

RESEARCH SUMMARY



SEPTEMBER 2018



EDTECH INNOVATIONS IN TANZANIA: INVESTIGATING STUDENT AND TEACHER PERCEPTIONS

1. INTRODUCTION

What are secondary school teachers' and students' perceptions of applying Information and Communication technologies (ICTs) in the teaching of mathematics, science and English, and how does the use of tablet computers in particular impact on student learning? Whilst there is a general consensus that ICT can help

enable learning, existing research does not provide clear evidence as to how, or why, using tablets in classroom contexts can improve learning outcomes¹. It is therefore recommended that future research moves beyond exploration towards more in-depth investigations and takes into account both teacher and student perspectives relating to their introduction and use.

¹ Haßler, Major and Hennessy 2015

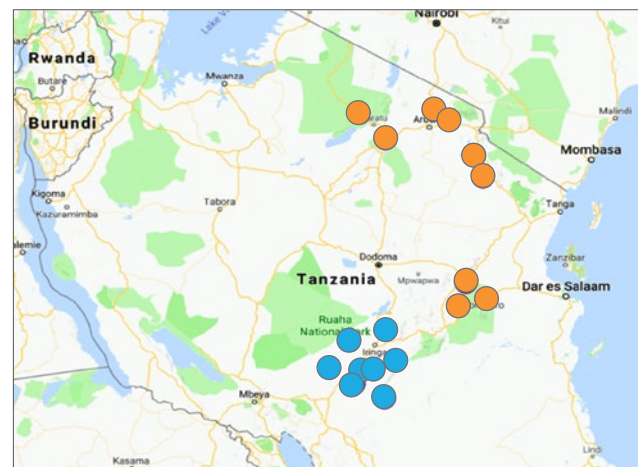
Newcastle University and HDIF Tanzania have conducted a study on two HDIF-funded pilot programmes focusing on technological resources that support education ('EdTech') – one implemented by the Campaign for Female Education (Camfed) and the other by the Christian Social Services Commission (CSSC).

Camfed: In primary schools across Tanzania, children are taught in Swahili, whereas in secondary schools the language of instruction is English. This makes it difficult for most secondary school students to do well in their studies and that leads to reduced school attendance and higher dropout rates, in particular among girls. Camfed's technology-supported learning project aimed to support students in their transition between primary and secondary education. Through the project, Camfed partnered with World Reader to introduce a total of 1,300 English language e-readers into 25 pilot schools across Iringa District, in central Tanzania. Students in Form 1 were given access to tailored learning resources on the e-readers alongside supplementary reading materials to help foster their enjoyment of reading and speaking in English.

CSSC: In partnership with Studi Academy, CSSC worked on addressing the challenges that many students face in fully understanding the concepts of science and mathematics. Studi Academy has expertise in creating online content and worked with CSSC to develop a two-year pilot project titled 'Performance Enhancement by eLearning for Secondary Schools', whose aim was to create a learning platform for tablet computers that would improve students' understanding of science and mathematics. Studi Academy's e-learning platform was introduced into 47 secondary schools, which involved distributing tablet computers pre-loaded with learning content mapped to the Tanzania national curriculum. The teaching materials included animation, video and interactive exercises to stimulate learning and teachers were trained to use a progressive learning pedagogy that places them in more of a support role, encouraging peer and group learning.

Using a variety of research methods – primarily interviews with teachers and focus groups with

Figure 1 Location of schools in the project



● CSSC schools in Manyara, Arusha, Kilimanjaro and Morogoro

● Camfed schools in Iringa (rural) district

students – the research aimed to answer the following questions:

1. What are the suggested benefits of introducing tablet computers in these two projects?
2. What kind of teacher training was provided and did teachers believe it was a) effective and/or b) sufficient?
3. Were teachers expected to change the way they taught when using tablet computers, and which innovative methods were being employed?
4. What do students think about the use of tablet computers in the classroom? What benefits do they see?
5. Based upon teacher and student feedback, what are the lessons for the future with reference to the introduction of tablet computers within this context?

Nine schools – 216 students (108 male, 108 female) and 12 teachers (9 male, 3 female) from Camfed's English literacy e-reader project, as well as eight schools – 158 students (64 male, 94 female) and 11 teachers (8 male, 3 female) from CSSC's Performance Enhancement by eLearning project, took part in the research.

