Knowledge, evidence and learning for development

An overview of ICT for education of refugees and IDPs

Chris Joynes & Zoe James
Education Development Trust
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Question

1. *Identify examples of ICT approaches to address the education needs of those living in IDP and refugee camps.*
2. *What are lessons learned from these experiences?*

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1. Summary

ICT holds ‘great promise’ (World Bank 2016: 5) for responding to unmet education needs within refugee settings, with the potential to deliver educational content at low cost virtually anywhere, provide a curriculum and records system that can follow children moving from location to location, reach those unable to attend school, and link digital content to the national curricula of students’ home country or their country of refuge (Burde et al. 2015: 16; World Bank 2016: 10).

However, many studies conclude that access to ICTs in schools or at home is not sufficient in itself to improve learning outcomes.

Firstly, the role of a mentor or tutor figure is seen as key to productive learner engagement with technology, and the effectiveness of ICT-based education is reliant on appropriate teacher training to ensure successful up-take at the classroom level (Tauson & Stannard 2018: 47, 62; UNESCO 2018: 74; Carlson 2013: 30).

Secondly, in terms of content, ICTs for education should provide content that is responsive or adaptable to the learners’ level, is implemented in line with the local curriculum and also is relevant to the learners’ context (Tauson & Stannard 2018: 36-38, 61). There is also an unmet need for materials in local languages as well as content that is tailored to local curricula or matched with international teaching standards (UNESCO 2018: 44).

Open Education Resources (OERs) frequently provide strong source material for the content of ICT-led education programmes for refugees, but should be adapted to context in line with the principles outlined above. From a pedagogic perspective, there is frequently a need to improve educational structuring within digital OER, and to improve instructional design in accordance with pedagogic principles (UNESCO 2018: 45; World Bank 2016: 7; Carlson 2013: 30).

In addition to providing learning, ICTs can also provide systemic support to education in refugee settings, offering a means to train teachers, share materials and advice, assess and document learning, and certify educational achievement. ICT-gathered data can also provide a means to rapidly assess and map the educational situation and provide basic educational information to parents in real time (World Bank 2016: 5, 10; Burde et al. 2015: 17; Tauson & Stannard 2018: 55). However, the potential of ICTs to contribute to data gathering is frequently overlooked in education programme design and implementation, particularly in refugee contexts.

Finally, while ICTs for education can cover a range of technologies, evidence suggests that recent and emerging usage in refugee contexts focuses on the potential of two primary sets of media. Firstly, there is the widespread use of personal smartphones, tablets and other handheld devices to promote mobile learning in both formal and non-formal contexts (World Bank 2016: 8; Carlson 2013: 17; Unwin et al. 2017). Secondly, there is use of ‘connected classroom’ packages which combine portable hardware, ICT technologies and digital learning content for use within classroom settings (World Bank 2016: 7-8; Carlson 2013: 19-20). A number of studies reviewed for this report touch upon the relative strengths and weaknesses of both.

Despite this potential for ICTs, there remains a broad lack of evidence related to education in refugee settings (Burde et al. 2015; Tauson & Stannard 2018; World Bank 2016). In particular, more information is needed on pedagogic design, on the effective use of ICTs for learning, on the role of ICTs in ensuring continuity of and linkages between learning in formal and non-formal

settings, on the role of ICTs in educational data-gathering, and on the cost-effectiveness of ICT-led interventions (Burde et al 2015; Tausin & Stannard 2018; Carlson 2013). In light of the availability of evidence, some of the studies cited here instead supplement their findings by drawing on observational studies, and on studies on effective ICT usage from learners in non-refugee contexts (Burde et al. 2015; Tauson & Stannard 2018).

In keeping with the needs of the requester, this study includes a number of case studies selected to present a diversity of different types of technology projects operating to address education needs in IDP and refugee camps. Since only limited information is usually available in relation to the impact of specific programs, the study has focused on those examples where a relatively extensive literature is available. Further to this, a useful 'Project Inventory' of ICT programmes aimed at education in conflict & crisis can be found in Dahya (2016: 42 – 61), and further cases are presented in World Bank (2016: 21-40) and Carlson (2013).

This rapid review drew largely on synthesis studies, evaluative papers and some grey literature. The reviewed evidence was frequently produced as part of reports commissioned and published by international agencies, but undertaken by external researchers using mixed-method approaches. As discussed above, while the evidence reviewed was of good quality, there were also certain limitations to the evidence available.

The evidence and commentaries gathered and included in a number of the studies in this review made some mention of gender and disability, particularly in relation to access to education and ICTs in refugee contexts. However, as this was not a specific area of focus for this study, discussion of these topics are not included as part of this report.

2. A discussion of issues regarding evidence on ICT for education in refugee settings

According to the World Bank (2016: 5), ICT holds 'great promise' for responding to unmet education needs within refugee settings. Given basic infrastructure, ICTs can deliver educational content at low cost virtually anywhere, provide a curriculum and records system that can follow children moving from location to location, reach those unable to attend school, link digital content to the national curricula of students' home country or their country of refuge, and certify educational achievement. ICT can also provide a means for teachers and tutors to receive pedagogical training, share materials and advice, and assess and document learning. ICT-gathered data can provide a means to rapidly assess and map the educational situation and provide basic educational information to parents in real time.

ICT stands as a potential solution as a result of its widespread use, including by refugees. Mobile phones are now seen as a basic survival tool (Janbek 2015, cited in World Bank 2016: 5) and the primary way for the displaced to remain connected to their families and home communities. In the Za'atari Refugee Camp in Jordan, for example, a survey conducted in January 2015 found that 86% of youth own mobile handsets and 83% own SIM cards (Maitland & Xu 2016). As a result, in many refugee settings, there is already a relatively extensive digital infrastructure in place which educators could leverage to support new ways of learning (World Bank 2016: 5).

