

## e-Literacy Training in Deep Rural Areas: The Siyakhula Living Lab Experience

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### Abstract

Within the discourse of broadband deployment in poor areas (particularly rural), very little attention is generally put on the critical enabler represented by e-literacy training that empowers people to use ICT systems, especially in the form of full-fledged machines such as fixed, tower and laptop computers (These machines are still more preferable for growing a generation of ‘producers’ as opposed to ‘consumers’ in the ICT space.) This paper reports on the experience in running e-literacy in a deep rural area, as part of the Siyakhula Living Lab (SLL), whose end goal is to diffuse production oriented ICTs in poor areas of South Africa and Africa. In particular it will expand on the feedback given by the participants to the last edition of the e-literacy course, run in the first semester of 2014. The lessons learned from this experience include: the need for linguistic localization of the learning material or at least part of its presentation; the importance of teaching and learning that facilitates (easy) transfer of knowledge gained to other ICT settings (such as mobiles; or uses to support business); and the importance of face-to-face courses to allow real interaction with the people living in the targeted areas, partly as a strategic means to forging relations towards the realization of the Living Lab vision (co-creation of solutions with empowered users). Altogether, e-literacy courses have proved to be critical to the broad aim of SLL of ‘activating’ the segment of society living in poor areas towards self-determination. A small but telling indicator is the transformation in the view people have of themselves once certified as e-literate.

**Keywords:** e-Skills, e-Literacy, Education, Siyakhula Living Lab, Mobile, Rural

### Introduction

In today's world, we have come to accept that digital or e-literacy is as important as other forms of literacies. That is, unlike years gone by, we recognize that “to be a full citizen, several literacies have to be mastered: basic literacy, media, technological and informational”

(Peña-López, 2009).

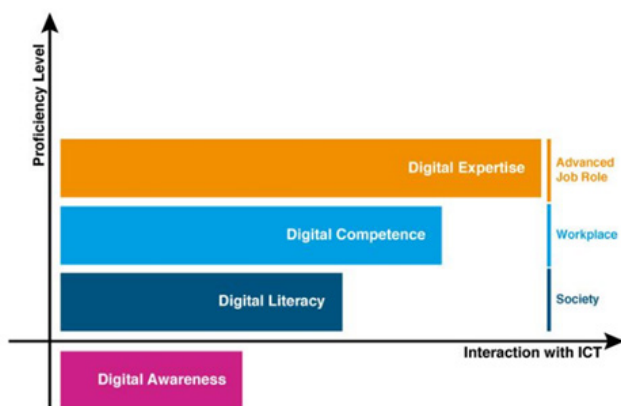
Without these multiple literacies, efforts aimed at (re)activating marginalized segments of society towards self-determination and development would fail. The Siyakhula Living Lab (SLL) - a long term Information and Communication Technologies for Development (ICT4D) project - works in fulfilment of

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realizing this very goal in the poor areas of the Eastern Cape in South Africa (Siyakhula Living Lab, n.d; Terzoli, 2010). This being the case, SLL foregrounds the importance of combating illiteracy of all kinds, as part of its strategy to minimize failure and because, at a fundamental level, the operations of SLL are rooted in the belief that ‘education is the cornerstone of development’ since whether formal or informal, education engenders the criticality that is essential for successful co-innovation and co-creation of appropriate solutions.

In this paper, we share our multi-year experience in running e-literacy trainings within SLL in an effort to contribute towards the computer literacy shortage problem in South Africa. Part of this initiative is to ensure that community members have the necessary e-literacy skills which may be defined as “the capabilities needed to be socially appropriate ICT for local development” and for participating in the Knowledge Economy (Mitrovic, 2012). We believe that success towards having communities that are digitally proficient lies, in part, in using traditional pedagogic methods that put emphasis on incremental learning and linkages of knowledge in the absolute sense of fostering the ability to solve problems and innovate using ICTs.



**Figure 1: Levels of Digital Proficiency (ECDL Foundation, 2011)**

Our belief is rooted in our general experience as teachers but also on a conceptual understanding akin to the one depicted in Figure 1 by the European Computer Driving Licence Foundation (ECDL, 2011) and further articulated by the Ikamva National e-Skills Institute of South Africa (iNeSI) (iNeSI, n.d.; Mitrovic, 2012). In essence, to get individuals and/or communities proficient, we first cultivate ‘digital awareness’, and in a slow, methodical manner we journey into developing ICT skills and knowledge that hopefully would

lead to competency—or, as summarized in the figure, we employ a training strategy that starts with awareness and in time, as interaction increases leads to increasing proficiency in the use of ICTs.

