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HELPDESK RESPONSE 26

Effective Teacher Education in Low-Connectivity Settings

A curated resource list

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About this document

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1. Document purpose

This list curates resources — both tools and initiatives — that can be adapted to support teacher education in low-connectivity settings, a prevailing challenge in Madagascar. Tools are defined as any specific technology that can be applied to an educational challenge (e.g. an app, a learning platform, a radio or TV programme). Initiatives are the application of a tool to a particular setting (i.e. the use of an educational app in a specific country). Teacher education denotes both initial teacher education and continuous teacher professional development (TPD). Given that adapting existing initiatives to specific contexts can often be problematic, this list has outlined resources that address specific Malagasy needs within the education sector. The resources listed have either:

- linguistic relevance (by containing francophone elements);

- educational relevance (by focusing on foundational literacy or maths);

- infrastructural relevance (by identifying resources with offline functionality).

Each example will identify the challenges a resource addresses, include the necessary prerequisites for each resource to be viable, balance the pros and cons of each resource, and include details of costs and impact assessment data where possible.

2. Background

The government of Madagascar has identified education as central to the country's overall development outcomes. In 2012, an estimated 1.4 million school-aged children did not access formal education; this was the fifth largest proportion of out-of-school children in the world. Additionally, the primary completion rate stood at 66% for the 2015–16 school year (World Bank, 2018). The country's Education Sector Plan (ESP) for 2018–2022 sets out a roadmap to improve educational outcomes in Madagascar via numerous pathways (Ministère de l'Éducation Nationale, Madagascar, 2017).

A key component of the ESP is the targeted improvement of teacher education to improve teaching practices and learning outcomes. This improvement centres on building the capabilities of the teaching workforce, almost half of whom are currently informally employed through a community-based school system. Global Partnership for Education (GPE, 2020) data shows that in 2016, for every trained teacher there were 271 primary school pupils. In 2018, just 15 per cent of primary school teachers were trained. As such, the ESP continually highlights the need to fundamentally reform teaching practice across the country (Ministère de l'Éducation Nationale, Madagascar, 2017).

Thus, this list focuses on resources that can be implemented in Madagascar to build the capacity of Malagasy teachers and ultimately enhance learning outcomes.

3. Overarching considerations on teacher education

This section outlines several overarching considerations on low-tech and offline teacher education initiatives relevant to the Malagasy context[1].

1. Technology may increase access to teacher education while decreasing programme costs. A number of examples cited in this paper have offline functionality which can widen the reach of

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[1] This section draws on the following key sources: Haßler and Moss, 2020; Haßler, 2020a, b; Haßler, Allier-Gagneur, McBurnie, & Damani, 2020

programmes to areas with low connectivity. However, we currently lack evidence on the impact of technology on the effectiveness of teacher education.

2. None of the resources listed in this document will be able to raise teaching standards on their own. Ultimately, the ways in which these resources are used within the current system will determine their impact. Evidence from Allier-Gagneur, et al. (2020) suggests that characteristics of effective teacher education programmes include:

   a. a focus on pupil learning outcomes;

   b. a focus on sharing effective teaching practices using modelling;

   c. an acknowledgement of teachers' existing knowledge, views, and experiences, and a focus on building on this existing knowledge;

   d. a focus on developing practical subject pedagogy rather than theoretical general pedagogy;

   e. empowering teachers to become reflective practitioners and structuring teacher education around practice-based cycles of trial and refinement;

   f. incorporating peer support;

   g. motivating teachers;

   h. prioritising school-based teacher education;

   i. scheduling regular, ongoing teacher education;

   j. providing supporting teaching and learning materials;

   k. ensuring support from school leaders;

   l. creating a coherent policy environment.

