



FROM E-LEARNING TO M-LEARNING

The
Future
of Mobile
Technologies
in Education

BILAL KATHRADA

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in Education**

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Table of Contents

Preface.....	5
[1] Introduction.....	7
[2] Smaller Screens, Bigger Issues: Developing Mobile-friendly Learning Materials	10
<i>Mobile Device Penetration</i>	<i>10</i>
<i>Mobile as a Solution.....</i>	<i>12</i>
<i>Challenges: Teacher Paradigm Shift.....</i>	<i>13</i>
<i>Challenges: Digital Skills.....</i>	<i>14</i>
<i>Challenges: Culture</i>	<i>14</i>
<i>Motivational Factors</i>	<i>15</i>
<i>Designing for Mobile</i>	<i>16</i>
<i>Technological Challenges</i>	<i>17</i>
<i>Payoff.....</i>	<i>18</i>
[3] Smaller People, Bigger Challenges: Building Educational Apps for Kids	19
<i>App Development Process.....</i>	<i>20</i>
Research and Planning	20
Expensive Mistakes	22
Design.....	23
Develop, Test, Iterate.....	24
[4] The People Challenge.....	26
<i>Evil Technology.....</i>	<i>26</i>
<i>Teacher Apprehensions and Misconceptions</i>	<i>27</i>

[5] Covid-19 and the New World	29
<i>The Al Falaah College and their Response to Covid.....</i>	<i>30</i>
<i>Inequality Exposed</i>	<i>31</i>
[6] Success Stories.....	35
<i>Breteau Foundation: Providing EdTech Solutions to South African Children</i>	<i>35</i>
It's all about the Teachers	36
Teacher-training	38
Success Measurement.....	39
Views on Government Rollouts	40
<i>Age of Learning: Testing a Research-Based Digital Learning Tool in China</i>	<i>41</i>
Game-Based English Language Learning	42
Research	43
Findings and conclusions	44
Conclusion	45
About the Author	47
Endnotes.....	49

*“The fact is that given the challenges we face,
education doesn’t need to be reformed - it needs to
be transformed.”*
Sir Ken Robinson

Preface

The global Covid-19 pandemic laid bare two major inherent underlying issues with the education systems in many countries: firstly, that the systems of delivery are not only outdated, but also resistant to change and disruption; and secondly, that there is massive inequality in education.

With the onset of the lockdowns, wealthier schools were able to keep classes going via e-learning, while the rest had no access to learning at all. This is an unacceptable situation.

What is the solution? While e-learning may have proven inaccessible to the masses, there is hope in the form of m-learning, or mobile learning, which can potentially make learning more accessible because far more households own a mobile device than a computer.

For example, in sub-Saharan Africa, one of the most poverty-stricken regions, mobile device penetration currently stands at 75%. This presents a huge opportunity to level the playing field and take education to the masses.

However, mobile should not be seen as a silver bullet to the world's education crisis, as there are still a number of challenges which need to be addressed, such as access to devices for those who do not have them and high data costs. Then there are pedagogical challenges, such as the matter of lower learner engagement and high dropout rates in online courses.

Are these challenges insurmountable, or is there hope?

This book aims to address the issues with education, highlight the potential of m-learning, to describe the development of the m-learning sector, and to present viable solutions in the form of work being done in different parts of the world by dedicated people who are finding ingenious and innovative ways to make quality learning accessible to the world's most impoverished communities using mobile devices.

[1]

Introduction

Lele Mabizela is a single mother who works as a waitress in a tiny rural village between Durban and Pietermaritzburg in KwaZulu Natal, South Africa. Lele began working from a very young age, and has occupied many different jobs since she began at around 15 years of age. Despite holding down a number of jobs to assist with the household expenses, she managed to complete grade 12, which is the minimum entry requirement for university. However, despite completing grade 12, Lele had little to no chances of ever going to university due to a number of factors.

The major contributing factor was her finances. Despite the availability of government assistance for studies at public universities, Lele could not afford the boarding and lodging fees that would be required if she were to move to Durban or Pietermaritzburg to study. Even though her home was located between the two cities where public universities were found, daily commuting was not an option either. In fact, the daily commute to either city would cost more than boarding and lodging. Secondly, Lele had to consider the potential loss of income should she leave her work to go and study full time. This was definitely not something she could afford to do, not with a 6-year-old son to take care of. Then there was the question of where her son would live if she left to go live and study in Durban or Pietermaritzburg.

Due to these factors, Lele had no choice but to remain in her current situation, with very little hope of improving her economic status. Getting jobs in rural KwaZulu Natal was difficult, more so if you are a woman. As a result, Lele continued at her current job, trying to get along on a minimum wage for the next three years.

Then, one day, Lele became aware that a nearby community centre, which was run by a non-profit organisation called the Valley Trust, was offering some online courses. The centre, which had a computer centre that was equipped with modest computers and a decent internet connection, had partnered with a start-up technology institute named IT varsity and was offering some exciting courses like web design, graphic design, digital marketing and coding.

This seemed to Lele like the opportunity she was waiting for, and she signed up immediately. “It was a great opportunity for me. The courses were highly practical and engaging, with videos and fun online activities, rather than tonnes of notes. And the best part was that it was all online which means that I could learn on my phone. I could from anywhere: from home or while riding a taxi or even at work during quiet times. It was a dream come true.”

Lele seized the opportunity and worked hard at completing the course. She managed to find a balance between studying, working and being a mother, and was making excellent progress. Little did she know that in early 2020 her life was about to change.

In December 2019, the Covid-19 pandemic broke out in China, and quickly spread to all parts of the world. As a precautionary measure, the South African government was forced to declare a national lockdown in March 2020, along with a number of countries around the world.