The journey to getting, in particular, poor communities in rural areas competent in the digital space is a formidable task. It is a complex affair for a number of reasons that stem, on the one hand, from the geographic location, which complicates, for example, logistics in organizing trainings. On the other hand, the reasons relate to having to operate in a context fraught with markers for exclusion in our society: poverty, unemployment, poor education together with other forms of inequality in South Africa’s dual economy.

We are aware of many initiatives that have e-literacy aspects in South Africa (such as the Digital Doorway (Gush, 2010), the large experiment in Cofimvaba (Ford, 2014) and above all the work by the iNeSI). This paper, however, will concentrate on our direct experience within the Siyakhula Living Lab, using the most recent evaluation of the literacy training by SLL community. The purpose is to contribute, practically, to the South African ICT policy recommendations through addressing the question of what can be done towards resolving the ICT skills shortage in South Africa based on the technology currently available.

The rest of the paper is structured as follows. The next section introduces the SLL. The third section is an overview of the e-literacy training run in the SLL since 2006. The fourth section reports

on the results of a survey administered to the participants of the 2014 (first semester) edition of the course. The fifth section discusses the lessons learnt and the final section concludes.

## Siyakhula Living Lab

The SLL is part of a larger ICT ecosystem for marginalized communities, and was initiated at the end of 2005 by the Telkom Centres of Excellence in Telecommunications at the University of Fort Hare and Rhodes University. Its main field site is in a deep rural part of the Eastern Cape Province, in the vicinity of the Dwesa Nature Reserve. Its location is illustrated in Figure 2a.



Figure 2a: Location of the Siyakhula Living Lab main site in Dwesa

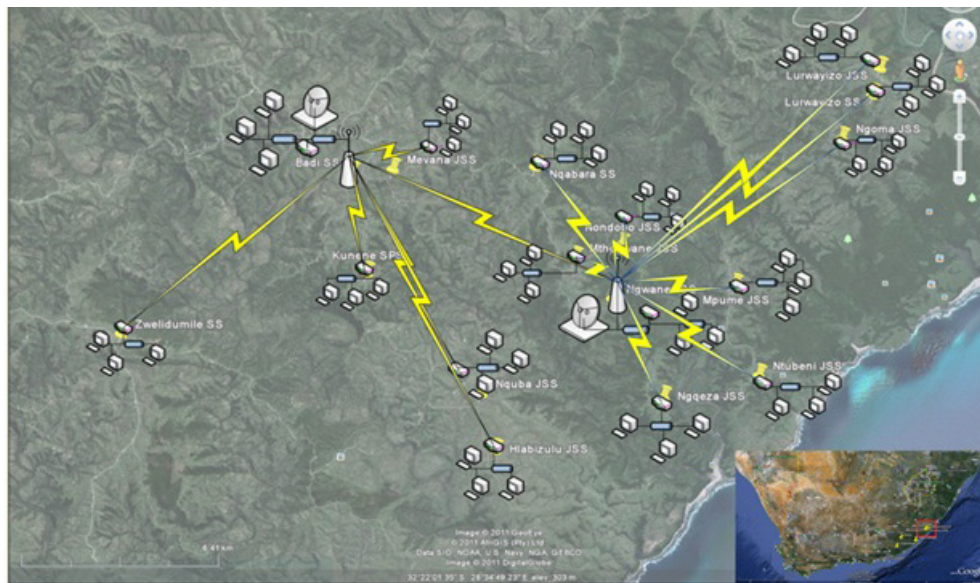


Figure 2b: The Siyakhula Living Lab Network (Siyakhula Living Lab, n.d.)