However, despite this potential for ICTs, there remains a broad lack of evidence related to education in refugee settings. Burde et al. (2015: v) highlight the absence of robust evidence, having uncovered only a few rigorous experimental studies or quasi-experimental studies conducted in countries affected by crisis. In terms of ICTs in particular, they acknowledge that an increasing number of education programmes use ICTs in crisis-affected countries. However, they are often not evaluated, and thus there is scarce evidence on their effectiveness in learning (Burde et al. 2015: 54). Their study instead relies on a large number of strong observational studies which they use as the basis for their own analysis.

Similarly, Tauson & Stannard (2018: 59) describe an 'obvious and glaring gap' in the lack of evaluations and impact studies on ICT for education in emergency settings. While there is a strong interest in evidence that technology-assisted approaches are effective, little actual evidence has been gathered with respect to ICT in education generally, and much less so in emergency situations. The extent of current long-standing refugee situations around the world provides numerous opportunities to build the evidence base, including through randomized control trials, and thereby improve ICT interventions and bring them to scale (World Bank 2016: 1).

In terms of design of ICT-led education programmes, Tauson & Stannard (2018: 59) highlight the potential for learning about effective ICT usage from learners in non-refugee contexts, stating that '*projects in emergency situations are more likely to be successful if they understand how children learn and what works in ICT for education generally before designing their interventions'.* However, they also highlight the fact that beneficiaries' opinions, attitudes towards technology, and digital literacy levels are all important to successful ICT usage, but there is very limited research available that shows engagement with the views, wants, and needs of children and families in emergency settings (Tauson & Stannard 2018: 51).

In terms of pedagogic design in particular, more evidence is needed on the best ways in which ICTs can be used to help blend formal, non-formal and informal learning. In refugee and other emergency settings, this is an important factor as regular school attendance is often interrupted: research needs to consider the best ways to use technology to ensure that informal learning can continue and also work to support formal and non-formal education structures (Tauson & Stannard 2018: 60).

In terms of data collection itself, more research is needed to understand how and which technology is the most useful when it comes to gathering insights on facilitating the learning process in such settings. While many smart phone and tablet applications can collect data remotely, this facility is frequently underused in education programme design. Where data is collected, it is used to monitor usage and not to help provide evidence of learning outcomes (Tauson & Stannard 2018: 59).

Research and evidence on costing are generally missing from the literature: systematic cost benefit analysis of ICT for education programming 'does not exist' (Tauson & Stannard 2018: 60).

However, while there is a lack of a robust evidence base, researchers and practitioners have continued to formulate design principles that can provide guidance to practitioners and policy makers. The main principles that often recur include the following:

- The purpose and context of each ICT-based intervention must be clearly understood;
- ICT is a toolset to use in facilitating education, not the solution itself;
- Open-source cost-free materials are best exploited using these same principles;
- ICT-based education programmes in refugee contexts should still focus on teacher training and development;
- Any interventions should include inbuilt evaluation in order to build the evidence base.

(World Bank 2016: 1)

3. An overview of general literature on ICTs for education in refugee and IDP settings

In providing an overview of recent approaches to the use of ICTs in the provision of education to children in refugee and IDP settings, there are a number of recent synthesis studies that draw on an extensive range of evidence from a variety of settings. Of greatest relevance to this study are Tauson & Stannard (2018), UNESCO (2018) and, in looking towards emerging patterns of ICT use in such contexts, Unwin et al. (2017). Less recent but also of strong practical value are the study on ICT for refugee education in the MENA region undertaken by the World Bank (2016), and the USAID study on ICT for refugee education in conflict settings undertaken by Carlson (2013). Burde et al. (2015) do not have a specific focus on ICTs for refugee education, but undertake a rigorous review of evidence related to broad educational interventions that promote access, quality of learning and well-being among children in crisis-affected settings.

In summary, Tauson & Stannard (2018) seek to identify how the utilisation of educational technology for teaching and learning - whether at home or at school - can best facilitate the learning process of children in crisis-affected settings. They find that there is currently little applicable evidence relevant for those engaging in education in emergencies. However, they also state that there is nearly three decades worth of research into 'what works' in educational technology in general, and identified areas where research from more stable contexts could be used to inform practice in emergency settings (Vosloo 2018). Taking this broader approach, the authors reviewed over 130 academic papers on ICT's impact on learning outcomes.

UNESCO (2018), in looking at approaches to leveraging technology to support education for refugees, place a particular focus on innovative approaches to the use of *mobile technology*. Drawing on a review of over 117 relevant papers and reports and analysis of 52 distinct projects, the report seeks to better understand how mobiles can open educational opportunities for refugees (Vosloo 2018). The report describes its role as being 'to scrutinize assumptions that mobile-based solutions can be used in a context-responsive manner by refugees to address specific educational challenges and enhance their learning opportunities in line with SDG 4 education targets' (UNESCO 2018: 11).

The World Bank (2016) study on the use of ICTs for refugee education in the MENA region is designed to provide a clear and concise snapshot of the role ICT has recently played in the region. It also outlines the projects that, at the time of writing, were currently under preparation. Based on acknowledged limitations on the availability of evidence, the study describes itself as '[not] a comprehensive assessment but rather an attempt to promote dialogue and inform programs' (World Bank 2016: 1).

In particular, World Bank (2016) highlights that the situation of refugees in MENA is highly diverse and that, in accordance with this, ICT-supported interventions must be correspondingly diverse: each intervention should be tailored to particular needs of particular groups and be integrated with an appropriate pedagogy. It also highlights the role of technology in aiding not only students and teachers, but also parents and relief organizations. It concludes that ICT should replace teachers and organized learning only in rare instances, but it can provide effective support to education, especially when supplemented with teacher training. The report also raises the potential of small-scale private schooling, assisted by technology, as a means of providing

education in highly disrupted settings (World Bank 2016: 1). More specifically, the report outlines five main ways in which technology can provide educational solutions:

- providing digital learning content;
- delivering such content;
- training and mentoring teachers;
- facilitating school re-entry;
- improving management of education information

(World Bank 2016: 6)

In addition, and of particular relevance to this report, the World Bank study also provides a comprehensive overview of many established or emerging ICT-led initiatives for refugee education from across the MENA region. Refer to Annex 1 (World Bank 2016: 22-40) for a comprehensive set of programmes, projects and resources, including external links to key supplementary information.