3. Many tech-based resources entail high initial costs. It is important to adopt a long-term view to identify a resource that best fits the Malagasy context. The following points should be considered:

   a. To what extent does using technology address the challenge of delivering teacher education? Are there other systemic issues that need to be addressed first?

   b. What technology can teachers in Madagascar already access? Can it be leveraged to increase the quality and accessibility of teacher education?

   c. What preparation do teachers require to engage with tech-based initiatives? Are teachers digitally literate? To what extent do teachers have practical knowledge of foundational pedagogical skills such as effective questioning?

   d. How will hardware and software be maintained? Is there local capacity to maintain technology? Can staff be supported to develop this capacity?

   e. How will the costs of a tech-based teacher education programme evolve over time? Can these costs be borne over several years and at scale?

4. While certain tech-based initiatives may appear free, they often entail additional costs such as digital skills training and infrastructure development. These 'hidden' costs can be prohibitive, particularly when attempting to operate at scale.

4. Resources which support teacher education

The following section discusses various teacher education interventions with linguistic, educational or infrastructural relevance to the Malagasy context.

4.1. OER4Schools: an in-service teacher education programme using open education resources (OER)

The OER4Schools programme provides an openly available, structured set of materials for school-based TPD.[2] The materials outline plans, learning objectives, and activities for 28 teacher-led workshops. The programme offers resources for teacher-facilitators to lead workshops and for teacher-participants to engage in workshops. The sessions involve collaborative planning and discussion to support reflective practice. The programme also provides video examples of interactive teaching in African schools to stimulate debate and reflection. This approach is based on established characteristics for effective and sustainable TPD (Hennessy, et al., 2016; Haßler, et al., 2018).

These resources can be used to enable teachers to improve their classroom practices to 'build back better'. When schools reopen, the programme can support a decentralised, school-based TPD model. Regularly scheduled and coherently sequenced school-based TPD programmes are more effective than one-off sessions at a centralised venue (Haßler et al. 2018; Power, et al., 2019).

The programme offers a toolkit that can be adapted to local contexts and translated into different languages. Materials have been used in Zambia, Kenya, Zimbabwe, Uganda, and South Africa. Schools will need to spend time preparing sessions and provide mini-blackboards to teachers. Materials can be used with or without additional technological components such as laptops and tablets. When accessing the materials offline one or two devices are required to project the videos. Although the programme entails no upfront cost, education providers will need to pay for the printing and distribution of materials.

A qualitative, in-depth study in Zambia found that participating teachers increasingly adapted lessons to the knowledge levels of pupils, raised teachers' expectations of pupil capability, and incorporated more interactive teaching, as well as practical and group work into their classes (Hennessy, et al., 2016). Meanwhile, the study found that the programme supported pupils to actively engage in activities to work collaboratively and develop a deeper subject knowledge (ibid.). Moreover, teacher interviews carried out 18 months after a year-long intervention in one Zambian school showed that the initiative had become self-sustaining.

Table 1. Advantages and disadvantages of OER4Schools

Advantages	Disadvantages
Materials are open and freely available for modification and translation.	Materials are not currently available in French.
Materials can support teacher education in schools in remote areas without the need for technology or expensive inputs.	Data on impact on pupils was not systematically collected.
The programme provides a structure and materials for long-term TPD focused on foundational teaching skills.	

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[2] OER4Schools (2020), available at http://oer.educ.cam.ac.uk/wiki/OER4Schools

The programme follows evidence-based principles for effective and sustainable teacher education.

An iteratively developed TPD programme with evidence of positive impact

4.2. Transforming Teacher Education and Learning: an initial teacher education programme using OER

Transforming Teacher Education and Learning (T-TEL)[3] is a national initiative, put in place by the government of Ghana to ensure that trainee teachers are equipped to deliver high-quality teaching in schools. To achieve this goal, T-TEL takes a comprehensive approach by seeking to reform: the curriculum, the management of Colleges of Education, Ghanaian educational policy, and local institutional development. It especially targets the professional development of Colleges of Education tutors, in order to ultimately enhance teaching practice. The professional development component of T-TEL was created by one of the developers of OER4Schools and the two initiatives thus follow a similar set of principles. Some TESSA materials have also been embedded into T-TEL. Like OLEGhana (discussed below), T-TEL resources have been shared via a Raspberry Pi[4] single-board computer (Mott MacDonald, 2020), an example of a community server.