Lele's workplace was forced to close and, like millions of people around the world, she found herself at home with nothing to do. But Lele capitalised on the time by continuing with her online studies. Unlike most other educational institutes in the country which had to shut down during the lockdowns, IT varsity remained open since they were a fully online institute. While her friends who were studying at the universities had to return home and suspend their studies and their lives, the lockdown proved to be a huge advantage for Lele. With no work responsibilities, she was free to spend much more time focussing on her studies, making excellent progress as a result.

Within a year of starting the course, Lele managed to land an internship position at an elite web development company based in Umhlanga, often referred to as Durban's tech startup hub.

“In just a few months after resuming the course I was excited about life and what the future holds for me in the IT industry.” Lele stated in a LinkedIn post.

[2]

Smaller Screens, Bigger Issues: Developing Mobile-friendly Learning Materials

One of the people responsible for Lele's success is Aakifah Hartley, an instructional designer based in Cape Town, nearly two thousand kilometres from Durban.

Hartley is the lead instructional designer for IT varsity, and is responsible for designing online learning materials that are, in her words, "effective, engaging and learner-centric".

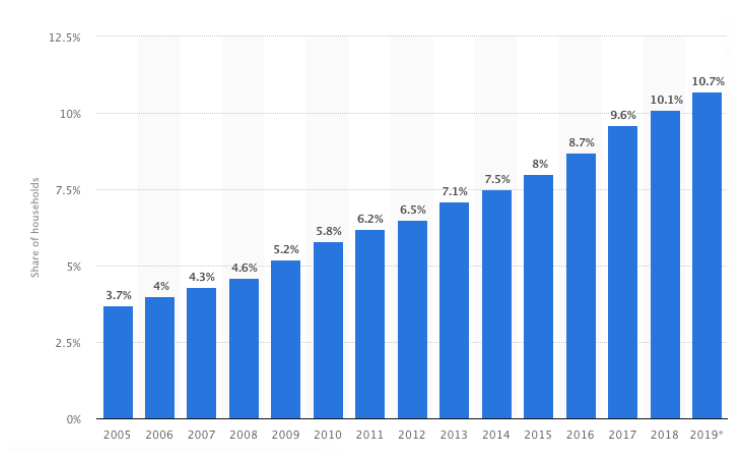
Hartley's work is challenging. When designing online courses, she needs to take into consideration all the theory and best practice relating to instructional design, such as identifying the type of learner the course is targeting, the nature of the content, the most appropriate and effective way to present a topic, the most suitable media to use, the types of activities that will consolidate learning and ensure a high level of engagement with the course. Above all, she has to design engaging and effective learning materials for learners with tiny cellphone screens rather than for larger computer screens. "If learners don't engage with the material, no learning takes place, and you are essentially dead in the water," Aakifah states.

Mobile Device Penetration

The challenge with traditional, computer-based e-learning, is that access to computers in South Africa is

extremely low, with less than 11% of households having a personal computer as of 2019ⁱ. Figure 1 visually represents the rate of computer penetration in South African households between 2005 and 2019. The most striking feature of these statistics is the low growth rate, which calculates to an average of 8.5% annual growth over a 15-year period. At this rate, it will take decades for computer penetration to reach 100%.

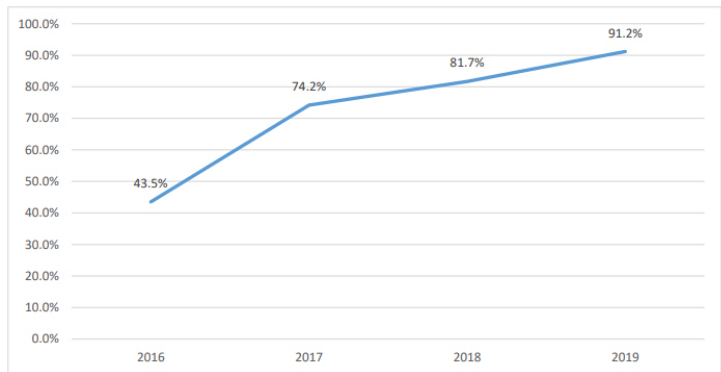
Table 1



On the bright side, mobile device penetration has experienced exponential growth during the same time period, with 90% of South Africa's population having access to mobile devices at the end of 2019ⁱⁱ. Figure 2 demonstrates this growth over a 4-year period.

Contributing to this is the relatively affordable prices of mobile devices, making them accessible to even the most low-income individuals.

Table 2



Mobile as a Solution

The wide accessibility of mobile devices in South Africa presents a valuable opportunity to provide quality education to the underprivileged and underserved communities, particularly in areas where access to schools and universities are out of reach of the population. Mobile devices present a novel solution to the country’s education crisis, and could potentially level the playing field in favour of the country’s most disadvantaged, thereby playing a key role in alleviating and possibly eliminating poverty and unemployment in the country.

It is hence without a doubt that in order to achieve the greatest impact, online educational institutes in South

Africa need to focus on the mobile market by designing mobile-friendly learning materials. While this view has been generally accepted for a number of years, evidenced by the large-scale rollouts of tablet PC's to schools around the country by government as well as the Ngo and corporate sectors, very little has been done by way of implementation. The reason for this is that mobile learning poses its own set of challenges.

Challenges: Teacher Paradigm Shift

According to Hartley, the biggest challenge is the paradigm shift for teachers. Almost all teachers and lecturers have been trained in the traditional, classroom-based mode of teaching, and have been employing this mode throughout their professional lives. Now, faced with this completely new mode of teaching, one where they no longer play the role of “sage on the stage”, they find it extremely difficult to embrace it. This, according to Hartley, is the Achilles heal of modern teachers: “the fact that they are so good at what they do, makes it doubly difficult to get them to change.”