The SLL promotes the diffusion of ICTs in poor areas (rural as well as peri-urban). In its main site, a IP network, realized with wireless and wired technologies, currently connects seventeen access points (Digital Access Nodes, DANs) based at schools, forming what we call a ‘broadband island’. The broadband island is in turn connected to the Internet via two satellite links, with a download speed of 512kbps and 1Mbps (Dalvit, 2011). A geographical view of the network is shown in Figure 2b, where the inter-DAN links, in yellow, are realized through WiMAX technology which theoretically has an average bandwidth of 70 Mbps (Chilgiredy, 2014)

Within each DAN, a computer laboratory with a variable number of user terminals is present, normally in a thin-client configuration. The operating system of choice is Edubuntu (of the Linux family) and productivity and educational software suites are all of a Free and Open Source Software (FOSS) nature. The network and the DANs are setup and maintained by researchers from Fort Hare and Rhodes, with the support of their industry partners and community champions (Gumbo, Terzoli, & Thinyane, 2013).

Very importantly, each Digital Access Nodes (DANs) is open to the members of the community surrounding the school.

Providing computing infrastructure and Internet alone, as important as it is, is just the start. Besides training which forms one of SLL's main activities, and will be expanded on in the next sections, there is the need to address the potential of deployed ICTs through the development of appropriate e-services, for example to facilitate government transactions (Fassil, 2009; Gumbo, Terzoli, & Thinyane, 2013). Also, it is crucial to find ways to sustain the infrastructure, which has a cost that is beyond the resources directly available in deep rural communities. The two needs have stimulated much research activity within the SLL, which is made concrete by an artefact currently in the making, TeleWeaver (Reed House Systems, n.d.).

TeleWeaver is an e-service integration platform, coupled with a billing engine. Services can range from e-commerce support to sell local products and services (from beading to micro-tourism); to support for preparing a Curriculum Vitae in response to a job advertisement, possibly found through another service in TeleWeaver - the Career service; to support of interaction with governmental entities at various level (ID requests and tracking or child grants from the Department of Home Affairs, for example); to support for surveys in the community; to support for pre-paid services. (The applications listed are just a small subset: the idea is to have tens and then hundreds of services over time) (Terzoli, 2013).

Each application running in TeleWeaver will in general be a source of revenue, either from the local users (for example, preparation of a CV) or, more importantly at first, from an entity outside the community (for example a buyer of online goods and services from the community; or a department such as Department of Home Affairs, which might want to pay to reduce the presence of physical offices for the operations made possible by TeleWeaver). The revenue per single application will not be large: but the sum of the revenues has the potential to be substantial. This, by the way, is the reason for the name, TeleWeaver: revenue streams are 'woven' together until they become important and are able to support the ICT infrastructure, exactly as reeds are woven together to make artefacts much stronger than any single reed (Terzoli, 2013).

SLL relies on user involvement for the building of systematic use cases and requirements analysis, in a full user centered approach and towards co-creation of solutions (Gumbo, Terzoli, & Thinyane, 2013). As part of the user-centred approach to facilitate the use of the DANs, internet, developed e-services and basic community e-literacy has been conducted by the university researchers (and later community champions) since 2006. While the details of logistics and content involved have evolved over time, they have remained relatively constant since 2012. The next section describes in general the e-literacy training as conducted over the years, and the following sections give the course overview and feedback of trainees in the first edition of the 2014 e-literacy training, as supported by the iKamva National Skills Institute (iNeSI), Eastern Cape CoLab and Makana Apps Factory (MAF), from February 2014.

## **E-Literacy Training**

SLL offers a free, attendance and competence certified, e-literacy course, delivered by the university researchers to the SLL community, to properly activate and enhance the use of the SLL ICT infrastructure and broadband, and also, to facilitate ICT user driven innovation. This course is

hosted at two of the largest DANs, in order to accommodate all seventeen schools over two weeks per month.

## Content

The content for the SLL e-literacy training course enables basic exposure and a foundation to computer technology and FOSS, as illustrated in Figure 3. This course is packaged and printed as four modules, briefly described in Table 1. The course includes games and an adaptation of five of the seven Core Modules in the International Computer Drivers Licence (ICDL) certified course (International Computer Drivers License, n.d.). The trainees are also encouraged to practice over a wide range of devices, beyond those located in the DANs, in order to activate other competencies, such as advance use of mobile phones (Gumbo, & Terzoli, 2013).



Figure 3: An EduBuntu computer game which forms part of the Introduction to Computers

Table 1: SLL e-literacy training modules

Module Name	Description
<b>Introduction to Computers and Managing Files</b>	Computer navigation and familiarization of desktop computers and EduBuntu. Creating folders and saving files.
<b>Word Processing using Open Office Writer</b>	Main operations and formatting options in a Word Processor, using Writer as the example.
<b>Spreadsheet using Open Office Calc</b>	Main operations and formatting options in a spreadsheet, using Calc as an example.
<b>Using the Internet</b>	Introduction to the internet; navigation through different web pages, using the Google search page as a starting point; opening an email account (normally the first one) and using it.