T-TEL professional development resources, available as OER, were developed to support teaching in 46 of Ghana's Public Colleges of Education and improve the competency of trainee teachers. Although they were developed for Colleges of Education, the resources can also be used within schools and communities of practice by in-service teachers. The set of resources are organised into twelve pedagogical themes including questioning, group work, and assessment for learning. Within each theme, a number of teaching strategies (for example roleplay or storytelling) are introduced. Trainee teachers are invited to read an example of the use of a strategy, plan how they will use the strategy in the classroom, try out the planned activity and reflect on their experiences.

A recent study on physics tutors' perceptions of T-TEL's impact on their teaching practices found that teachers thought T-TEL had a positive impact on their teaching (Coffie, 2019). Furthermore, the study found that if lessons learned from the programme were to be implemented in the classroom, the teachers' pedagogical practices would become 'more interactive, pupil-centred and gender-responsive' (ibid.). A midline survey of the initiative had previously found that 65.9% of tutors interviewed demonstrated pupil-focused teaching methods compared to a baseline of 26.1% (T-TEL, 2017). Information about the cost of integrating the T-TEL initiative into national teacher education systems is not readily available.

Table 2. Advantages and disadvantages of the T-TEL programme

Advantages	Disadvantages
T-TEL builds on OER4Schools and TESSA which means it is able to integrate lessons learned from these initiatives.	Materials are not available in French.
Materials produced in this initiative are open and freely available for modification and translation.	Although materials can be used in schools, they were developed with the structure of the Ghanaian Colleges of Education in mind.

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[3] T-TEL (n.d.), available at https://www.t-tel.org/home

[4] Raspberry Pi (n.d.), as available at https://www.raspberrypi.org/

TESSA resources promote known 'effective features of teacher education'[5]: such as a focus on pupil learning, encouraging teachers to be reflective practitioners and sharing effective pedagogical practices.	Evaluations of the programme have focused on teachers' experiences and we lack an understanding of the impact on pupils.
The programme follows evidence-based principles for effective and sustainable teacher education.	
An iteratively developed TPD programme with robust evidence of positive impact.	

4.3. Open Learning Exchange: using a virtual learning environment and community server (OLE Ghana)

The Open Learning Exchange (OLE)[6] aims to address three challenges:

1. A lack of quality learning material.;

2. A lack of effective teachers.

3. A lack of meaningful interconnectedness between pupils, teachers, and school administrators globally.

The OLE has rolled out a number of initiatives across the world. One such initiative is OLE Ghana which uses interactive, curriculum-aligned content, which employs low-cost technology via the generic learning system Planet Learning. It particularly focuses on learners in violence-riven, disrupted, and marginalised settings. Differing programmes within OLE Ghana include TeacherMate[7] which assists teachers with handheld devices and differentiated learning systems to improve pupils' basic literacy levels; and Ghana Reads,[8] an approach to pupil literacy-building which emphasises self-paced, pupil-centred learning plans. OLE Ghana uses low-cost devices which link to an offline digital library housed on a Raspberry Pi to complete teacher-assigned learning tasks. The OLE website provides estimated costs, with a 1GB Raspberry Pi server costing $35, and tablets and keyboards costing $60, all powered by low-cost solar panels. The programme is being scaled nationwide in Ghana, aiming to serve 6,000 pupils. There is no readily available impact data regarding TeacherMate, Ghana Reads, or OLE Ghana in general.

OLE Madagascar is listed as a partner country on the OLE site, however, re-engagement is required in order to progress this programme due to initial funding constraints when the partnership was announced in August 2017.