As part of their wider analysis of effective approaches to the education of children in crisis-affected settings, Burde et al. (2015: v) highlight the importance of investing in research on mobile phone teaching and learning platforms and other promising distance learning innovations. They state that such resources are likely to be particularly important to the education of highly mobile, hard-to-reach populations affected by conflict and crisis. However, as part of their analysis on ICTs in particular, Burde et al. (2015: 21) also draw in evidence drawn from non-crisis settings – an approach also seen in Tauson and Stannard (2018).

Carlson (2013) compiles a series of country-specific case studies of technology-supported interventions to deliver education services that promote equitable access to children and youth in environments affected by crisis and/or conflict. Using a country case study approach, this report examines three types of educational technology programs: mobile phone-based delivery of educational content; internet-enabled computer labs; and Interactive Radio Instruction (IRI) in primary education. There is also some discussion of 'emerging technologies' such as tablet devices.

Predominantly, Carlson (2013) identifies the practical advantages and disadvantages of each form of technology. Based on these, he also provides recommendations for the design and implementation of technology-supported education interventions, with an intended audience of education program planners in developing countries, particularly those affected by conflict or crisis. Importantly, Carlson (2013) covers a number of country cases of broad regional relevance to this study (i.e. India; Pakistan; Afghanistan; Phillippines). In all cases, he highlights the importance of educational objectives, contextual need, and infrastructural circumstances as the key drivers underpinning successful design and delivery of these ICT-led interventions.

Finally, Unwin et al. (2017) provide an informed but speculative look ahead to the future of learning and technology in deprived contexts, based on a literature review, interviews with experts, a workshop and consultations with Save the Children staff. Their report presents an assessment of the likely patterns of ICT usage in deprived settings in 2020-2025. Firstly, in general terms, this study concludes that the pace of change in education is likely to remain slow in most countries, with an increased diversity and inequality in learning practices and

opportunities (Vosloo 2018). However, the increased usage of ICT in education will contribute to an increased diversity of content provision and a greater emphasis on non-formal and lifelong learning. Secondly, in discussing the role of ICTs for education in crisis-affected areas, Unwin et al. (2017) predict that mobile technologies will increasingly enable refugee and IDP children to continue to participate in both formal and informal learning. In addition, the study states that it is likely that numerous different ICT-enhanced school-in-a-box solutions, combining connectivity, electricity, devices and content, will be available that can be set up quickly and effectively to address need.

Finally, outside of a specifically educational role, Unwin et al. (2017) also predict that ICTs for refugees will make extensive use of online resources to provide counselling for those traumatised by disasters and war; that online resources will be available specifically to provide children in acute crises with additional information to enable them to be better able to survive; and that there will be much greater use of mobile phones by refugees to find out information about entering other countries, and what they need to know about the different cultures and ways of life there in order to survive (Unwin et al. 2017). This ties in with findings in current practice from a range of other studies, including Carlson (2013) and World Bank (2016).

Despite the broad range of sources all reports draw upon, the majority of publications reviewed here (Tauson & Stannard 2018; UNESCO 2018; World Bank 2016; Burde et al. 2015; Carlson 2013) highlight the need for more evaluation, research and assessment of the role of ICTs in providing learning possibilities for refugees and displaced populations (Vosloo 2018).

4. A summary of findings on the use of ICTs for learning in a refugee context

Drawing on the documents covered in their study, Tauson & Stannard's (2018) main conclusions on the use of ICTs for school- or home-based learning in a refugee context touch on both content and curriculum design, and also the role of the teacher.

Firstly, they conclude that access to ICTs in schools or at home is not sufficient in itself to improve learning outcomes. A number of further elements must be in place in order for learning outcomes to improve (Tauson & Stannard 2018: 33). The role of a mentor or tutor figure is key to productive learner engagement with technology. The effectiveness of ICT-based education is reliant on appropriate teacher training to ensure successful up-take at the classroom level (Tauson & Stannard 2018: 47, 62). Poor teacher training and induction for ICTs leads to poor results from ICT-led educational initiatives. Continued teacher development positively correlates with successful up-take of ICTs, and teachers' opinions and perspectives are crucial. Parental perception of technology is also an important influence on uptake and outcomes (Tauson & Stannard 2018: 42, 46, 50, 62). Tauson & Stannard (2018: 41-42, 44, 61) conclude that that ICT-led scaffolding is not effective without an adult or teacher there to help, a finding that is seen by Vosloo (2018) as controversial. However, with appropriate design and implementation, scaffolded and adaptive software can be extremely useful in classroom settings. When available, ICTs can support teachers and free them up to engage in greater student-teacher interaction (Tauson & Stannard 2018: 38, 61).

Secondly, in order to be effective, the design of ICTs for education need to be constructed using pedagogic principles such as active learning, engagement, and interactive content. ICTs for education should support cognition and not only deliver or share curriculum content (Tauson & Stannard 2018: 35, 61). In delivering this, ICTs should be responsive or adaptable to the learners' level, particularly in the context of primary education. Materials should be at the correct level for the child so that they are challenged but can also progress (Tauson & Stannard 2018: 37, 61). In addition, interventions that use ICTs must be implemented in line with the local curriculum and also include content that is relevant to the learners' context (Tauson & Stannard 2018: 36-38, 61). In low-resource settings, this has significant implications for the quality of initiatives that rely heavily on open content, such as that accessible through Khan Academy, Wikipedia, and so on (Vosloo 2018). While these resources can be valuable, they need to be framed within the users' specific schooling context.