In addition to the e-literacy course outlined above, an opportunity for SLL educators to enroll in more formal programme called Advanced Certificate in Education (ACE) in ICT came about through the collaboration of the Department of Education, Rhodes University and the SLL in 2009. Pre-ACE was held at Ngwane JSS, one of the seventeen SLL schools, and consisted of twenty educators from various schools, within and beyond the network. In this way, the SLL presented the educators with an evolution to the traditional schooling system, through an innovative education and learning strategy that saw educators trained in their local environment for the first time as opposed to universities (Dalvit, 2011).



## **Structure**

Since 2012, the SLL has used two DANs for e-literacy training. At the beginning of 2014, there was a plan to use three DANs. However, due to the rationalisation of all schools in the former Transkei region, the third school had to start extensively using the DAN as a classroom. On the other hand, one of our five seater DANs was upgraded to a twenty-four seater in August 2014. It will be used as an additional e-literacy training centre in the second semester of 2014.

Each day's training session consists of teaching and a practical demonstration by the researchers and an exercise session for the trainees, over three hours. In total, approximately sixty hours of contact time is required to complete the course. During the course trainees have to demonstrate their skills of basic web-based browsing, text entry and text formatting skills, through emailing completed exercises to the main author for assessment and feedback. As a result, the certification is not only based on attendance, but also the submission of completed exercises to validate operative capacity of trainees.

e-Literacy course planning is done through workshops with representatives affiliated to the seventeen schools (principal, educators and community member per each school). Through these workshops, we determine what the communities see as their ICT requirements and also researchers and community members discuss potential literacy training logistics issues. For example, unforeseen incidents such as flooding rivers, technology failures, problems with transport from the community and the university side are discussed, so that everybody will try to minimize them. Ad hoc adjustments of the drafted schedule can still be necessary over the duration of the e-literacy training course. These adjustments are typically communicated via smses and, where possible, instant messengers like WhatsApp. These discussions form the basis of the evaluation given by literacy training attendees in later sections. A smaller SLL community committee, the 'executive committee', follows up with specific schools / communities if it appears that there is a decrease in course attendance.

## **Trainees**

At the moment the e-literacy courses are open to four members of each of the seventeen DANs at a time. We accommodate community members (often unemployed, youth, elderly, economically challenged individuals) and educators from schools within the network, to distribute the training geographically and socially. There is a need to control the number bias towards educator's enrollment by insisting that community members be included to reduce the divide which might result from the employed educators who have access to ICT resources improving their skills, while the community at large falls behind. The main incentive for course attendance is based on the fact that basic office applications and internet use is a new experience for individuals from the SLL communities and beyond.

## **Trainers**

To conduct e-literacy training, researchers from the two universities are required to become familiar with the Eastern Cape rural context, through studying and residing, at least for short periods, in the rural environment (a week at a time). Trips depart on Sunday, for the researchers to be on site from Monday to Friday while keeping in constant contact with the project lead, and through her, whoever else has the expertise with the solution of a specific problem in the field. The literacy training sessions require about six trainers, so that there is adequate presence (which ideally includes a proficient Xhosa trainer) at the two training DANs.

Beyond conducting e-literacy training, it is useful for the researchers to be able to troubleshoot ICT problems encountered on site, though at times specific 'technical' trips are necessary. Figure 4 illustrates a SLL trip dedicated to networking.



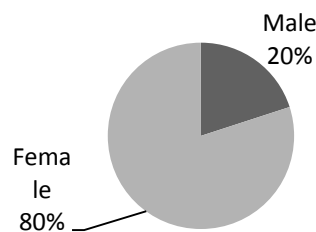
**Figure 4: Authors troubleshooting some of the computer problems**

The e-literacy training interactions are relevant to the researchers for their specific research task (often in the form of a thesis). They use the opportunity of the e-literacy course to build relations, conducting requirements and needs assessments, and use-cases using interviews, questionnaires and focus group discussions (Siyakhula Living Lab, n.d). These week-long e-literacy session then become crucial to build a real interaction between researchers and SLL communities through involving researchers, schools and communities in one well focused, purposeful interactive activity.