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[5]Haßler, Allier-Gagneur, McBurnie and Damani (2020), available at
https://docs.google.com/document/d/1QH7yZvtTFYp_MYsaXw59sAw9GkhGzBWcMHUq0eQKBcA/edit

[6] Open Learning Exchange (2017), as available at https://www.ole.org/

[7] Open Learning Exchange Ghana (2017b), as available at
http://www.oleghana.org/index.php?option=com_sppagebuilder&view=page&id=20&Itemid=694

[8] Open Learning Exchange Ghana (2017a), as available at
http://www.oleghana.org/index.php?option=com_sppagebuilder&view=page&id=21&Itemid=693

Table 3. Advantages and disadvantages of the Open Learning Exchange

Advantages	Disadvantages
OLE's focus on disrupted education is particularly pertinent in the current context of COVID-19.	As with any tech-based initiative, the OLE hardware will require maintenance over time, implying additional costs.
The programme is scalable and has been adapted in 19 partner countries in varying contexts including formal schools, remote villages, and refugee camps.	Storing the hardware securely will incur additional costs.
The Planet Learning system is a repository of free, open access and public domain resources.	Constraints related to the initial roll-out of OLE Madagascar may indicate limitations around the programme's future feasibility.
The Planet Learning system is portable and can be carried in a small backpack or suitcase.	A mass roll-out of the programme and purchase of the hardware will incur significant one-off costs. Pilot projects would be needed to test, learn, and iterate before investing at scale.

4.4. Teacher Education through School-based Support: using OER to strengthen in-school professional learning

TESS-India[9] aims to strengthen pre- and in-service TPD, and in-classroom practice in India, reaching more than one million teachers and teacher educators. TESS-India focuses on inclusive, participatory child-centred pedagogy, and offers a toolkit of freely available OER in multiple local languages. The toolkit comprises 105 teacher development units, 20 school leadership units, 10 principles of practice, 55 videos of authentic classroom teaching, and a compendium offering sample teaching and learning pathways through the OER. Teacher educators are supported by a free Massive Open Online Course (MOOC) available in English and Hindi.

Users are free to use, adapt and re-use this material as long as the source is credited. The cost of conventional in-service teacher education programmes are estimated to be around £38 per teacher per year in India, with the initiative estimating costs of £3.30 per teacher, per year; this reflects a significant saving. Evidence from Wolfenden et al. (2017) suggests that the programme engaged teachers to attempt more interactive and participatory practices in both lesson planning and in-classroom teaching. Wolfenden et al's (2017) study also describes the enhanced digital literacy of teachers following engagement in the programme. A separate study by Wolfenden, Cross and Henry (2017) describes the imaginative solutions to overcome infrastructural challenges that teachers developed during the programme, such as via creating self-generated support groups. Furthermore, the TESS-India MOOC, through its localised nature, shows promising signs of building teacher capacity in low-income settings (ibid.).

Table 4. Advantages and disadvantages of the TESS-India programme

Advantages	Disadvantages
Materials produced in this initiative are open and freely available for modification and translation.	Not currently available in French.

[9] TESS-India (2020), available at: https://www.open.edu/openlearncreate/course/index.php?categoryid=45#:~:text=TESS%2DIndia%20(Teacher%20Education%20through%20School%2Dbased%20Support),and%20classroom%20practice%20in%20India.

Evidence suggests the programme has a positive impact on modifying teaching practice.	Limited offline functionality of the MOOC for teacher educators.
Estimated costs are low when compared with conventional training methods.	

4.5. Teacher Education in sub-Saharan Africa: using OER to strengthen in-school training

Teacher Education in sub-Saharan Africa (TESSA)[10] is a network of teachers and teacher educators stretching across Sub-Saharan Africa. It is linked to the TESS-India example above. It was created to improve the quality of, and access to, school-based education for teachers. At the core of the network is a bank of OER, produced in partnership with local, African educational experts. These resources are designed to help teachers and teacher educators develop an active approach to learning and to make their teaching more interactive.

The TESSA OER touch upon subjects such as numeracy, literacy, life skills, social studies, and the arts, and science. They can be integrated into the national curriculum and support both pre-service and in-service teacher education programmes. These resources can be accessed through the open educational platform OpenLearn Create[11] to allow users to track their progress and earn badges. Alternatively, they can be printed or put onto SD cards,[12] community servers and tablets.