Hartley proposes a two-step process of “unlearning” old methods of education and “relearning” new methods.

“The teachers are key to adoption, and if they refuse to adopt, that’s where it ends. Without this, any rollout of mobile devices is doomed to failure. It is for this reason that thousands of devices at schools around the country remain unused.”

IT varsity has overcome the teacher challenge by hiring fresh new interns to design learning materials for mobile. Most of these interns, including Hartley herself, are graduates of the institute and have been trained in mobile development. Further, they have been trained in design thinking, which ensures that designers take a user-centric approach to design to come up with innovative solutions that are desirable to the target audience, as well as feasible and viable.

Challenges: Digital Skills

Hartley's instructional design team faces another serious challenge: digital illiteracy. In the South African context, IT varsity typically caters to learners with relatively low levels of digital literacy, and with little to no prior experience with online learning. This poses a major design challenge, where not just the learning materials, but also the learning management system itself, need to be carefully designed to be as user-friendly and intuitive as possible. Added to that, the team needs to ensure that they create sufficient guides, in the form of videos, notes, forums and system tours, to orient new learners into the platform.

Every aspect of the student journey needs to be taken into consideration, and effort has to be made to ensure it is intuitive and user-friendly.

Challenges: Culture

Furthermore, the majority of learners are hamstrung by archaic and outdated attitudes around learning, such as that all serious learning is done in-person at a university or similar institute and that no constructive learning can

be done otherwise. Many fail to see mobile devices as serious learning tools. This attitude seems to be encouraged by parents of younger learners, who feel that learners will not do any work from home, and need to attend a campus.

Motivational Factors

Online learning is a new platform for many learners, and many tend to underestimate the amount of time and effort required to succeed in an online course. A common misconception is that, since there are no in-person contact sessions, online learning requires much less time. Another misconception is that online should be somewhat less challenging than in-person classes.

It is largely due to these misconceptions that learners in online courses tend to underestimate how demanding an online course can be, and as such face an unpleasant surprise when they take a course and realise that is in many ways a lot more demanding than in-person classes, and requires as much, if not more, involvement.

Since online learning is self-driven and not fixed to rigid times, success depends entirely on the learner's ability to manage their time effectively. It also requires considerably more discipline than in-person courses. After all, the learner is answerable only to himself or herself for progress made. Unfortunately, it often happens that work and domestic responsibilities infringe on learning times, and learning is postponed. If left unchecked, these "de-prioritisations" and postponements

lead to the learner falling so far behind that they lose any hope of catching up, leading to learner attrition.

Designing for Mobile

There are numerous instructional design challenges specific to mobile devices, considering their small screen sizes and the vast number of different screen sizes. Hartley maintains that designing learning materials for computer screens is challenging enough; but designing for tiny mobile screens that are as small as five inches in size, is exponentially more challenging.

“On a computer screen, you have the luxury of spreading content out, making it easier to design a beautiful and intuitive interface. With mobile devices, there is far less screen real estate to work with, and if content is not laid out carefully, it could end up being so poorly displayed that it could make learning impossible,” says Hartley.

According to Hartley, every lesson and activity has to be designed to display well on multiple screen sizes, utilising a web design technique called “responsive layouts” which essentially ensures that the layout of the lessons responds to the screen size it is being displayed on, presenting the content in the most appropriate format for that particular screen size. Testing needs to be done on every conceivable screen type and size, as well as on every browser, to ensure uniformity of the content no matter what device and browser combination a learner is using.

Technological Challenges

All things considered, there still remain a number of technological challenges that may prove more difficult to overcome. One of these is data accessibility, particularly in rural areas, coupled with the high price of data, which is beyond the means of most people in rural areas. These present a major obstacle in many instances, with no easy solution in sight. The scope of the problem is beyond the private and NGO sectors, and undoubtedly needs government intervention.

There are also challenges intrinsic to mobile devices themselves. Despite their immense capabilities, mobile devices are nowhere close to the capabilities of computers, due to hardware limitations, software limitations, or a combination of both. Many Android devices are available at an affordable price of as low as US\$25, but this comes at the expense of performance.

On the other end of the scale are Apple's iPad Pro devices, which are more powerful than most desktop computers, but due to limitations in the iOS operating system, are unable to perform many of the tasks that computers handle with ease.

As an example, learners at an institute like IT varsity that teaches coding, cannot suffice with learning on their mobile devices, since coding exercises need to be done on a computer, whether a Mac or a PC. The reason for this is that it is not possible to code professionally on a tablet PC, no matter how powerful its specifications may be. This is a limitation of the mobile operating systems.

The responsibility then falls on learners to find a computer in order to complete their projects. Some are fortunate to have access to someone they know personally who owns a computer, while others might go to an internet café, community centre or school where they can access a computer.

Payoff

Hartley believes that the challenges associated with the field of mobile learning arise from the fact mobile learning is a relatively new field, one that is still in its infancy. As the field progresses and evolves, many of today's challenges will no longer exist in the future. This has proven true for many different technologies in the past. After all, it was not long ago that owning a mobile phone was a privilege only reserved for the wealthy classes, but today that is far from the case with smart phone prices having dropped to below US\$25, making them accessible to even the poorest of people.

Similarly, today's challenges with mobile learning will slowly but surely be overcome.

“Despite the challenges, we cannot afford to disregard mobile learning due to the immense potential it presents to educate the nation. Academia, business and government need to come to the party and work together to work towards overcoming these challenges.”