## 2014 e-Literacy Training Feedback

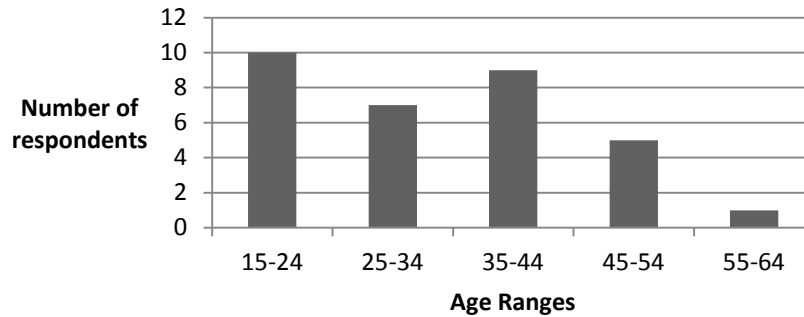
The following sections are based on the impact of ICT e-literacy on human resource development in the SLL communities, based on the opinions of individuals who attended the training sessions, and completed the course successfully. The results presented in this section are based on feedback from the 2014 e-literacy course trainees (first semester), a mix of educators and community members. The questions used to provide this feedback also serve as a response to the questions which were raised in the SLL planning workshops prior to the literacy training sessions.

The gender distribution of the trainees who completed the training is shown in Figure 5. Of the 35 trainees, 7 were male, 28 were female. Initially 40 people were enrolled in the course. The community champions, who assist with the nomination of trainees have an even gender distribution, but the results show that the majority of people who attend the session in 2014 were female. These numbers accurately depicts the average gender distribution and activity in SLL over the years, since inception.



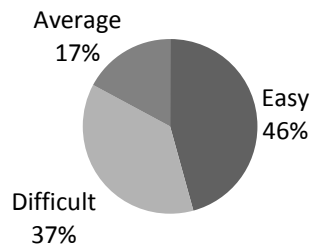
**Figure 5: Gender distribution of respondents**

We captured the age distribution of the trainees who attended the training sessions as shown in Figure 6. These ranged from 18 years to almost 60 years. This illustrates how ICT is perceived as relevant in all age even in a rural context, although the highest attendance is represented by the youth.



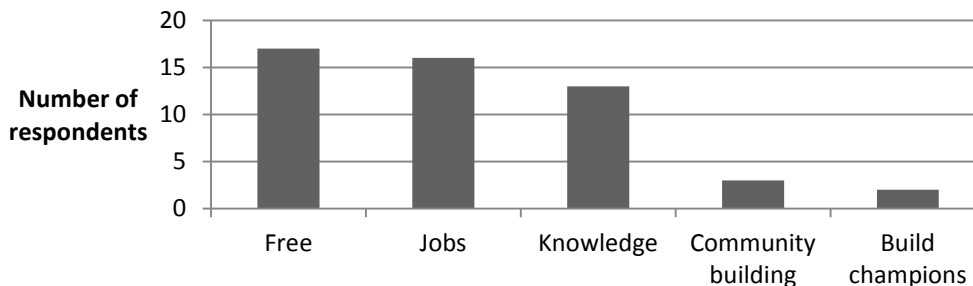
**Figure 6: Age distribution of trainees**

There was a mixed reaction to the question ‘Do you think ICT training is easy or difficult?’, as shown in Figure 7. While the majority of respondents responded that it was easy, a sizeable number responded that it was difficult. While the option of ‘average’ was intentionally not offered, some of the respondents decided to add it, as shown in Figure 7. So it would appear that the course is tuned acceptably to the capacity of the audience.



**Figure 7: Level of difficulty in e-literacy training**

Figure 8 illustrates what the trainees understood as the advantages of attending e-literacy training sessions, towards the end of their course. The question was open, with strong clustering of the answers. The responses show an appreciation towards free ICT, targeted to the improvement of rural life. Possibility of finding a job (or a better job) is a close second, while the reward of knowing more is in a good third position. Interesting are the answers that see the exercise as a good for community building, though only about 10% of the respondents offered that as an advantage.