UNESCO (2018) state that many current mobile-based projects and initiatives are designed to enable and broaden refugee access to primary and secondary education and/or enhance the quality of learning and teaching. However, the current evidence suggests that most projects have not reached scale nor have rigorously evaluated their impact on educational access and quality. The limited evidence that has been gathered is inconclusive (UNESCO 2018: 53). (For reviewed examples of a range of formal and non-formal mobile-based education initiatives, see UNESCO 2018: 54-55, 57-58).

UNESCO goes on to highlight the fact that digital resources, and particularly open educational resources (OER), represent one possible avenue for addressing a variety of educational challenges associated with educational resourcing in refugee settings. Their use can include increasing access to textbooks and learning materials, improving education quality and reducing

costs (Miao et al., 2016, cited in UNESCO 2018: 42), and enabling the adaption of materials to local needs and rapidly implemented at low cost via mobile networks or other offline distribution mechanisms (UNESCO 2018: 42). (For reviewed examples, see UNESCO 2018: 43-44). However, although digital content for refugees is available in the form of open educational resources (OER), it is often scattered and unaligned with the education systems in which it is used. There is also an unmet need for materials in local languages, as well as content that is tailored to local curricula or matched with international teaching standards (UNESCO 2018: 44). There is a need to improve educational structuring within digital OER, and to improve instructional design in accordance with pedagogic principles (UNESCO 2018: 45).

Echoing a key point raised by Tauson & Stannard (2018), UNESCO also states that, in terms of pedagogic design in refugee settings, an effective mobile learning programme often not only blends both technology and human interventions, but also includes varied pedagogical modes that are relevant to the actual contexts and responsive to learners' needs. Refugees from a background in which learning is almost exclusively determined and dominated by teachers might be disoriented by the multiple learning pathways of mobile learning that are designed based on personalized learning methodologies and collaborative digital learning environments (UNESCO 2018: 74).

Finally, although low language and literacy skills can be the most pervasive and potentially damaging barrier to educational participation for a refugee learner, UNESCO states that, to date there is little evidence that documents the efficacy of specific learning and literacy apps in refugee settings. In relation to this, based on some examples, the report indicates that mobile-enhanced conversational and situated learning scenarios deserve further analysis (UNESCO 2018).

The World Bank (2016) outlines two main ways in which technology can provide educational solutions to school-based learning: by developing digital learning content, and by delivering such content (World Bank 2016: 6).

In developing digital content, the World Bank study focuses on the advantages of OERs in crisis and conflict situations, where learning materials can be made available rapidly, at low cost, and adapted locally to specific target group needs. Moreover, this content could be distributed on memory sticks or through other offline methods, as well as distributed virtually via cellular networks and the Internet. In addition, precisely because they are 'open', OERs could be incorporated into any digital learning platform. The study highlights the need for the creation of additional materials by local educators, with the most appropriate existing materials translated or subtitled with some effort by a dedicated team or through low-cost service providers. These materials would be available not only for immediate use but also as a model for other educators (World Bank 2016: 7)

The World Bank (2016: 8) highlight that the delivery of digital content can take place through many media formats and in many educational contexts, whether formal, nonformal, or informal. The two main avenues they cite for the delivery of digital educational content in the MENA context are: a) mobile learning through personal handheld electronic devices such as smartphones, and b) 'connected classrooms' – portable packages containing necessary hardware, internet solutions and/or pre-loaded digital content for use in a classroom context.

Mobile learning via a personal handheld electronic device such as a smartphone is not confined to the classroom or home but can take place anywhere. In many cases, mobile learning also permits synchronous or asynchronous interaction with teachers and other learners. Mobile learning may be the preferred technology for informal and non-formal learning, which might take place individually, through social media, or in community centres. World Bank (2016: 8) state that smartphones are widespread in the MENA region, even among refugees who have lost their homes and possessions.

However, the study highlights the fact that mobile learning is constrained by the cost of cell phone subscriptions and mobile Internet access. For that reason, many providers to refugee contexts emphasize the value of '*content that can be downloaded for offline use'* (World Bank 2016: 8). Though mobile learning holds much promise, many mobile learning projects for refugees are very early in their development, typically in the planning or pilot stage. However, the promise of mobile learning has attracted a wide range of actors: from large-scale public and private funders, such as Norad and the Maktoum Foundation, to very small NGOs, such as Aliim (see Annex 1, World Bank 2016: 21-40).

In discussing "Connected Classroom" approaches, the World Bank study summarises the use of ICTs for educational purposes within classrooms. In the refugee context, this may require special infrastructure such as rapidly-deployable packaged hardware for education in emergencies. Such hardware generally features pre-loaded academic content, and sometimes connectivity solutions. The study points towards UNICEF's "Digital School in a Box", the LearnSyria project, the Open Learning Exchange's Open Learning Kit (see: http://ole.org/mena/) and Ushahidi's BRCK technology and Kio Kit (see: http://education.brck.com/) as examples that have been rolled out in a range of contexts (World Bank 2016: 7-8).

Burde et al. (2015: 17) cite ICTs in distance learning programmes as among the interventions that can improve access to education in crisis-affected settings by reducing distance of travel to school, an intervention that is correlated with an increase in enrolments. However, in terms of reach, existing research from non-crisis, low-income countries indicates that print, TV, and radio broadcasts appear more successful than the Internet, since the digital-access divide is often significant among target populations for distance learning programmes in developing countries. The prohibitive cost of the Internet and the lack of infrastructure make online learning challenging, while in contrast, mobile learning through mobile phone applications shows some potential. Finally, programmes appear to have been more successful in reaching large numbers of the rural poor when they have been implemented through multiple modalities combining print, TV, audio, and internet (Burde et al, 2015: 21). However, the cited cases to support this are drawn from outside of crisis-affected settings.