[3]

Smaller People, Bigger Challenges: Building Educational Apps for Kids

As operations head of one of South Africa's biggest educational app companies, Xander Educational Apps, Maseeh Kathrada is all too aware of the challenges associated with mobile learning, but also its immense capability.

Xander was established in 2012, and has since gone on to win a string of awards for its innovative educational apps. The company currently has over 60 apps on the app stores, and its apps have been downloaded over a million times across the app stores.

The apps focus on teaching numeracy and literacy from early childhood level through primary school. They are available in English as well as in a number of South Africa's national languages, like Afrikaans, Zulu, Xhosa, Tswana, Sotho and Shona. The company has also made a few apps in Swahili, catering to the East African region.

According to the company's website, "Local children can now learn-through-play and master new skills in their own languages. Created by a team of specialists, who are also parents, to give modern parents like them, peace of mind knowing they've embraced technology that is also good for their children."

According to Maseeh, making apps for children is difficult. “The main reason is, when you build an app or e-learning material for adults, there is a certain amount of flexibility and room for error. Adults are more forgiving, more understanding and definitely more motivated. Children, on the other hand, have zero tolerance. They will make up their minds if they either love something or hate it within the first two minutes. And if they hate it, they will simply not use it. End of story.”

App Development Process

Xander builds their apps through what Maseeh refers to as a “child-centric expert collaboration”, bringing together experts from a number of fields to plan, design, build, test and publish educational apps that are especially designed for children to use without any prior training or supervision.

“The focal point at every step is the child, and it is very important to keep this in mind,” he said.

The Xander apps are built with a strong gamification aspect baked in, which is intended to give a child the impression that she is playing a game, whereas she is, in fact, learning new concepts and skills.

Research and Planning

Maseeh and his team commence the development of each app with thorough research on the concepts that need to be taught, and the best approach to teaching those concepts via gamified learning apps. The research team found it most effective to utilise a design thinking

approach which places a strong emphasis on empathy by involving the end users from the outset. As such, initial research will involve project managers, instructional designers, user interface designers, app developers, teachers and learners. The research team begins by working with teachers to get an understanding of the concepts that need to be covered.

The team is extremely selective about the types of teachers they work with. These teachers need not necessarily understand the technology paradigm, but they need to be experts in their fields, with at least five to ten years of experience working with their subject matter in the same schooling phase, be it early childhood phase, early primary school phase, Intermediary primary phase or junior high school phase. For example, a teacher who has a total of five years of experience teaching, but has spent some of that time teaching early childhood development, and then moved upwards to teach intermediary level, did not qualify to work with the Xander team for lack of sufficient experience in either phase. The teachers' primary role is to consult the analysts and instructional designers within the Xander team on the important concepts, and the best methods they've discovered, over their years of teaching, to help learners to better understand the concepts.

Aside from number of years of experience, the teachers are required to have an excellent track record, as evidenced by the success rate of their learners and the recommendations of their peers, superiors and parents. They have to have developed some of their own

innovative teaching methods to effectively teach challenging concepts by simplifying them down to the cognitive level of their target audience.

“That is the Xander difference,” said Maseeh. “We do not build apps based on what some educational expert who has never actually worked with kids, thinks will be great for kids. We build apps based on the experience of people who have been in the trenches. We embrace the methods of highly experienced teachers who have tried and tested these methods for a number of years, and also get feedback from the users themselves – the learners.”

Expensive Mistakes

The Xander team has developed this method of teacher selection over the years, and after many expensive mistakes. It costs the team nearly a quarter of a million South African Rands to build a single app, which includes researching the concepts, analysis of the teaching methods, designing the apps, development, testing and marketing.

The high costs associated with the development of apps makes it more critical that the team gets it right, but there were, according to Maseeh, more than a few failures, when they developed apps that they thought were going to be smash hits, but after putting them out into the app stores, things did not turn out as they had expected: very few people were buying those apps, and the feedback from teachers and parents around the world was either that the kids did not enjoy working with the apps, or were having trouble figuring out how to use them; or that the apps

failed to deliver on their promise of assisting kids to master the concepts.

“The last thing you want to do is to make false promises to the market,” says Maseeh.

The company was forced to pull down the underperforming apps from the app stores. Sometimes it was possible to rework the apps and put them back on the market, but at other times the cost of doing so would be too high, and the apps had to be shelved.

The Xander team found that such mistakes can be disastrous not just for the brand, but also for the mobile learning paradigm. “Naysayers abound, and they will climb on every opportunity to discredit the whole mobile learning paradigm just because one or two apps do not deliver on their promises.”

Design

Once the initial concept for the app is worked out, the Xander team then hands off the process to its user experience or UX designers who use graphical tools to carefully design the various screens of the app, as well as the flow between the screens. These designs have to be child friendly and intuitive, allowing a child to navigate the app without any instructions.

“We believe in what Steve Jobs said about building a product, that if it needs a manual, you’ve made it too complicated,” said Maseeh. “Take the iPad as an example. It is an expensive piece of technology, but comes with no

instruction manual. There is no need for one, because it is easy and intuitive to use. In the same way, we need our users to be able to open an app and get using it with no instructions. If a five-year-old child needs instructions, that is it - we've failed. A child will never ask for instructions on how to use an app. If they don't understand it, they will simply close it and do something else."

Develop, Test, Iterate

The design concept is then presented to the teacher and the rest of the team and upon approval, a working prototype of the app is built by the development team. The prototype is a highly simplified albeit functional version of the actual app, used to test if the app is functional, user-friendly and adequately covers the concepts it was intended to.