2. FINDINGS

The results highlight both the benefits and challenges faced by students, teachers and school managers in using tablet computers to support learning. The results also point to a number of factors that support project success and sustainability:

- ▤ Selecting schools with good infrastructure and a reliable internet connection
- ▤ Teacher readiness and skills
- ▤ Effective project management and a pre-tested design
- ▤ Sound choice of implementing partners
- ▤ Collaboration with the government

2.1. Camfed's technology-supported learning project

2.1.1. Benefits perceived by students and teachers

Benefits identified by both teachers and students fall into the following key categories:

1. **Improvements in English language skills:** Students reported that they were learning English at a faster pace, resulting in improved English vocabulary and pronunciation. They also reported increased confidence in debates, increased confidence in speaking with teachers, and improved understanding of other subjects. This increase in confidence is particularly beneficial for girls. The teachers believed that use of the e-readers encouraged the habit of reading books and answering questions and also encouraged students to participate more in their learning. They also reported that these changes in students' habits led to improved student performance in exams.
2. **Practical benefits:** The most prominent practical benefit reported by both teachers and students was the ability to access a larger number and wider range of books than they could previously.
3. **Additional benefits:** Both students and teachers reported that use of e-readers led to better attendance in schools, helped students to self-teach, and reduced students' dependency on teachers.

Benefits identified by students alone were: an improvement in their social skills; being more up to date on new technology and having a greater awareness of the growth and potential of new technology.

These benefits shed light on the potential of the devices, suggesting that a student's education could become freed from dependency on the availability of a good teacher. A teacher's role may also change from being instructor to being a facilitator, which may also bring about changes in pedagogy. It is clear these devices have the potential to help students teach themselves and become more independent and lifelong learners.

2.1.2. Challenges perceived by students and teachers

Challenges reported by students and teachers were about the project and the product design.

Project design: The majority of perceived challenges were related to the project design, the two most prominent being the shortage of e-readers and the lack of electricity to recharge the devices.

- a) Students in particular highlighted their frustration with the shortage of e-readers, which resulted in groups having to share one device. As a result, some students would lose interest when the device was dominated by one student. The students argued that, by having their own device, they would be able to dig deeper into areas of interest, learn at a faster rate and improve their performance in exams.
- b) While it is clear that Camfed adopted the classroom model, it is less clear whether teachers received sufficient training on how to use the devices with a class of children working in groups. This very specific form of teacher training would certainly help to manage student expectations. However, the fact that teachers also identified the shortage of e-readers as the greatest challenge they faced suggests that there was either a lack of teacher training or there were an insufficient number of e-readers to adopt the classroom model.

Four of the nine schools included in the study did not have electricity and this made it difficult to charge

the e-readers. Some teachers reported charging the e-readers at their homes, located far from the schools.

These challenges raise several design issues, such as the size of the pilot, the number of e-readers distributed to each school, the nature of the teacher training that was provided, and how different schools were selected to take part in the pilot.

Product design: Both female and male students reported similar challenges. However, a number of male students stated that there were many books available that were not related to the syllabus and there were also many books listed in the syllabus that were not available on the e-reader. One student also suggested that while the books may help with spoken and written English they still did not help the student to answer exam questions. These comments help to shed light on the exam-oriented culture in Tanzania and the corresponding need for technology interventions to be directly related to improving student performance in national exams. This issue raises the following question: to what extent were teachers involved in the development of the content

or selection of what content to put on the e-readers?