In discussing the use of mobile phone platforms to deliver lessons, Burde et al. (2015: 20, 29) conclude that such educational technology, when applied in contextually relevant ways, may contribute to positive learning experiences and improve educational achievement, even in contexts affected by conflict and disaster. However, they only cite examples from stable or non-crisis-affected contexts, with the exception of emerging observational evidence on the use of mobile phones. Research on a UNESCO supported girls' literacy programme implemented via mobile phones in Pakistan found that over a four-month period, literacy skills improved by a weighted average of 67%. However, since no control group was used, it is not possible to attribute these gains entirely to the programme (Burde et al. 2015: 32).

Carlson (2013) highlights the fact that mobile learning represents a simple, low-cost hardware that can be used in conjunction with existing mobile phone infrastructure. Furthermore, the ease of use and popularity of mobile phones enables students and teachers to learn how use the educational software quickly, to access it inside and outside of school as self-directed learners. This reduces training time, accelerates teacher adoption, and facilitates development of teacher 'communities of practice', presenting a possible alternative to historically ineffective cascade teacher training models. Finally, the ability to provide high-quality audio-visual content and learning resources encourages engagement and facilitates interactive collaborative learning (Carlson 2013: 17).

However, Carlson (2103: 17) also highlights the fact that, to date, there has been no large-scale implementation of mobile phone-based educational technology in countries affected by crisis and conflict, so the concept remains unproven. On a practical note, usage also depends on reliable mobile phone infrastructure penetration into rural areas. From a pedagogic design perspective, without appropriate instructional design, the mobile-phone operates as a one-way content delivery system which lacks full interactivity and Internet access - this could reduce impact of higher learning or teacher training activities, which often require reflection and research to succeed. Finally, in terms of functionality, he highlights the small screen of a mobile phone is a limiting factor, plus the fact that much of the currently available educational content is re-purposed from other sources, and may not be well-adapted to the particular functionality of mobile phones (Carlson 2013: 17). In contrast, he points towards the relative advantage of emerging tablet technologies to overcome such limitations while still remaining relatively cost-effective (Carlson 2013: 25-26).

In discussing the use of internet-enabled computer labs, Carlson (2013: 19-20) touches on the 'connected classroom' model outlined by the World Bank (2016). The advantages of this technology is that they can provide a wide range of possible educational applications, including research, the full suite of productivity software, distance-based learning, etc., in addition to strengthening youth employment skills. In addition, desktop computers are well established and reliable technologies, and technical support for repair and maintenance is often locally available (Carlson 2013: 19-20).

However, from a pedagogic perspective, computer-based learning is much harder to integrate into actual classroom teaching than more mobile devices. Many teachers simply do not want to take this time away from other classroom learning activities. Practically, computer labs require reliable and affordable electricity from the grid or from generators, often not available or reliable in refugee contexts (Carlson 2013: 19-20).

Carlson concludes by highlighting the fact that, regardless of media and delivery technology, successful ICT-based education programmes have engaged local content developers to develop digital learning materials that are relevant and locally appropriate, and are also accepted by teachers, students, and the broader community. In addition, he underlines that strong monitoring and evaluation systems, coupled with programmatic flexibility, are necessary so that content delivery, teacher training, hardware provision, maintenance, and other elements can be adjusted as circumstances require, particularly in high conflict situations, in order that programmes keep learning and adapting in a constructive, iterative process (Carlson 2013: 30).

5. A summary of findings on the use of ICTs in providing systemic support to education in refugee contexts

Tauson & Stannard's (2018) main findings on the use of ICTs in providing systemic strengthening for education in refugee contexts highlight the fact that there is strong support for the potential role that ICTs can play in blending between formal, non-formal and informal learning frameworks, although there is not a great deal of evidence available on this. However, in emergency settings, this is an important aspect of ICTs for education as regular school attendance is often interrupted (Tauson & Stannard 2018: 55).

Tauson & Stannard (2018) state that a common theme across their reviewed literature was the barrier of existing infrastructure in preventing the successful utilisation and integration of ICTs into education systems. They state a need to look beyond the claimed infrastructure and policy framework of specific countries, and analyse what the actual and current infrastructure really is (Tauson & Stannard 2018: 39-40, 50, 53, 63). This is particularly the case in refugee camps and/or conflict affected settings.

Finally, they conclude that ICTs for education can, but do not necessarily, represent the best value for money, particularly in refugee settings. In emergency situations when resources are limited and the infrastructure to support the technology is under strain, the sustainability and feasibility of an intervention has to be established if long-term improvements in learning outcomes are the aim of the intervention. Furthermore, ICT-based interventions can become a burden to the communities if the long-term considerations of maintenance are not considered. In assessing value-for-money, the issues that need to be considered include: the appropriateness of the hardware; sustained training initiatives for teachers; adaptation costs for the learning environment, and capacity building to ensure that broken equipment can be maintained (Tauson & Stannard 2018: 52-53, 62-63).

UNESCO (2018) conclude that, in the use of ICTs in providing systemic support to education in a refugee context, there are some indications that mobile learning can be used to provide mentoring and ongoing support to teachers of refugees, with cited examples pointing to the value of mobile learning to help teachers of refugees improve their day-to-day teaching practice through a range of mobile-based components (for reviewed examples, see UNESCO 2018: 39-42). The current evidence base regarding mobile learning for teacher training in refugee contexts is 'surprisingly scarce': the report states that studies with a robust evaluation conducted in this area could not be found (UNESCO 2018: 39). However, the report cites the case of the Teachers for Teachers project in Kakuma camp, Kenya, led by Columbia University, as a strong example of how teacher training and virtual mentoring is possible (Vosloo 2018).