Harley and Simiyu Barasa's independent evaluation of this programme, conducted in 2012, found that TESSA had a significant impact on the identities and practices of teacher educators and a profound impact on those of trainee teachers. It was stated that the programme "has fused theory and practice; shifted perceptions from teacher as a 'know it all' to 'teacher as facilitator of learning'; and greatly enhanced the relevance of pupils' learning experiences" (ibid.). The success of the programme was reported to be hinged on the provision of tools and resources which promote activity-based learning and the focus on practical skills as opposed to abstract theories.

Information about the cost of integrating the TESSA approach into national teacher education systems is not readily available. Costs will vary with the method chosen to enable teachers to access the resources.

Table 5. Advantages and disadvantages of the TESSA programme

Advantages	Disadvantages
Coordinated by the Open University,[13] a well-recognised UK-based university which has been committed to international development for the past 20 years and has reached over 2 million individuals.	In cases where a lack of pre-existing ICT infrastructure has meant that TESSA resources have had to be printed, access to the materials is made more difficult and expensive.
Generic TPD materials intended to be easily adapted to local contexts are available in French.	Evaluations of the programmes have focused on teachers' experiences and we lack an understanding of the impact on pupils.

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[10] TESSA (2020), available at http://www.tessafrica.net/about-us
[11] The Open University (2017), available at https://www.open.edu/openlearncreate/
[12] Secure digital (SD) cards are a type of memory storing card widely used in portable devices
[13] The Open University (2020), available at http://www.open.ac.uk/about/international-development/projects-and-programmes/tessa-teacher-education-sub-saharan-africa

TESSA resources promote known 'effective features of teacher education'[14]: such as school-based education, a focus on pupil learning, encouraging teachers to be reflective practitioners. General pedagogy is taught in the context of curriculum subjects.	TESSA resources can complement and strengthen existing teacher education programmes but they are not a substitute. We know that solely providing teachers with resources and expecting them to study on their own does not work (McAleavy et al., 2018).

4.6. Rising on Air: enhancing TPD through interactive radio instruction

Rising Academies operates a network of 160 schools in Liberia and Sierra Leone. Since the onset of the current pandemic, Rising Academies has developed the 'Rising on Air'[15] interactive radio instruction (IRI) programme. A key component of this initiative focuses on TPD. The Rising on Air web portal offers freely available French and English language scripts for interactive radio-based TPD. These scripts focus on core pedagogical skills such as questioning and giving feedback. International partners can download, adapt and deliver this content to teachers in their own countries.

Outside of scripts, radio-based educational programmes require a number of additional inputs. Firstly, teachers will need to have access to radios and radio coverage. Although governments can work with community radio stations to expand coverage, negotiations often demand substantial time. Alternatively, governments could distribute audio content on MP3 players or via SMS. Meanwhile, education providers will need access to recording studios and trained radio presenters to adapt Rising on Air TPD scripts. If educators want to present content in Malagasy, they will need to hire translators.

Contrary to regular radio-based TPD programmes, IRI broadcasts ensure participating teachers engage in activities such as critical reflection on their past experiences. IRI initiatives require supporting print materials such as programme plans, worksheets and reading content. Education providers could use open access print-based resources from a programme such as OER4Schools discussed above. IRI broadcasts could scaffold and stimulate engagement with these materials as well as the broader teacher education programme.

There is no readily available impact data specific to the Rising on Air programme; however, third-party evaluations have been carried out analysing Rising Academies' work in Liberia and Sierra Leone. In Liberia, Skidmore (2019) found that pupils from Rising's schools progressed twice as quickly as those from comparable government schools with regard to learning outcomes. Additionally, the programme had a positive impact on pupil enrolment and retention (ibid.). In Sierra Leone, Johnson, and Hsieh (2019) found that pupils from the Rising Academies' programme performed better in both reading and maths in relation to pupils from comparable schools over a three year period.