2.1.3. Most useful content

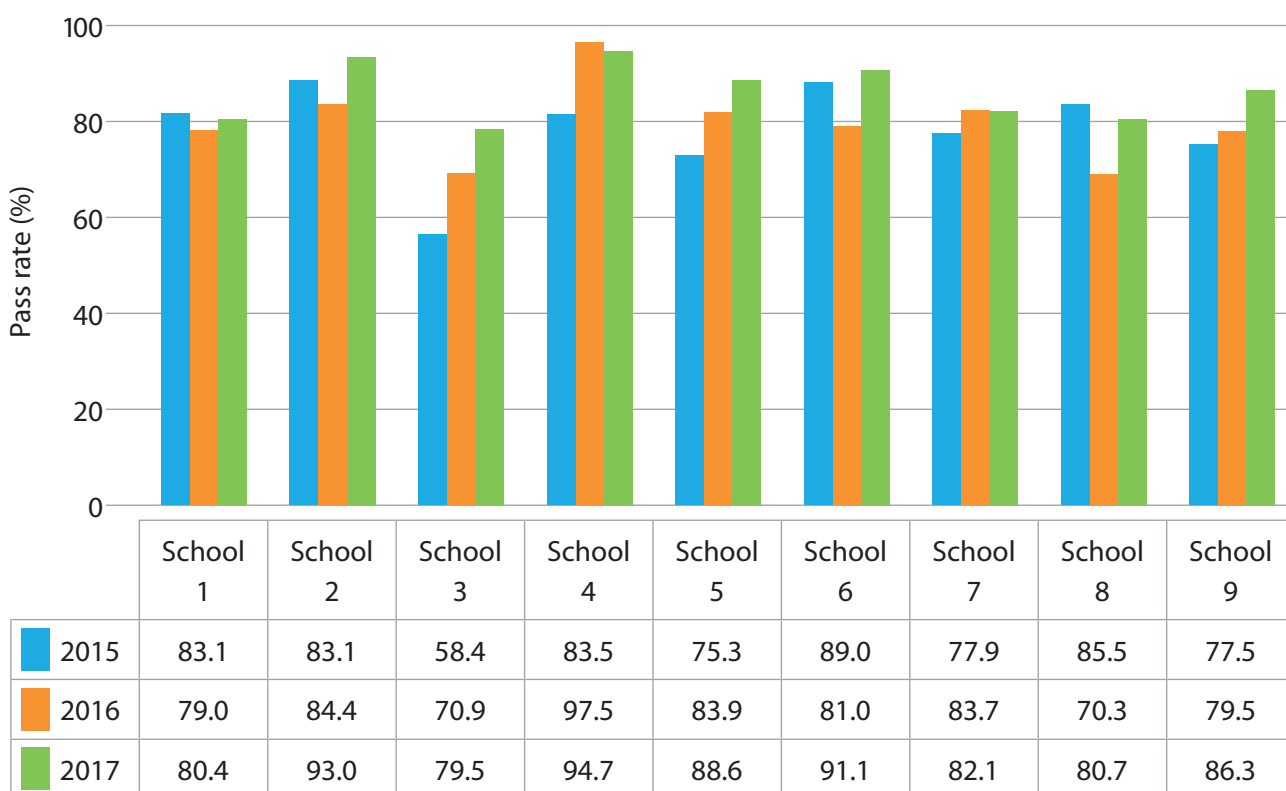
The content that most students found useful included: the dictionary; English text books; story books; an English pronunciation tool; and biology, mathematics and Swahili content. Teachers also identified story books and mathematics and biology textbooks as useful content. This suggests that the e-reader device had already moved beyond simply helping students to improve their English language skills, towards a device that gives them access to different textbooks in various subject areas.

2.1.4 Exam results

In the nine Camfed schools that took part in this research, both female and male students identified improvements in academic performance as a perceived benefit of using the new technology. The English exams results for these schools are shown in Figure 2.

The graph shows that in seven of the nine schools, English Form 2 pass rates increased between 2015 and 2017. For example, the pass rates at School 3 increased

Figure 2 Form 2 English exam pass rates in partner schools (2015–2017)



from 58.4 per cent in 2015 to 79.5 per cent in 2017. The improvement of English exam results in these beneficiary schools can be said to be attributed to the use of e-readers in these schools. Further research would be needed to identify the extent of e-reader impact and to better understand why some schools witnessed a decline in results.

2.2 CSSC's Performance Enhancement by eLearning for Secondary Schools project

2.2.1 Benefits perceived by students and teachers

Students reported that teachers use the tablet computers in lessons in a number of different ways and for different reasons, such as: showing video content to help students understand difficult concepts; complementing their own teaching materials by asking students to engage with the Studi Academy online materials and quizzes; and enabling students to continue learning on their own if teachers are not present or are busy elsewhere in the school.

Both students and teachers identified access to more and different types of learning materials as being the greatest benefit. Specific reported benefits related to this were as follows:

- ▄ The online resources provide richer and more detailed content than that provided in textbooks or by the teacher
- ▄ Having access to a variety of different formats, including video, helps to make difficult concepts easier to understand
- ▄ The online platform enables students to share learning materials between themselves and facilitates peer learning
- ▄ Students use the tablets outside of class time to search for learning materials on the internet related to other subjects and for their own personal studies

These findings suggest that students were using the Studi Platform and the internet to a) deepen their

“It was hard to understand books, but easy to understand lessons in tablets because they have many ways to explain concepts.”

– Secondary School Student from CSSC project

understanding of what they already know and b) learn about new topics.