UNESCO (2018: 74) also echo Tauson & Stannard's points on ensuring the uptake of ICT-based education by teachers of refugees, stating that only comprehensive training on the integration of mobile technologies and appropriate pedagogical methodologies, as well as necessary subject matter knowledge, can equip teachers with adequate initial skills to design and facilitate mobile learning practices. While teacher training is a standard component of most mobile learning projects, the quality and sustainability of training should be enhanced (UNESCO 2018: 74).

The UNESCO study finds that, increasingly, programme design for refugee education is making use of mobile social media and mobile instant messaging spaces to support delivery, although

data-gathering and analysis remains weak. Mobile technologies can play an essential role in improving basic operational, planning and controlling functions in education systems in refugee and crisis settings, through the capture and analysis of education data. In low-resource and low-infrastructure settings, mobile devices are often the only available technology that allows quick data capture on available infrastructure, teacher and student numbers, thereby potentially enabling more rapid and appropriate responses (For reviewed examples of mobile applications for data gathering, see UNESCO 2018: 46-48). However, this opportunity is only infrequently realised within programme design, particularly in relation to monitoring data on learning progress among learners, classes, schools and systems in refugee contexts, and also in terms of documenting and accrediting learners as they move from location to location (UNESCO 2018: 46).

In terms of cost, the UNESCO study highlights that outstanding questions over the cost-effectiveness of mobile-based solutions for the provision of primary and secondary education should also be acknowledged. Based on the limited data available, it remains unclear whether digital technologies are the most cost-effective solution to enhance learning and teaching in refugee settings when compared with other less technology-orientated approaches (UNESCO 2018: 53).

The World Bank (2016) study outlines three main ways in which technology can provide systemic support to educational solutions in refugee contexts: a) training and mentoring teachers; b) facilitating school re-entry for refugee children; and c) improving management of education information (World Bank 2016: 6).

Firstly, in ICT-based teacher training and mentoring, the World Bank study claims that only rudimentary steps have been taken so far, whether in refugee contexts or elsewhere. For the most part, ICT-enabled teacher training has been a component of a few tightly targeted projects: a single more robust ICT-enabled teacher training approach is seen in UNICEF's Raspberry Pi for Learning Initiative (Pi4L) (World Bank 2016: 9).

Secondly, the World Bank study highlights the potential for ICT to facilitate the re-integration of displaced children and youth into formal schooling in their country of refuge. They propose that, in part, this is a matter of refreshing children's lost knowledge, re-establishing study habits, and so forth. This can take the form of accelerated 'catch-up' programs, helping them revive the habits of study and ability to concentrate, guiding them and their parents in regard to enrolment procedures and preparing for placement examinations. The study also touches on the role of ICTs in addressing trauma and post-traumatic stress, a point also highlighted in UNESCO (2018: 53). More formally, ICTs can help address the issue of documentation and certification of learning and achievement among refugee communities to enable ease of transfer. The World Bank study points towards a competency-based approach to certification, citing cases from observation in regard to Jordan, Lebanon, and Turkey (Culbertson & Constant 2015, 25–26, cited in World Bank 2016: 10), or simplified age-based benchmarks based on internationally recognized educational benchmarking systems, such as TIMSS/PIRLS, PISA, or others.

Thirdly, in improving the management of education in refugee contexts, the role of Education Management Information Systems (EMIS) could play a central role. The World Bank study cites examples such as YOBIS (https://yobis.meb.gov.tr/), a data management system created by Turkey's Ministry of National Education and UNICEF, which documents demographic data of non-Turkish students and tracks their education records (and health records). This appears to be

a supplement to the ministry's existing national EMIS. Additional technologies described in Annex 1 of the World Bank study (World Bank 2016: 21-40) which might contribute to these efforts include examples such as Tangerine, Open EMIS Refugee, and sQuidcard (World Bank 2016: 10).

Fourthly, the World Bank study also indicates the role that education technology can play in improving the efficient use of school facilities. While host-community schools can suffer in response to meeting the needs of refugee populations, ICT can enable off-site learning as one means of compensating for lost classroom time and relieve pressure on school facilities. They cite the 'Learn Syria' initiative piloted by Rumie, which already claims this as an outcome (World Bank 2016: 10).

Finally, the World Bank also point towards the role that ICTs can play in supporting an expanded private and non-formal education model, using computer-assisted learning within hyperlocal, small-scale, low-cost schools. They propose that this be seen as an extension of the connected classroom concept, combining it with teacher training and mentoring, digital content, and possibly even scripted lessons, all supported by a digital classroom consisting of a projector, curated digital content, and basic classroom supplies. Similar community- or home-based schools (without the technology) have been used effectively for Afghan refugees in Pakistan, South Sudanese refugees in Kenya, and Rohingya refugees in Malaysia (Dryden-Peterson 2011; UNHCR 2015b; citied in World Bank 2016: 9).

Burde et al. (2015: 16) cite ICTs in distance learning programmes as among the interventions that can focus on improving administration, infrastructure, and resources for education in crisis-affected settings. Limited anecdotal evidence suggests that mobile phone messaging platforms can facilitate the physical protection of schools and students in conflict contexts where attacks on schools are a particular problem. In Gaza, Souktel implemented a large scale, web-based SMS alert and survey system as part of the UNESCO crisis-Disaster Risk Reduction (c-DRR) programme (Burde et al. 2015: 45).

6. Case Studies

The case studies presented below have been selected to present a diversity of different types of technology projects operating to address education needs in IDP and refugee camps. Since only limited information is usually available in relation to the impact of specific programs, this study has therefore focused on those examples where a relatively extensive literature is available.

Further to the cases presented in this section, a useful 'Project Inventory' of ICT programmes aimed at education in conflict & crisis can be found in Dahya (2016: 42 – 61).