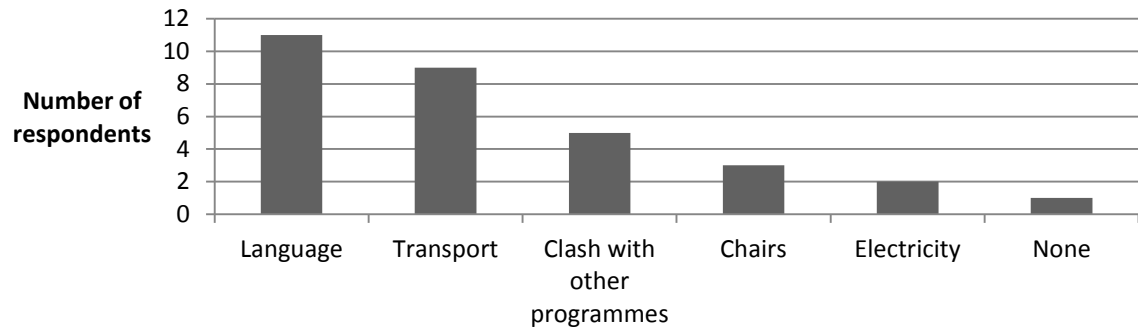


**Figure 8: Advantages of undergoing e-literacy training**

The e-literacy sessions were not without problems, as shown in Figure 9. A large number of trainees highlighted how they would prefer these modules to be conducted in Xhosa, which is the predominant language in the Eastern Cape province. The second challenge was the travel by the community members to reach the venues for the training. (Although the travel is a challenge for the researchers as well, Dwesa being about 280km from FH (institution 1), and 330km from RU

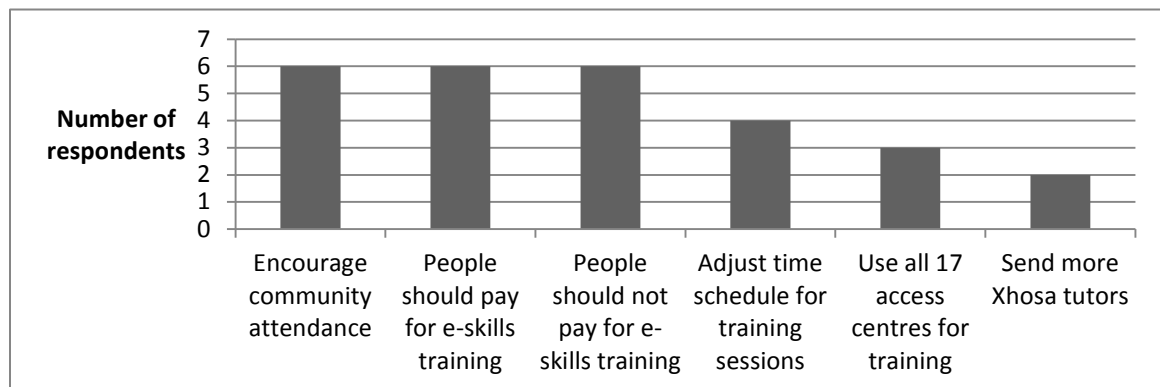


(institution 2), we are here focusing on the local travel by trainees.) Indeed, some of the trainees had to travel up to about 40km on rather bad gravel roads. The answer regarding chairs might be surprising, and of course is not widespread: chairs are indeed a problem in rural schools unless appropriate ‘innovations’ are brought it.



**Figure 9: Problems encountered during e-literacy training**

At the end of the survey there was a request for suggestion to improve the course. The responses are illustrated in Figure 10. An interesting point to note is the balances ‘debate’ between free vs paid e-literacy courses. Another is the awareness of the nature of the ICT intervention, which targets the entire community, even if it is located in schools, and the suggestion to push that side further.



**Figure 10: Suggestions for e-literacy training**

## Discussion

The study reported in the previous section was run at the end of a 4-module e-literacy course in the Dwesa site of the SLL, which concluded at the end of the first semester of 2014. This section will use it as a springboard for a discussion on e-literacy courses in the Siyakhula Living Lab in general, integrating the experience gained from previous years. For this privileged vintage position to matter, however, we must be in “true solidarity” with the communities, as expressed by Freire (2000) in his classic text, ‘Pedagogy of the Oppressed’, which might assist in articulating experience gained and validating responses.