The cost of recording and broadcasting radio programmes varies across countries. In Zambia, Rising Academies' partners have paid regional radio stations approximately US$35 for a 30-minute broadcasting slot. In Sierra Leone, radio stations have charged Rising Academies between US$30 and $US60 to air a 1-hour broadcast. Meanwhile, Rising Academies have paid US$30 to record a single broadcast in a private studio.

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[14]Haßler, Allier-Gagneur, McBurnie and Damani (2020), available at https://docs.google.com/document/d/1QH7yZvtTFYp_MYsaXw59sAw9GkhGzBWcMHUq0eQKBcA/edit
[15] Rising Academies (2020), available at https://www.risingacademies.com/onair.

Table 6. Advantages and disadvantages of the Rising on Air TPD programme

Advantages	Disadvantages
Scripts are available in French.	The scripts neither form part of a national programme nor align with planned curriculum reforms in Madagascar.
Adapting freely available scripts reduces the time and cost of resource development.	The impact of radio-based TPD remains unclear, especially for home-based teachers.
The Rising on Air programme has already been adapted to a number of different country contexts.	The progress of teachers is difficult to monitor although this can be done using supplementary text messages and phone calls.
The programme is designed to provide offline, remote TPD opportunities while schools are shut.	Negotiating with radio stations can prove time-consuming.
	Content currently focuses on generic pedagogical skills rather than subject-specific pedagogical knowledge.
	45% of the Malagasy population own a radio (Multiple Indicator Cluster Surveys, 2018). But of this percentage, only 1% of learners use them (instat: Madagascar, 2020)

4.7. Early Grade Reading Study II: virtual coaching

While this example does not relate to a Francophone country, it exhibits the potential of using virtual coaching to improve foundational literacy skills.[16]

Under the Early Grade Reading Study II (EGRS II) programme[17] in South Africa, expert reading coaches used telephone calls and text messages to coach teachers remotely. Virtual coaches worked with individual teachers to improve instructional practice in English. Participating teachers also received a tablet with preloaded daily lesson plans. The initiative aimed to raise the foundational literacy skills of children in grades 1 and 2.

Outside of technological hardware, the programme depended on the availability of a sufficient number of expert coaches. The remote coaching format reduced this demand as virtual coaches could complete the same volume of work as three in-person coaches (Kotze, et al., 2019). Meanwhile, teachers received training to build their digital literacy skills to effectively use tablets.

After one year, a randomised control trial found that this virtual coaching programme proved as effective as in-person coaching at improving instructional practice and pupil learning outcomes in literacy (Kotze, et al., 2019). The annual per-pupil cost of virtual coaching was US$43. This cost covered mobile phone credit, tablets, and additional digital skills training. Meanwhile, the annual per-pupil cost of in-person coaching was US$48. This cost covered the salaries of the additional in-person coaches required to physically visit schools.

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[16] For more information and resources on coaching see Results for Development (2020), available at
https://r4d.org/thecoachingapproach/
[17] USAID (2019), available at
https://www.edu-links.org/about/education-programs/early-grade-reading-study-ii-egrs-ii

Table 7. Advantages and disadvantages of the EGRS II virtual coaching model

Advantages	Disadvantages
Virtual coaching reduces the need for a large number of expert coaches.	Relatively high annual per-pupil cost.
This model builds on existing plans to provide teachers and principals with phones, SIM cards, and tablets.	Requires procurement of tablets, and existence of, or capability to develop, curriculum-aligned lesson plans.
Virtual coaching avoids the logistical challenge of physically reaching teachers in remote areas.	Storing tablets securely will incur additional costs.

4.8. Kolibri, RACHEL and the EDBox: using community servers for content distribution

The Remote Community Hotspot for Education and Learning (RACHEL), produced by World Possible[18], the EDBox, sold by ED4Free[19] and Kolibri, developed by Learning Equality[20] are examples of community servers. The EDBox and RACHEL are pieces of hardware. However, Kolibri is an app which gives access to an educational platform that can be set up on a range of hardware including Windows, macOS, and Linux (including Raspberry Pi) computers. A version for Android tablets is being developed.