Case Study 1:

Project(s)	**'Antura and the Letters'** & **'Feed the Monster'**
Location	Jordan (Azraq refugee camp)
Implementer	These 2 programmes were the winners of the 'EduApp4Syria' competition, organised by Norad & supported by ACR GCD. *Antura & the Letters* was developed by a consortium led by the Cologne Game Lab, whilst *Feed the Monster* was developed by a consortium led by the Apps Factory in Bucharest
Target group	Syrian refugee children with little or no schooling
Target outcome(s)	• Foundational Arabic literacy skills • Psychosocial wellbeing
Technology	• Digital game-based learning (DGBL) • Opensource smartphone app

Both *Antura & the Letters* & *Feed the Monster* are DGBL programmes, which incorporate educational content or learning objectives into digital games, played on a smartphone or tablet computer. DGBL-type platforms can reduce barriers to accessing learning materials and alleviate needs for physical learning environments, whilst also offering opportunities for differentiated learning and quality improvement (Koval-Saifi & Plass 2018a: 8).

Antura & the Letters is a game which requires 36 hours to play a total of six levels, each of which introduces different elements of beginner-level Arabic literacy. Meanwhile, *Feed the Monster* is a game that can be completed in 3 hours by players with beginning reading skills (Comings, 2018:2-3). Both games are designed to be played independently on a smartphone with minimal adult supervision. The games are not primarily intended for use in formal or structured educational settings but the testing of the games for the purpose of the evaluation was conducted in remedial education centres (Koval-Saifi & Plass 2018a: 9).

Both projects were subject to a quasi-experimental mixed methods evaluation funded and supported by DL4D and UNICEF, and implemented by INTEGRATED International and NYU's CREATE group. These constitute some of the most rigorous evaluations of technology interventions in education in refugee and IDP camp settings.

The evaluation adopted a treatment and control design, and assessed the pre-test and post-test performance of children in (i) literacy via subtests of the Arabic EGRA administered to children; and (ii) psychosocial outcomes via the Strengths and Difficulties Questionnaire (SDQ), administered to parents (Comings 2018:5). The evaluation faced several challenges,

including limited sample sizes owing to high levels of dropout (linked to families leaving the camp), and the challenge of the relatively low 'dosage' of each intervention. Results were 'weak but encouraging' (Comings 2018:5), with the treatment group demonstrating improved (but not always statistically significantly better) outcomes in both literacy and psychosocial indicators, compared to the control group. The evaluation also considered the extent to which each app was either (a) engaging or (b) easy to use, which provided valuable feedback to the teams developing each app. Many of these suggestions have fed back into the design of the games, in the form of updates and improvements to the pedagogical approach, the difficulty levels and flow of the games, and the in-built reward systems which aim to improve player retention (Comings 2018: 13-14). The evaluation reports are clear about the challenges of designing effective apps and programmes in these contexts. The evaluations for each game detail a number of recommendations for the future development of these sort of games (for example Koval-Saifi & Plass 2018: 60 & 74-75) and for evaluations of such programs (for example Koval-Saifi & Plass 2018: 77-78).	
Similar projects	**Can't Wait to Learn/ eLearning Sudan –** DGBL Arabic & Maths, linked to curricula & implemented in Sudan, Jordan, Lebanon & Uganda (WarChild & implementing partners) (see also Dahya 2016: 20). **EdTech for Emergencies** – Tablet-based 'reading-to-learn' app for Somali refugees in Kenya (Dadaab refugee camp), evaluation underway & possible expansion to Djibouti, Ethiopia & Somalia & South Sudanese languages (BRCK, e-Limu, NRC & SIL International).

Case Study 2:

Project(s)	**Instant Network Schools programme**
Location	**Multiple**: Kenya, Tanzania, Democratic Republic of the Congo (DRC) & South Sudan
Implementer	UNHCR, UN Refugee Agency, Vodafone Foundation
Target group	Young refugees & teachers
Target outcome(s)	Multiple
Technology	Digital school in a box

Instant Network Schools (INS) provides access to technology, the internet, and educational content with the aim of improving the quality of education for students living in refugee camps in countries where Vodafone operates. Each 'Instant Classroom' is equipped with a laptop, 25 tablets pre-loaded with educational software, a projector, a speaker and a hotspot modem with 3G connectivity (Vodafone Foundation, 2018). It takes 20 minutes to set up and is designed to work in areas without electrical or internet connectivity, often linked to existing school infrastructure (Vodafone Foundation, 2018). By the end of 2017, INS had set up 36 schools in eight refugee camps in Kenya, Tanzania, South Sudan and DRC benefitting over 40,000 refugees and 600 teachers every month (Vodafone Foundation 2017: 4).

The programme has several objectives: (i) expose under resourced schools to dynamic educational tools and training and support their use; (ii) improve digital literacy in refugee/ rural settings with low mobile/ ICT penetration; (iii) provide opportunities to access certified higher education courses through open and distance learning; (iv) enrich lives by enabling students to interact and share experiences with communities outside of refugee camps; (v) improve school retention rates; (vi) contribute to increased exam performance (Vodafone Foundation 2017: 6). The programme sees successful technology-led programmes as being driven by nine elements: programme ownership, local initiatives, teacher training, educational content, content and tablet management, connectivity, power, hardware and monitoring & evaluation (Vodafone Foundation 2017: 7). The programme design and implementation is iterative, whereby the partners constantly revisit the existing programmes to improve delivery, creating innovation cycles that respond to evolving needs and promising practice.

An independent impact assessment study was due to be completed in January 2018, including data collection on teacher motivation and confidence, student motivation and confidence, school attendance, exam results, digital skills/ ICT literacy & child protection. Initial qualitative feedback from beneficiaries about the perceived value of the programme suggest evidence of: (i) a positive contribution to student retention; (ii) improvement in student motivation and engagement; (iii) improvements in the performance of refugee children in national examinations; (iv) improvements in ICT literacy among teachers and students; (v) community ownership of the programmes may improve their sustainability (Vodafone Foundation 2017: 10).