2.2.2 Challenges perceived by students and teachers

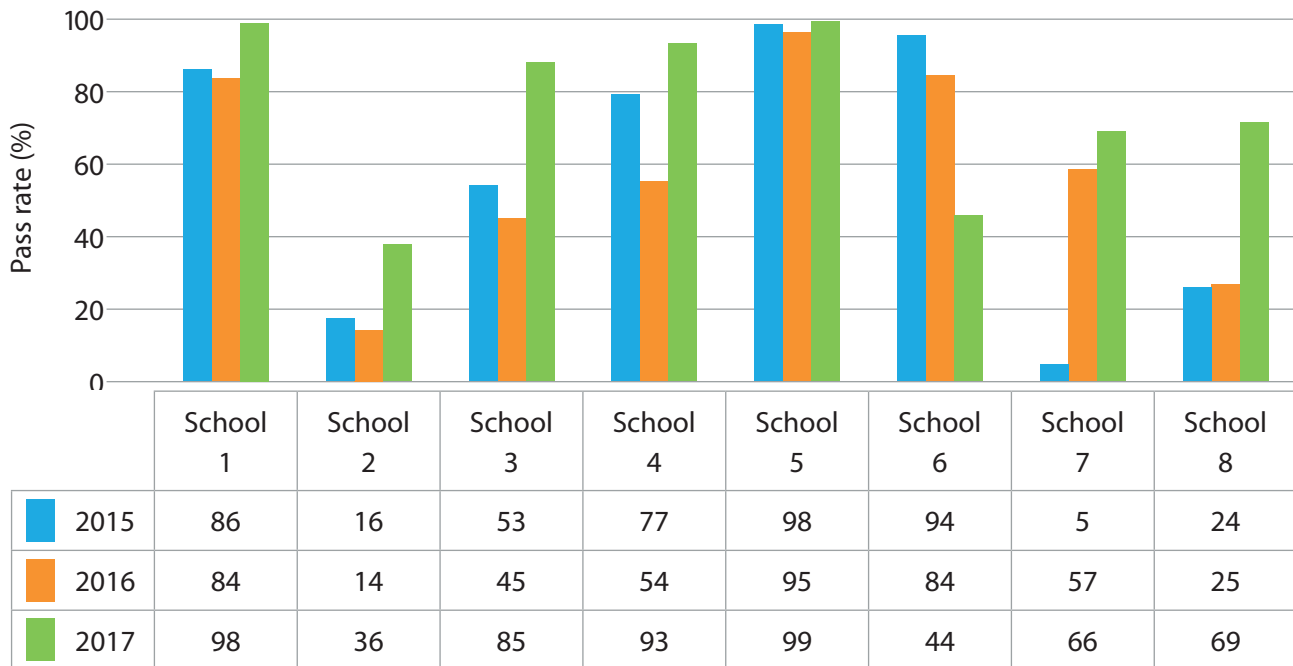
Challenges identified by teachers and students in using the Studi Academy platform were: tablets not always being fully charged and therefore losing power quickly; power cuts in rainy seasons making it difficult to recharge the tablets; and unreliable internet access making it difficult for all tablets to access the internet at the same time, resulting in time being wasted waiting for reconnection and lessons not being completed.

Additional challenges that were reported included the difficulties relating to groups of students having to share one device and the fact that students have to understand English before they can use the Studi platform. It was also reported that students who have access to tablets at home tended to dominate the lessons at school when tablets were used, suggesting that those students who do not have access to tablet computers at home may require additional guidance and support.

2.2.3 Most useful content

The types of content that students and teachers found most useful were the quizzes and the videos. Students were attracted to the quizzes because they enabled students to continuously self-test and evaluate themselves, and feedback and corrections were provided instantly. Teachers found the quizzes useful, as they helped them to evaluate student progress. Both teachers and students found the videos useful because the combination of audio and visual helped students to improve their understanding in a short period of time.

Figure 3 Form 2 Maths exam pass rates in CSSC schools (2015–2017)



2.2.4 Exam results

In the eight CSSC schools, both female and male students identified improvements in academic performance as a perceived benefit of using the new technology and gaining access to the new content. Mathematics exam results from 2015 to 2017 for the eight schools taking part in this research project are shown in Figure 3.

The graph shows that in seven of the eight schools, Form 2 mathematics pass rates increased between 2015 and 2017. This increase during the project implementation can be said to be attributed to the students' use of tablets for learning. Further research would be needed to identify the extent of e-reader impact and to better understand why some schools witnessed a decline in results.