The gender distribution witnessed in the 2014 (first semester) edition is fairly typical of previous years. Contributing to this are two obvious facts: a portion of the course participants are educators, a profession in which female presence is prevalent, at least for this particular community (based on the course attendees information in our possession); and it is easier to have women in the community that are unemployed and so can attend the course. To this, however, one should add the fact that the stereotype very common in western settings, which associated mostly men to

technology and so computers, does not seem to be as common in the community in which we are operating. We as SLL endeavor to maintain a strong female presence in e-skills courses (and not just at literacy level).

The responses on the advantages of attending the e-literacy course reflect widespread perceptions in the area as well as the core problem, which is unemployment. So, besides highlighting the fact that it is free (which is per se an advantage, both of short duration), the focus is on the increases chances for a job. We have on record individuals from Dwesa that have started money making activities on the strength of being e-literate (and have access to the Internet through the DANs), but the phenomenon is still in its infancy. The fact is, however, that people sees, correctly, any improvement of their knowledge base, especially in connection with ‘modernity’, as a step that moves them closer to a job. The request of some form of certification at the end of the course is a reflection of this.

Seeing community building as an advantage of the e-literacy course has to do with at least two aspects of the SLL activity. First of all, the learning is communal and in a communal setting: different from the way learning of ICT is often (incorrectly) represented. Communal learning is not just more cost effective, but it is generally better when very new paradigms and ideas are proposed, as it is the case of ICT in a deep rural setting. An interesting side-effect in the context of easing the introduction of new paradigms, was noted when SLL realized that people that had Internet enabled cellular phones started using them for Internet access after the e-literacy courses and not before (Gumbo, & Terzoli, 2013). Secondly, there is community building in the fact that our operations, and especially the e-literacy courses, open the schools to the communities around them, reinforcing the link that should exist (but often does not) between schools and the embedding society.

Most teaching is predicated on a language, and e-literacy is no exception in the SLL setting. Indigenous languages are critical in the interaction during the introduction to ICTs, although electronic resources such as computers, tablets or cellphones often require, currently at least, the use of basic English. (This is due to the slow speed at which localization is taking up in South Africa, in part exactly due to the lack of e-skills.) The practice shows us that Xhosa would be ideal all through the course, though SLL is faced with two problems. The first while SLL has produced a reduced version of the course material in Xhosa and has an ICT English – Xhosa glossary (Sam, 2010) not all material is yet available in Xhosa. The other, more serious, is that only some of the SLL tutors are able to speak Xhosa, and the situation is not likely to change anytime soon, based on the demographics of researcher enrollment over the years. Of course, the second constraint falls away when the courses are given by local ‘champions’ and later simply by members of the community. Certainly, localization, not only of teaching materials but of the applications interfaces, is one of the foci of the activity of the SLL (Gumbo, 2012).

An issue always surfacing with SLL e-literacy courses is whether they should be free or not. It is a common experience that often what is paid for is held in greater regard than what is free. The discussion is certainly ongoing, but the practice adopted in the SLL currently is that courses provided directly by the Fort Hare and Rhodes team are free, while the ones offered by the community can be for a fee. An interesting proposal by a member of the community is that the access to courses run by the Universities should be linked to the payment of a deposit, which is refundable on the successful completion of the course. This would increase attendance, which is crucial during e-literacy training but not a fully solved problem. (As an aside, it is not uncommon for a community member to feel they deserve a certificate despite not being present at some of the classes, or enquire about class when the course is well underway.)

Logistical difficulty is almost by definition connected to rural areas, and makes ICT a particularly good fit to solve rurality problems. This is particularly true for areas such as the former Transkei,

where even the concept of a ‘village’ is almost absent. Coupled with very sparse distribution of the population, the road network is very underdeveloped. (For example, in the full area covered by the SLL DANs in Dwesa, there is not even a meter of tar road or a single proper bridge over the streams. The gravel roads are in a terrible state due to continuous erosion due to the seasonal rain.) One of the reasons to locate the public access points in schools is exactly to try and reduce the travel needed to reach a DAN. Unfortunately, at this stage, not all the available DANs are the same for the purpose of e-literacy: some only have enough end-user terminals to be able to run courses for a reasonable number of people. Besides that, there are limitations on the number of people that could do the teaching, though that limitation is reducing with the increase of the e-literate people in the area who have responded well to the course and have the capacity to teach others.