The prototype is then tested internally by the Xander team as well as externally by a carefully selected group of teachers and learners, who provide valuable feedback. Bugs and other issues are identified and reported to the development team, who promptly deal with them. User interface issues are escalated to the UX design team, while pedagogical issues are escalated to the instructional designer and the consultant teacher.

After an iterative process of testing and fixing, the prototype reaches a stage of maturity where it is ready to go into the final stage of development. The final product is developed and goes through a testing phase similar to the prototype testing phase. Upon completion of this phase, the app is then released to the app stores. The entire

process from inception through launching to the app stores takes anywhere from three to six months.

[4]

The People Challenge

While the technology and pedagogy pose a constant uphill battle for mobile learning, they pale in comparison to the challenges presented by people, who range from outright technophobes who are vehemently opposed to any technology, through sensationalist media, religious leaders with extremely critical views on technology, reluctant teachers and well-meaning yet bumbling government officials and corporates who feed into the negative frenzy by making enormous and expensive mistakes.

Evil Technology

One of the key challenges faced by companies like Xander is that, globally, a large number of teachers and parents are resistant to embracing the mobile learning paradigm because they are of the opinion that mobile devices offer little more than entertainment and information consumption value to kids. Others have a more deep-rooted suspicion for mobile devices and technology in general, and fear more covert yet ominous dangers. More often than not, this stems from their religious beliefs and personal moral standards, fuelled by religious leaders who incessantly warn of the dangers of technology to children, such as children falling prey to evils like pornography, child molesters, illicit relationships and myriad other dangers.

While the dangers of technology to children are no doubt real, and while it is possible for any child to fall prey to some of these dangers, they are arguably no more than the dangers faced by a child on a daily basis while going about his or her normal life, such as going to school, playing with friends at a playground, or going to the mall. It is not inconceivable that, without proper adult supervision and care, a child could fall prey to similar, if not worse dangers.

What makes the situation worse, is that reports of such technology-related incidents in the media are quickly seized, amplified, and echoed throughout the world, especially by conservatives, who waste no time in stating that “we told you so.” Such propaganda often make a single incident seem like multiple incidents, often causing fever-pitch fear and apprehension among the ranks of parents and teachers.

Teacher Apprehensions and Misconceptions

Teacher adoption is another hurdle to adoption of mobile learning, or any e-learning for that matter. When faced with technology adoption, teachers usually fit into one of four broad categories: the outright rejectors, the passive aggressive rejectors, the reluctant acceptors and the enthusiastic acceptors.

The reasons for rejecting technology among teachers vary widely, such as technophobia, where they basically fear the technology; fear of the unknown, where there is a perception they have to give up all they’ve trained for, and have been practising all their professional lives, in favour

of embracing a completely new and unknown paradigm that technology presents; a fear of being at a disadvantage to their learners, who often seem to know more about the technology than them; and finally, and most powerfully, a fear of losing their careers to gadgets.

Yet other teachers embrace extreme views on the dangers of technology to children, as described previously. Unfortunately, the number of teachers who wilfully and enthusiastically embrace technology enhanced learning are a minority.

[5]

Covid-19 and the New World

Did the Covid-19 pandemic and subsequent lockdowns have any impact on educational technology adoption? The answer to this question is extremely complex, and there simply isn't a clear "yes" or "no" as much as one would have liked to see a more positive outcome.

The 2020 global Covid-19 pandemic and national lockdowns across dozens of countries was an unprecedented occurrence in history in sheer scale of the event. Never before had so many people across so many different countries been affected by a pandemic. To protect their citizens, governments around the world were forced to impose national lockdowns in order to restrict movement of people, thereby reducing the spread of the highly infectious Covid-19 virus which was responsible for the deaths of tens of thousands of people.

All except the most essential businesses and services were required to close for periods ranging from a couple of weeks to three months, in certain cases more. Entire economies ground to an abrupt halt as businesses, shopping centres, government departments, public transport, and all kinds of educational institutes were completely shut.

The only non-essential organisations that were able to remain in operation were those that could operate without

any physical interactions between people. These were typically internet-based organisations whose workforce was able to operate remotely. In this category were e-commerce stores such as Amazon; online services like video streaming services such as Netflix; social media services like Facebook and Instagram; and online learning institutes like IT varsity and Udemy.

This highlighted a hugely important fact about the world of the future: that the most resilient and successful businesses and organisations will be the ones that are most geared towards offering their products and services online. While this was by no means a novel idea, the Covid-19 lockdowns served to jolt the world to the extent of this reality.

Not surprisingly, there was a general scramble by organisations of all sorts to establish some sort of online presence so that they could keep at least a part of their operations going. Many schools also arrived at the same realisation.

[The Al Falaah College and their Response to Covid](#)

Among the schools that decided to take action during lockdown was the Al Falaah College, one of South Africa's foremost private schools. Within a couple of weeks of the announcement of the lockdowns, the school was quick to set up a Moodle-based learning management system, upload content, and prepare their educators and learners for online classes. Live classes would be conducted using Google Meets, and content would be

shared with learners via the LMS, which also served as a platform for learners to submit their homework.

At the commencement of the lockdown, the school was fully prepared for going online and, whereas most other schools went into total shutdown, learning at the Al Falaah College continued uninterrupted, albeit at a slightly slower pace than during normal classroom sessions, which was due to the challenges faced by teachers and learners in the process of transitioning from a fully in-person to an online institute in an extremely short space of time.

Learners would use their iPads to log in daily at specific times to attend online lectures, pretty much the same way in which they would attend in-person classes. To keep the overall experience as close as possible to attending campus, the school even conducted a daily digital assembly at the start of the day. While there were some challenges around learner engagement, the school received positive feedback from educators, learners and parents. The exercise was a success.