3. COMPARISON OF THE TWO PROGRAMMES

The two programmes can be compared in the following ways:

1. Stakeholder engagement: Many previous development projects that have attempted to introduce new technology have failed due to a lack of stakeholder

engagement. Both Camfed and CSSC have avoided repeating these mistakes by collaborating with their partners and the projects have shown a wide range of positive effects.

2. Provision of relevant technology: Both Camfed and CSSC made a good decision in using tablets that require low energy and which can be charged using either solar or mains power. However, Camfed used monochromatic Kindle e-readers that can hold charge for several days, whereas CSSC used Samsung tablets that require charging each night. CSSC technology was also found to be very reliant on internet connection, something that limited both its effectiveness and sustainability.
3. Students' access to tablets: Both programmes allowed similar access to the tablet computers both in formal lessons and after school. Students valued the time for self-study, which gave them the opportunity to explore and develop critical thinking skills.
4. Content updating: With the Camfed project, updating content requires transporting tablets to a regional office, as schools have neither the technical capacity nor internet connectivity to do the updates. CSSC faced a similar challenge because, as a result of the third-party ownership arrangement, it had little control over

content development and updating. As a result the content was not being updated regularly, and teachers were losing interest.

5. **Sustainability:** CSSC has worked on addressing several challenges, such as the technology's over-reliance on internet connection and CSSC's lack of control over updating content. Both projects still need to work on addressing challenges related to the limited number of devices and lack of electricity in some of the schools.

4. LESSONS AND RECOMMENDATIONS

From the lessons generated from this study, we have made several recommendations, as follows:

1. **Sustainability must be the main priority.** To ensure sustainability, the design of the technology should be simple, maintenance should be easy to carry out, electricity should be reliable, content delivery should be flexible and the project manager should be experienced and conversant with the Principles of Digital Development.
2. **Support to participating schools is essential.** In many EdTech programmes, continued technical support is often neglected or expires when external funding ends. Local government authorities, in collaboration with the Ministry of Education, Science, and Technology, should evaluate implemented EdTech programmes and allocate funds to continually support the programmes that demonstrate positive impact.
3. **Ownership and self-reliance will help schools take responsibility for maintenance and recurring costs of the programme.** Programme designers should avoid the use of vendors with recurring costs and expensive service agreements. Open-source software should be used where possible.
4. **Support students and teachers to benefit from use of EdTech outside of the formal classroom environment.** Programme designers should include



Students access educational animations, videos and interactive exercises on tablet computers.

- a training component for teachers and school administrators on the benefits of self-organised learning and critical thinking.
5. **Development agencies should consider utilizing the Principles for Digital Development as a framework for understanding success factors for scaling Edtech innovations and to monitor and evaluate projects throughout their lifecycle.** This may not guarantee project success but it will certainly help to encourage learning and ensure that mistakes are not repeated.
6. **To improve access, programme designers should ensure that EdTech programmes include training of teachers on resource management.**
7. **Involve stakeholders and users in the design of the project from the offset and view their engagement as a continuous, iterative and integral part of the project's development.**

5. CONCLUSIONS

Evidence collected so far suggests the projects are having a range of positive effects and are helping students to improve their English literacy and language skills and understanding of mathematics and science subjects. An increase in students' self-confidence and the ability of technologies to enable students to participate more in their learning has also been documented.

The evidence also suggests that there is a conflict between the desire to reach students who are most in need and the fact that the majority of the schools that serve this population often lack the infrastructure and facilities required to enable an EdTech innovation to be implemented and sustained.

It's advised that in order to improve the impact of education projects that aim to employ technology to improve students' learning outcomes: a) project design should address the Principles for Digital Development; and b) projects should be monitored and evaluated using the principles as a framework.

The full report can be found at www.hdif-tz.org

References

Haßler, B., Major, L. and Hennessy, S. (2015) 'Tablet use in schools: A critical review of the evidence for learning gains', *Journal of Computer Assisted Learning*, June 2015.

Further reading

<https://digitalprinciples.org/>

http://www.hdif-tz.org/wp-content/uploads/sites/11/2017/11/HDIF_PDD_Web7.pdf

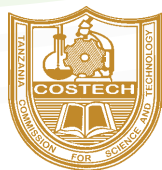
http://www.hdif-tz.org/wp-content/uploads/sites/11/2017/11/PBB_Brief-1_CAMFED_Online.pdf

http://www.hdif-tz.org/wp-content/uploads/sites/11/2018/06/PiP_CSSC.pdf

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