Community servers provide a solution to digitally distribute teacher education content to those without an internet connection. After connecting to the internet, the servers store websites and open-source content and make them available over a local wireless connection[21]. This enables individuals with devices that have the ability to connect to wifi, but cannot due to a lack of local internet availability, to connect to the community servers and access websites such as Wikipedia, Moodle or Khan Academy.

Such devices have been used for teacher education purposes. L'IFADEM (Initiative Francophone pour la Formation à Distance des Maîtres), for example, equipped digital spaces in Burkina Faso, Mali, Chad, and Comoros island with the EDBox (IFADEM, 2015). This allowed the organisation to disseminate its teacher education resources without having to print them or rely on access to the internet. The Kolibri Content Library[22] contains materials from TESSA and TESS-India. OLE Ghana likewise used a Raspberry Pi to store its Basic Education e-Learning Libraries (Open Learning Exchange, n.d.).

The potential community servers can have on teacher education has not been evaluated. However, previous evaluations suggest that community servers can help individuals learn. A quasi-experimental evaluation was carried out on a pilot programme which used RACHEL in Guatemala. It found that allowing pupils to access educational content via technology led to higher learning outcomes than interventions that gave pupils access to technology without educational content (MANUS Consulting, 2019).

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[18] World Possible (n.d.b), available at https://worldpossible.org/rachel
[19] ED4Free (n.d.), available in French at http://ed4free.ovh/index.php/produits/
[20] Learning Equality (2020a), available at https://learningequality.org/kolibri/
[21] RACHEL also uses the Raspberry Pi hardware mentioned in the OLE example
[22] Learning equality (2020b), available at https://catalog.learningequality.org/#/public?keywords=teacher&page=1&query_id=7auctc

Table 8. Cost comparison of community servers

	One-off cost	Cost per simultaneous user
EDBox	US$168	US$6.72–25 users
RACHEL	US$169 US$749	US$16.9–10 users US$14.98–50 users
Kolibri	Free to download and can be installed on Raspberry Pi — a Pi Zero starter kit costs USD$25	USD$0,83–30 users

Table 9. Advantages and disadvantages of community servers

Advantages	Disadvantages
The EDBox was developed by a Francophone NGO and has modules available on the OER repository OER2Go[23] in French, English, and Spanish. Kolibri is working with the EdTech Hub to develop content in French.	Providing community servers to teachers does not guarantee that the content they contain will be used.
Community servers remove the need to print OER resources to distribute them to areas without access to the internet.	The usefulness of this hardware is only as high as the quality of the resources it contains. OER resources uploaded onto the servers would need to be adapted to the local context.
Specifically designed for education in remote locations.	Teachers would need to be trained on how to use community servers.
	Although they remove the need for internet connectivity, teachers would need to have access to internet-enabled devices in order to access the content of community servers.
	Initial high cost of devices for EDBox and RACHEL. Hardware will require electricity and will need maintenance.
	Lack of information about the potential of community servers for teacher education.

4.9. Abracadabra: a pupil-focused virtual learning environment with teacher training elements

There are many pupil-focused programmes which do not have any TPD components at all. However, some initiatives ensure inclusion of TPD programmes to enhance overall pedagogy. One such programme is Abracadabra.

Abracadabra (ABRA) is a toolkit composed of phonics, fluency, and comprehension activities based around a series of age-appropriate texts. ABRA offers both online and offline versions of its content which targets early-literacy learners. Abracadabra Lite is designed to build foundational literacy skills. ABRA also provides learners with access to the Repository of Ebooks And Digital Stories (READS), an

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[23] World possible (n.d.a), available at https://worldpossible.org/oer2go

organised catalogue of hundreds of multinational digital stories. ABRA has produced content in both English and French which is free and open source. Prerequisites to access the content include an internet-enabled device and access to power and connectivity. During roll-outs in schools, a focus has been placed on enhancing the pedagogical capacity of the teaching workforce so that teachers and teaching assistants can facilitate pupil learning on ABRA more effectively (Coventry University, 2019).