The school made their learning management and some of their own content available at no cost to other schools, although the uptake was poor.

Inequality Exposed

Despite the generous offer of a learning management system and content made by the Al Falaah College to other schools, there were no more than four takers across South Africa. This, despite a number of announcements

via teachers' forums and social media. What was the reason for the poor uptake?

While on the surface it may seem like apathy on the part of the schools who did not respond, the reality is a problem faced by learners in developing countries around the globe: a lack of access to devices and data. This poses one of the biggest challenges to education, and by extension the social and economic advancement of these countries.

Never before has information and education been so easily accessible to so many people, even in the remotest parts of the world. And never before has the possibility to level the playing field in favour of the poorer, developing nations been so within reach, thanks to the internet. While in the past, quality education was the privilege of wealthier nations, or of people in metropolitan areas where the best schools and tertiary institutes are almost always found, today it is possible for people in the most rural and remote areas to receive world-class education from the world's best schools and teachers, over the internet.

Nonetheless, the people who need it the most, often cannot access this wealth of knowledge and information, and this is hurting entire nations. As a matter of extreme urgency, governments, businesses and policy-makers need to firstly recognise and embrace the immense opportunities the internet provides for education, and then work strategically towards viable and holistic solutions.

To date, the South African government has made a number of attempts at solving the problem of device and data access, often at huge cost to the taxpayers. For example, in his state of the nation address in February 2019, President Cyril Ramaphosa announced that government would provide every school child in South Africa with digital content on a tablet deviceⁱⁱⁱ. These tablets would be funded by the government, as well as by the private sector, non-governmental organisations as well as some foreign governments.

Additionally, during the 2020 lockdowns the government announced that educational websites would be “zero-rated” across all the country’s major cellular networks, which would theoretically mean that a learner with a device and a sim card could access the learning without the need to purchase data bundles.

From the outset, the government’s plans were met with scepticism by educational experts, such as Dr. Lieb Liebenberg, who “warn against adopting an overly simplistic view that the mere adoption of technology will solve our structural education problems”^{iv}.

South Africa’s education crisis did not begin with the lockdowns. From problems created by the apartheid regime, where non-White learners received lower standards of education compared to their White counterparts, to large scale mismanagement and corruption in the post-apartheid era, South Africa’s education system has been teetering on the brink of collapse for decades. The Covid-19 lockdowns simply

exposed a condition that was already in its advanced stages, and experts like Dr. Liebenberg believe that a lot more than technology would be required to fix such fundamental problems. “Technology is not the focus. The focus needs to be on good, proper teaching. Technology can just provide the scaffolding for this.”

[6]

Success Stories

Despite the seemingly insurmountable challenges that make the adoption of mobile learning a constant uphill battle, there are people in many parts of the globe, like Miss Hartley and Maseeh, mentioned earlier in this chapter, who are achieving huge success.

Thanks to their hard work and dedication, holistic approach and strategic thinking, these people are leading the way into the future of learning by demonstrating to the world that, despite the challenges, mobile learning is indeed a viable solution to the world's education problems.

Breteau Foundation: Providing EdTech Solutions to South African Children

Mona Ewees Mkumatela is the South Africa Programme Manager and Lead Teacher Trainer for the Breteau Foundation, a non-profit organisation that has been providing tablet PC's preloaded with apps, as well as other educational material to children in some of the most disadvantaged countries in the world, such as Colombia, Lebanon and South Africa, since 2014.

Mkumatela spent the first 14 years of her career as a schoolteacher, then as the founding principal at the SPARK school in Johannesburg, South Africa, which is a low-fee private school that is focussed on technology-

integrated learning, where learners spend at least an hour a day in the school's computer lab.

While she was principal of the SPARK school, the Breteau Foundation approached Mkumatela to run a pilot tablet PC rollout at the school. The foundation chose the school specifically because of their technology-centric approach to learning and teaching. The school agreed to be a part of the project, which was subsequently launched in 2014 with 20 tablet PCs.

Unfortunately, the project did not go exactly as planned. While not a complete failure, the results were nowhere close to what the foundation had envisioned, which was improved learner engagement through the use of the tablet technology. They had envisioned this taking place via daily use of the tablets in the classrooms, and complete integration into most of the lessons. Instead, the tablets were used mostly as extracurricular activities or free-time fillers.

“It was definitely a huge amount of work: training teachers, timetabling, implementation; for not a lot of payoff,” Mkumatela commented.

It's all about the Teachers

According to Mkumatela, there were three primary reasons for this: firstly, that the teachers received only once-off training that was not sufficient to provide them with the skills to integrate the tablets into the learning and teaching process; secondly, that they were not given ongoing mentorship and support; and finally, that the apps

which were preloaded on the tablets were loaded in United Kingdom with content relevant to the UK, and not to the South African context. For example, money amounts were represented in British Pounds and not South African Rands. More seriously, the content in the apps did not align with the South African National Curriculum and Assessment Policy Statement (CAPS) which is highly prescriptive and provides little flexibility for adding supplementary content. As a consequence, the digital content was relegated to mere extracurricular activities.

Mkumatela provided her feedback, stating that the most basic requirement for the success of a tablet PC rollout would be to provide teachers with comprehensive training on both the usage of the tablet PC technology as well as on the pedagogy of technology enhanced learning. This would be no easy task. In addition to teacher training, Mkumatela also made a strong recommendation that content that is preloaded onto the tablets should be relevant to the South African context, aligned to the CAPS curriculum and, as far as possible, in the South African home languages to enable dual medium instruction, which is standard in most schools in South Africa. There are eleven national languages in South Africa.