The “chairs problem” (Figure 9) illustrates something important - besides the obvious point of the importance of preventing chairs from disappearing or being of bad quality and so break easily. The lesson here is that without real engagement with a community, it is difficult to forecast what the real problems in the community are, and even more so how to fix them, no matter how trivial the problem, or the fix, is. This observation is at the core of the Living Lab methodology. Figure 3 illustrate the SLL solution to this specific little problem. The solution, which utilizes outdoor picnic tables as the main element of furniture for the DANs, has other advantages, including the comparatively low cost and the long life span.

One final aspect of the SLL e-literacy courses is its fundamental contribution to the realization of the Living Lab research paradigm (Cunningham, 2011), something which is essential for SLL to search of sustainable ways to diffuse ICT in poor settings. This contribution happens in two manners. The first one is rather direct: to be able to co-opt the people living in the area covered by the Living Lab, SLL needs them to be able to understand what an e-service is, what the Internet is etc, and not just in a ‘theoretical’ manner but in a practical one, with meaning for their everyday lives. The second is more subtle, but as important. To be able to be co-opted in the creation of new solutions to local problems, it is necessary to have the belief that one can actually contribute to the solution of a problem. This is a formidable mind shift, especially for people living in deep rural areas, faced with the interaction of ‘outsiders’ that show technology competence in an area that is completely new to them. What SLL has witnessed is that this mind shift can happen as the result of the e-literacy course, possibly linked to the sense of self-fulfillment linked to having mastered something that was seen as foreign and beyond one’s possibilities. Provided, naturally, that the ‘outsiders’ (the trainers) runs the courses recognizing the trainees as peers, who simply don’t have specific knowledge about an area but in exchange will have other knowledge in other areas.

## Conclusion

Digital literacy now counts among the other basic literacies that are essential for meaningful participation in the modern society (Peña-López, 2009). As such, all efforts aimed at facilitating the acquisition of relevant digital skills and knowledge via various forms of education and training are important—by virtue of empowering individuals, they hold the potential to ‘activate’ them into reclaiming their agency within the big picture of addressing unemployment, poverty and other kinds of inequality.

In this paper, we shared some aspects of our multi-year experience in conducting trainings for building digital competency skills in a deep rural area of South Africa. While SLL regards its training successful, more should be done and appropriate resources should be provided as matter of urgency to give e-literacy courses a wider reach, even simply because of the sense of hope and increased sense of self determination that SLL records among the people attending the e-literacy

courses for being able to master what is still regarded an almost impossible technology in rural areas.

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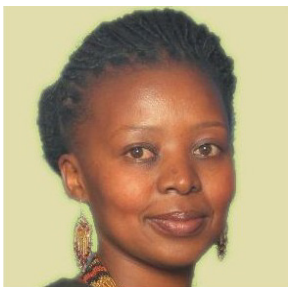
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## Biography



**Sibukele Gumbo** is the Project Lead of the Siyakhula Living Lab Management Unit and the Research Assistant in the University of Fort Hare Telkom Centre of Excellence. Her main areas of academic interest are in ICT for development, Java programming and computer networking. Sibukele holds an MSc in Computer Science (cum laude) and is currently a Doctoral candidate in the Computer Science Department at the University of Fort Hare.



**Mathe Ntšekhe** is currently reading towards a PhD degree at Rhodes University. Her research interests lie in the broad areas of ICT4D, Indigenous Knowledge Management and Education. She firmly believes that use of indigenous knowledge in formal education has the potential to enhance learning and root pupils in traditions and environments that may be relevant for them.



**Alfredo Terzoli** obtained a Laurea cum Laude in Physics from the University of Pavia, Italy. He is currently the Head of the Telkom Centre of Excellence in Distributed Multimedia in the Computer Science department of Rhodes University and Research Director of the Telkom Centre of Excellence in ICT4Development, hosted at University of Fort Hare.

His main technical research interest is the building of advanced telecommunication services that merge real-time and non-real-time multimedia streams, in converged networks. He also has a strong interest in ICT for development, where he started and leads a multi-disciplinary, long term, cooperative research project sited in Dwesa, in 2006. The project was re-organized in 2008 as the Siyakhula Living Lab. In 2010, the project was complemented by the start of a software factory, Reed House Systems which is ‘productizing’ and commercializing the innovations realized in the Siyakhula Living Lab.