the critical path.

It also illustrates a key reality of delivering change in assessment, where change can often be tied to infrequent events (e.g. a new authoring cycle or marking window). Two consequences flow: first, it is important to plan around key dates when teams are busy (because these busy periods are inflexible and demanding and will drown out other initiatives); second, the cost of 'missing a window' to get started should be recognised. If there is an annual authoring period, for example, missing a cycle can delay a change programme for a whole a year, making the process of delivering improvement slower than it should be.

In the case of this programme, dates have generally been adhered to although delays in procurement of some scanning related systems has pushed back the date of the first topic level reports in schools.

In general the lesson is that change takes time, meaning there is pressure to get change started so improvement is not delayed. Given cycle times, it is better to 'get started' with a good plan at a manageable scale, rather than wait a long time to develop the perfect plan.

High potential of the training model

The programme includes a mixed training model, with some face to face work and then some remote, online mentoring support delivered via the authoring application. This mentoring will take place using expert reviewers working on live items, with the opportunity to target this review quite tightly if required on specific item types (e.g. 'higher order thinking questions').

This mixed training model has very significant potential for improving the training process and making high quality training more effective and efficient.

The role of technology in underpinning improvement

While people are at the heart of change, it is clear from this programme that well-used technology has high potential to support educational goals, for example:
- supporting international collaboration in the training area
- making it easier to track the item review processes and carry out pre-testing
- supporting test construction with dynamic coverage analysis
- making item banking possible, with attendant benefits of greater test security and item choice
- transforming the MCQ marking process to generate richer, more useful data with less effort
- facilitating new ways of analysing exam results data to support school improvement.

Technology has been a key enabler of change and improvement in assessment for many years and this programme underlines the important role it can play.

More information

For more information, please contact the author.

Final note: travel policy

While much of the service has been delivered remotely, the programme has required a number of visits to Guyana from the UK. GradeMaker's environmental policy is to offset all travel for its staff and suppliers, which has been carried out during this project initially using BP TargetNeutral, and now using ClimateCareUK, see https://climatecare.org/.