The Breteau Foundation subsequently offered Mkumatela the position of the South Africa Programme Manager and Lead Teacher Trainer, which she accepted. Since her appointment to the post in 2014, Mkumatela has facilitated teacher training at nearly 30 schools, reaching over 13000 learners.

As expected, Mkumatela's biggest challenge was getting teacher buy-in which, in 2014, was far more challenging than it is today. At many of the rural schools she trained at, the teachers had never seen or held a tablet PC before, and simply did not know what they were for, or what to do with them. Today, the situation is quite different thanks to the proliferation of mobile phones.

Mkumatela's first order of business was to provide basic training to the teachers on the use of the tablets, which was then followed by training on the pedagogy behind technology-enhanced learning.

Teacher-training

Over the next three years, Mkumatela formulated a detailed standard curriculum that would be applicable at all South African schools. The curriculum was extensive, and took teachers two years to complete. The course provided teachers with all the skills they needed to effectively use the tablets in their classrooms to improve overall learning and teaching. Concurrently, Mkumatela was busy identifying the "best of breed" local educational apps that would align with the CAPS curriculum. The tablets were fully loaded with content covering all the major learning areas, such as numeracy, literacy, problem solving, critical thinking and coding. Additionally, each tablet was loaded with a "tool box" which was a suite of creator apps where learners could compile all kinds of content such as books, projects and collages.

The Breteau team decided the focus their efforts on the foundation phase, because they are often overlooked in

favour of intermediate phase. The overall goal was that kids should become accustomed to using technology during the foundation phase, so that by the time they reached the intermediate phase they would be perfectly comfortable with it.

“The main programme objective was to train teachers to use tablets in their classrooms. We did not want expensive tablets lying around in classrooms unused,” said Mkumatela. “It’s essentially a teacher-centred programme. It is really about the teachers because our theory of change was that, if we can change the teaching and learning in the classroom, and the teachers become comfortable using the tablets in the classes, only then will the learners benefit. It really all comes down to teachers.”

Only once these two projects were well underway, did the tablet rollouts to schools begin. By all indications, the projects were a success.

Success Measurement

Although there was no empirical research done to measure actual success of the tablet rollout from the perspective of the learners, such as a before-and-after study, the Breteau Foundation measured success via surveys and observation which sufficed their needs and provided ample evidence that the programme had achieved the foundation’s objective of “improving academic engagement by creating better teaches and using technology.”

Teacher progress was monitored over the years with Teaching Technology Competency Self-Assessment

rubrics, and the outcomes were overwhelmingly positive. The results of these surveys were subsequently published in the Breteau Foundation's annual Impact Reports^v, which shows the statistics on teacher competency in each of the countries the foundation operates in.

One such observation was school attendance. Whereas attendance is problematic in rural South African schools, the team notice that on “tablet days”, days during which a particular class would have use of the tablets, there was a spike in learner attendance of those classes. They attributed this to a higher level of learner engagement and motivation.

Additionally, surveys conducted among parents yielded positive feedback.

Views on Government Rollouts

Like many other experts in the field, Mkumatela is highly sceptical about large-scale government rollouts of tablet PC's, almost entirely on the grounds that very little or no teacher training is being provided. She cites examples of public schools that she had visited where the tablets were locked away cupboards, and almost never used. Upon inquiry, she was informed by the teachers that they did not make use of the tablets because they had little to no knowledge on how to use them, much less utilising them as pedagogical tools, because they had received nothing more than a two-hour workshop when the tablets were delivered to their schools, and no further training or mentorship since.

“It is simply not possible to teach how to use a tablet effectively in the classroom in two hours,” says Mkumatela. “It takes us two years to bring teachers up to a level where they are at least somewhat capable of effectively using the tablets in their classrooms.”

Age of Learning: Testing a Research-Based Digital Learning Tool in China

Empirical longitudinal research around the overall efficacy of mobile learning is scarce, particularly where younger children in developing countries are concerned. This is undoubtedly due to the fact that using mobile devices as a means of serious learning is a relatively new concept, having only gained any serious traction in developing countries after 2016.

Dr Hee Jin Bang is one of the few researchers who have conducted efficacy research of mobile learning, and her findings have been published in a paper entitled “Testing a Research-Based Digital Learning Tool: Chinese EFL Children’s Linguistic Development.”^{vi}

Dr Bang is the director of efficacy research and evaluation at the Age Of Learning Inc. based in the United States of America. Age of Learning is an educational technology company whose purpose is to help children to build a strong foundation for academic success and to foster a lifelong love of learning. They aim to achieve this via their flagship program, the award-winning ABCmouse Early Learning Academy mobile app, a comprehensive digital learning resource for children ages two to eight years old,

designed to help prepare children for kindergarten and to ensure third-grade readiness.

Game-Based English Language Learning

One of the components of the ABCmouse programme is the ABCmouse English programme, a digital teaching and learning programme designed to teach young children English in a foreign language context. The programme uses Digital Game Based Learning (DGBL) to teach children to understand and use basic vocabulary and simple grammar to converse in English. According to Dr. Bang's research, DGBL can prove a very effective way to learn a new language for a number of reasons, particularly with younger children, as it was shown to produce higher levels of engagement and lower anxiety levels.

Realising that the effectiveness of DGBL depends largely on the design of the programme, Age of Learning brought together a team comprising of curriculum specialists, English teachers, second language acquisition (SLA) researchers, applied linguists, and game developers to collaborate and create the programme. The team utilised both the Common European Framework of Reference (CEFR) standards and the American Council on the Teaching of Foreign Languages (ACTFL) as guidelines. Additionally, since second language acquisition research shows that language learning is best accomplished through activities or tasks based on everyday experiences rather than through learning the grammatical aspects of the language, the team created the programme around activities and experiences that young learners would be

accustomed to on a daily experiences, such as putting on their clothes in the morning, or enjoying a meal.