A trial has been conducted to test the efficacy of ABRA's toolkit. The efficacy trial[24] comprised online and offline interventions and found that the toolkit had a positive effect — equivalent to two to three months of additional progress — on learning. The toolkit had a particularly positive impact on pupils from low-income families. The findings demonstrate that the technology is most effective when used to facilitate new approaches to teaching and learning (Coventry University, 2019). A follow-up effectiveness trial[25] is also in progress with results due in 2020 centred on whether ABRA's toolkit can work at scale. The average cost per pupil per year over three years is £8.52 for the ICT intervention and £8.49 for the non-ICT intervention. This cost includes training teaching assistants, cover during training, and travel costs. All of the costs are frontloaded into the first year of the programmes (which cost £25.56 and £25.47 per pupil respectively). The programme is free to deliver in subsequent years.

Table 10. Advantages and disadvantages of ABRA

Advantages	Disadvantages
An evidence-based programme where trials conducted show ABRA to benefit learning.	There are initial costs in training teaching assistants to use the software.
The content is readily available in French.	The trials of ABRA's toolkit have been conducted in a high-income context, which potentially limits its relevance to low- and middle-income countries. However, the greater benefits to low-income families within this context may hold some value.
The programme focuses on building pedagogical capacity to engage with the toolkit.	Limited access to internet-enabled devices and overall connectivity may limit the use of the toolkit.

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[24] Education Endowment Foundation (2019), as available at https://educationendowmentfoundation.org.uk/pdf/generate/?u=https://educationendowmentfoundation.org.uk/pdf/project/?id=187&t=EEF%20Projects&e=187&s=

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5. Summary of resources

Table 11. Summary of resources

Resource	Description	Linguistic relevance	Curriculum relevance	Infrastructural relevance
OER4Schools	Openly available materials for 28 teacher-led workshops covering key teaching strategies such as interactive teaching, questioning, whole-class dialogue, group work, inquiry-based learning, and assessment for learning.	n/a	n/a	Free open-source materials which will need to be printed for offline functionality.
T-TEL	Initiative in Ghanaian Colleges of Education aimed at increasing the quality of teacher education using OER materials.	n/a	Content can be aligned to the Malagasy curriculum and teacher education system.	Free open-source materials which will need to be either printed for offline functionality or distributed through technology.
OLE	Interactive, curriculum-aligned content which employs low-cost technology via the generic learning system.	Funding constraints prevented roll-out in Madagascar, some content may be usable though.	Content can be aligned to curriculum.	Free open-source materials which will need to be either printed for offline functionality or distributed through technology.
TESS-India	Network of teachers and teacher educators which has produced OER resources for teacher education.	n/a	n/a	Free open-source materials which will need to be either printed for offline functionality or distributed through technology.
TESSA	Network of teachers and teacher educators which has produced OER resources for teacher education.	Materials available in French.	Teacher education materials on literacy and numeracy available.	Free open-source materials which will need to be either printed for offline functionality or distributed through technology.
Rising on Air	Freely available French language scripts for radio-based TPD.	Materials available in French.	n/a	The programme is designed to deliver TPD in remote areas without internet access.
EGRS II	A phone- and tablet-based virtual coaching initiative.	This model could be feasibly	The initiative improved	The initiative did not rely on internet connectivity

		offered in French or Malagasy.	foundational literacy skills.	although it did require teachers to have feature phones and tablets.
RACHEL, EdBox and Kolibri	Technologies which store websites and open-source content and make them available over a local wireless connection.	ED4Free, provider of the EDBox is a francophone NGO. Kolibri's content is also developed in French.	n/a	Hardware designed for remote locations without internet connectivity.
ABRA	A virtual learning environment with training programmes designed to enhance pedagogy alongside the content itself.	Materials available in English and French.	n/a	Online and offline content available but connectivity required for enhanced access.

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