Key strategic and operational lessons from this program include the following:

(i) there is great potential for innovative partnerships in this sector;

(ii) there needs to be improved coordination amongst providers of educational content;

(iii) identifying and training local 'champions' of the programme & ensuring local ownership was key to success; (iv) technology should be an enabler not the end goal; (v) teacher capacity needs to be a key priority; (vi) solutions must be appropriate for the local context; (vii) where internet access is provided, it's important to implement safeguarding procedures and online child protection policy (Vodafone Foundation 2017: 13).	
Similar Project(s)	**Ideas Box –** pop-up multimedia centre & portable library implemented in multiple contexts including refugee camps in Burundi (UNHCR & Libraries without Borders) (see Dahya 2016: 20) **Community Technology Access (CTA**): Internet-enabled computer labs for education and training in African refugee camps, UNHCR (see Carlson 2013: 18)

Case Study 3:

Project(s)	**Teachers for Teachers: Strengthening Support for Refugee Teachers**
Location	Kenya (Kakuma Refugee Camp)
Implementer	UNHCR, Teachers College Columbia & Finn Church Aid
Target group	Teachers
Target outcome(s)	Teacher training and ongoing support/ mentoring to improve teacher practice
Technology	Mobile phones/ instant messaging

Teachers for Teachers is a multi-layered and staged approach to teacher training which uses technology to offer global mentorship and support to refugee teachers in the Kakuma Refugee Camp. In refugee settings, teachers often receive minimal or no training at all, and many have only their own educational experiences on which to draw. Where training is available, it is often in the form of one-off workshops. Teachers for Teachers aims to offer meaningful and sustained support and strengthen a sense of professional identity via a threefold program which combines a variety of professional development opportunities, some of which draw on ICT.

In the first instance, training teams of international and local staff led in-person training sessions with cohorts of 25-30 teachers, allowing teachers to learn new techniques and methods particularly adapted for emergency contexts. After completion of this training element, teachers participate in face-to-face coaching and mobile mentoring. These packages cover the same content but proceed in two tracks: (i) the Initial Training Pack which consists of a four-day training followed by two months peer coaching and two months mobile mentoring; and (ii) the Extended Training Pack (ETP) which consists of 11 months of training, 11 months peer coaching and 6 months mobile mentoring.

Mobile mentoring is the third phase of the initiative, which offers long-term support from external and professional resources. Teachers are paired with a 'Global Mentor' who they can contact via 'Whatsapp' for ongoing support and expert mentoring. These 'Global Mentors' are volunteers from around the world with classroom teaching experience. The initiative is supported from Safaricom and the Vodafone Foundation, who have provided all mentees with phones, airtime and data. Mentees and mentors communicate regularly about specific problems in the classroom, more general approaches to pedagogy and planning.

Emerging results suggest that 'teachers who participated in the Teachers for Teachers programme reported better preparation, higher confidence, a stronger sense of purpose – not just as educators, but also as advocates for child protection and positive discipline – and that they were more aware of useful practices that can be used in their classrooms' (Save the Children et al, 2017: 33). The report also includes a 'personal impact story' from a trainee teacher (Save the Children et al, 2017: 21).

Between June 2016 & April 2017 137 teachers had trained through the ITP track, and 27 through the ETP track. Between September 2016 and January 2017, 15 global mentors had been recruited and 82 teachers had received mobile mentoring.

Source: All information in this box was adapted from Teachers College Columbia (2017).

Similar projects	**Skype in the Classroom** – allows both students and teachers to connect with experts around the world, and communities of teaching practice. Implemented in multiple locations, including in Kakuma refugee camp in Kenya, with some evaluative elements (UNHCR, Microsoft).

Case Study 4:

Project(s)	**TIGER (These Inspiring Girls Enjoy Reading)**
Location	Jordan (Zaatari Camp)
Implementer	UNHCR, UNHCR Innovation, Open Learning Exchange (OLE), IRD
Target group	Adolescent girls
Target outcome(s)	Multiple
Technology	Open educational resources

TIGER is supported by UNHCR and is being implemented through an award to OLE, with IRD as the implementing partner. OLE is an organisation that uses low-cost and scalable technologies that work off the internet and electric grid and that can reach every child. They seek to help students and teachers move from passive, distributive learning modes to active, student-centred learning.

The TIGER programme allows adolescent girls to access a wide range of open educational resources and courses on 8" colour tablets connected by Wi-Fi to a Raspberry Pi server. This allows them to experience self-paced learning that is aligned to school assignments. It is a 16-month program implemented in six Community Learning Centres open after school, evening and on weekends. TIGER teams use a multi-media digital library of open educational resources and a learning management system to enable them to plan, track & share their progress on their personal learning ladder.

The specific objectives of the program are: (i) to increase personal sense of agency, meaning and connection among at least 1,200 adolescent Syrian refugee girls in the Zaatari camp; (ii) organize TIGER teams of girls who, assisted by Syrian women coaches, support each other in creating and fulfilling their goals; (iii) provide these girls with the knowledge, skills and values resulting from working as teams on one or more projects that improve the living conditions of the camp; (iv) succeed in encouraging as many such girls as possible who are at risk of leaving school to stay in school and complete secondary; (v) succeed in encouraging as many such as girls as possible who are not in school to enrol in and stay in school to complete secondary; (vi) demonstrate and document the above.

No evaluative data was identified as being available at the time of writing.

Source: All information in this box was adapted from Rowe (2016)

Similar project(s)	**Connect to Learn** – Online teacher training resources via a cloud-based server for 160 Syrian teachers in the Domiz refugee camp in Iraq, with a focus on psychosocial training and working with children in conflict (Ericsson, Asiacell, IRC) (see also Dahya 2016:15)

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