Research

To what extent can a research-driven app such as ABCmouse English help young learners in an English Foreign Language (EFL) context develop English language skills? Dr. Bang embarked on a research study to answer this question, and to conduct this research she turned to China, where there is strong motivation to learn English. Since the late 1970's the Chinese government has made English learning mandatory in Chinese schools, but despite this, there seems to be a lack of an effective English teaching system. The ABCmouse English team felt that their programme was developed to meet this need in the Chinese education system, and it was time to put this to the test.

Dr. Bang's team chose to work in Hangzhou, the fourth largest metropolitan area in China, where 113 children, 5 and 6 years of age, were recruited from 88 different kindergarten schools. Specific selection criteria were put into place to ensure accurate results, such as that eligible learners and their parents had to have little or no prior knowledge of English. Pre-tests were conducted to ensure this. Additionally, learners needed to have access to a smart phone or a tablet for at least 20 minutes per day, and parents had to commit to a 6-month study programme.

The recruits were asked to use ABCmouse English for a minimum of 15–20 minutes daily for six days a week between December 2018 and May 2019. Researchers

monitored the usage data on a weekly basis via surveys completed by parents and by reviewing the game usage data from learners' devices. The research team had to constantly ensure that all participants were meeting the minimum weekly usage requirement. This was done through regular communication with the parents and by motivating learners through appropriate gifts for those who met their targets.

Findings and conclusions

The results of Dr. Bang's study showed that the children demonstrated substantial improvements in both comprehension and production skills in English. Her findings indicate that consistent usage of an app designed along best practices can be highly effective in helping young learners to learn a new language. This is a major breakthrough, and sheds some light on the potential of research-informed mobile apps as a serious mode of learning.

Conclusion

Despite numerous challenges relating to mobile learning, there is sufficient evidence to be optimistic that, given time and the right approach, mobile apps could become a highly effective learning medium. In fact, one might go so far as to say that apps could, in time, prove to be more effective than the traditional modes of learning and teaching in creating engagement and achieving learning outcomes.

This can be attributed to a number of characteristics of mobile learning that simply cannot be replicated in traditional teaching modes. Mobile learning is ubiquitous, flexible, interactive, enables gamified learning, and supports the use of multimedia. Added to this, the decreasing prices of mobile devices and data will make it possible for learners in even the remotest and most disadvantaged areas of the world to access quality learning. These characteristics will undoubtedly prove to be extremely powerful in levelling the playing field in favour of those currently deprived of quality learning. Time will testify to this.

What is needed most at this stage is for learners and teachers to shift from a mindset of dogmatically holding on to traditional learning and teaching modes to one of embracing mobile learning; for parents and communities to shift from suspicion and fears around mobile technologies to one of optimism and open mindedness; and for political leaders to shift from using technology

rollouts as a means of earning political points to one of sincere concern for the welfare of learners. Further, there needs to be ongoing deep collaboration between governments, businesses, non-profit organisations, learning and teaching experts, instructional designers, software developers, game developers, artificial intelligence experts and a host of other experts to improve the state of mobile learning worldwide.

Granted, there are challenges, but it is also worthwhile bearing in mind that while traditional teaching modes have been in play for millennia, mobile technology itself is a little over a decade old; and mobile learning no more than 5 or 6 years old. As with all technologies, mobile learning needs time and sufficient innovation to truly prove its capabilities.

About the Author



Bilal Kathrada is an EdTech entrepreneur, and is the founder of IT varsity (www.itvarsity.org). He is an multi award-winning app developer.

Bilal is a software engineer by profession, and is also an author, keynote speaker, newspaper columnist, strategic business and education digital transformation advisor. He has lectured at a number of notable institutes, such as the University of KwaZulu Natal, the Durban University of Technology, and the University of Johannesburg.

He was featured in the book, “Developer, Advocate!” by Geertjan Willenga for his work in promoting software development as a career in South Africa.

Bilal is a columnist for the Cape Argus, the Star and the Daily News. He writes about technology trends and education. He has appeared on a number of media, such as SABC 3 and SAFM.

He runs a weekly webinar entitled “African Techpreneur” which covers the latest developments in technology and the business and social implications.

Bilal is a regular speaker at a number of notable events, such as GovTech. He also consults several educational institutes and businesses on transformation for the Fourth Industrial Revolution.

Bilal lives in Durban, South Africa with his wife and three sons. They love mountain hiking and snorkelling.

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Endnotes

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EDUCATION IS OUTDATED.

We are teaching our kids using curricula and modes of delivery that were developed over a century ago. Not only that, but there is massive inequality in education, and at no time in history was this more clear than during the Covid-19 lockdowns, when wealthier schools were able to keep classes going via e-learning, while the rest were forced to shut down. This is an unacceptable situation.

What is the solution? The likely answer is m-learning, or mobile learning. M-learning has the potential to transform education by making learning more accessible everyone, due to the high mobile device penetration globally.

However, mobile should not be seen as a silver bullet; there are a number of challenges, such as access to devices and high data costs. Then there are pedagogical challenges, such as the matter of lower learner engagement and high dropout rates in online courses.

Are these challenges insurmountable, or is there hope?

This book aims to answer this question by showcasing the work being done by dedicated people around the world, who are using ingenious and innovative ways to use mobile learning to make quality learning accessible to the world's most impoverished communities.