

Pre-service teacher training in Malawi: Findings of a pilot study on the viability of media players for teacher development

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ABSTRACT

As part of the United States Agency for International Development (USAID funded Malawi Teacher Professional Development Support project, a sub-task was the piloting of an alternative technology that could be used for improving the quality and consistency of teacher continued professional development (CPD). The pilot, which included 26 open and distance learning (ODL) student teachers, was launched in the spring of 2011 using a low-cost portable MP3 multi-purpose device. A short course on numeracy, containing 5 weekly lessons, was piloted. Each lesson consisted of one or two readings, two videos, and an assignment that directed the learner to complete tasks and document their completion using the camera and audio recorder features of the media player. The viability of using the media player for CPD was evaluated on the ease of use, effectiveness of instruction, and potential for long-term scalability. The evaluation results demonstrated that, with a small amount of initial training, the devices were easy to use and they effectively deliver instruction. Scalability, however, is critical to the long-term success of an initiative based on these or similar devices. An analysis suggests that an affordable option worth considering is the systematic, shared use of media player devices within schools. This approach could dramatically reduce the cost of using this alternative technology for ODL training to pennies per lesson.

Keywords: ICT, Africa, international development education, media players, pre-service teacher education; remote delivery of training

INTRODUCTION

The Malawi Teacher Professional Development Support (MTPDS) project, funded by USAID, is a 3-year project that provides support to the Ministry of Education, Science and Technology (MoEST) in a wide range of areas from policy to teacher education. Under Result 2: Enhanced Teacher Performance, along with continuing CPD for in-service teachers, MTPDS is tasked with the implementation of alternative technology pilots for the Open and Distance Learning (ODL) initiative. The ODL program places untrained student teachers in remote schools and delivers teacher training directly to these locations rather than having the students participate as part of traditional campus-based cohorts at teacher training colleges. The current implementation of the ODL program uses paper-based training materials created by the Department of Teacher Education and Development (DTED), a division of MoEST.

Seward Incorporated International, one of the MTPDS implementation partners, was responsible for converting content created for in-service CPD activities. These materials needed to be modified for delivery to the ODL students using an alternative technology. Seward worked with MoEST's ODL Planning Committee to conceive of and conduct an alternative technology pilot in Year 2 of the MTPDS project. The work plan, under the guidance of the DTED Coordinator and

the ODL Coordinator, was reviewed and approved. The DTED Coordinator, with support from MTPDS, invited all responsible directorates in the MoEST to a meeting where Directors of MoEST reviewed and adjusted the plans in accordance with requirements of the Government of Malawi.

MoEST requested that the pilot study be conducted. They argued the potential benefits of an alternative technology for ODL would be:

- More cost-effective delivery of training
- More efficiency in delivery of training
- More consistency in delivery of the content across the population of ODL students
- More effective training because it:
 - Uses multiple modes of conveying information to ODL students
 - Can be accessed as often as needed by ODL students
 - Can be taken into real classrooms by ODL students as they work with learners
 - Models the behaviors the ODL students should be acquiring
- More useful to ODL students by allowing them to document their application of what they learned using audio, pictures, and video

The goal of the pilot was to determine the viability of the alternative technology being tested, that is, would the technology function in harsh rural conditions, could its operation be sustained in areas with poor electrical infrastructure, could the devices be used by technology novices, and would the ODL student teachers learn from the materials being presented. The pilot was not designed to determine the relative instructional effectiveness of the alternative technology when compared with the exiting paper-based approach. In fact, the project required that the content be converted from newly developed CPD materials. As a result, the pilot training (content and pedagogy) was not produced as alternative versions of an ODL print-based course. Rather, CPD materials developed in the term prior to the pilot, which addressed numeracy training for teachers in Standards 1-4, were selected for use.

The pilot training was developed as a short course consisting of five weekly lessons. ODL students were instructed to access and complete one lesson per week over a period of five weeks. Each lesson consisted of one or two readings, two videos, and an assignment that directed the learner to complete tasks and document their completion using the camera and audio recorder features of the multipurpose media player.

The first reading of each week described the numeracy topic being covered, its role in the early grades curriculum, and how to complete the lesson and assignment. The second reading presented the lesson details, in lesson plan format. The weekly videos, which were produced in Malawian schools with local students and experienced teachers, exposed the ODL participants to both model teaching and interviews with the teachers about how they approach customizing the lesson for their students and classrooms. The weekly assignments challenged the ODL students to adapt the lessons they studied to their classrooms and to teach those lessons to their students. Finally, students were required to document their assignment using the features of the pilot device.

LITERATURE REVIEW

Developed countries, those with infrastructure and resources, have been using technology in pre-service and in-service teacher training for several decades. Many writers have pointed out the value, or potential, of such an approach in research studies, position papers, standards documents, and guidelines (e.g., Gillard, Bailey, and Nolan, 2008; Sales, 2009; Easton, 2010).

In the late 1970s and early 1980s, as computers were beginning to appear in classrooms, ICT training for teachers focused on the use of technology – getting the computer to run, operating system software, and programming in BASIC. These early professional development experiences, for example, would teach computer vocabulary, such as input device, monitor, and mouse. They would involve teachers in assembling computer workstations, and teach them where the “on/off” switch was located and how to use a mouse. Over a period of years, this training gradually expanded to include using specific pieces of instruction and production software, such as Oregon Trail and Print Shop. By the late 1980s the role of technology in teacher training had shifted its focus to helping pre-service and in-services teachers develop strategies for the effective student use of technology for learning and to increase teacher productivity. Teachers were trained to use electronic grade books, data collection and analysis software, and online individualized educational program planners (Schrum, 1999; Gooler, Kautzer, and Knuth, 2000; Sales and Emesiochl, 2004; Rosenfeld, 2008). Since the explosion of internet resources and handheld devices in the late 1990s and early 2000s, another change in the use of technology in teacher training has taken place (Spector and de la Tega, 2001). Today, through the use of online distance learning, college credit, professional development, and even college degrees can be earned remotely. In developed countries training simply to make teachers computer literate is a thing of the past.

Unfortunately, in developing countries, where the need for more teachers, improved pre-service training, and quality CPD are critical, the use of technology has lagged far behind (Chapman and Carrier, 1990; Chapman, Garrett, and Mählick, 2004; Dikkers, 2010). Challenges to technology integration in developing countries include: little or no electrical power, conflict or post-conflict situations, harsh physical and environmental conditions that damage or destroy equipment (Gichoya, 2005), lack of secure storage facilities for equipment, little or no internet capability, and insufficient financial resources to obtain and maintain hardware and software. In spite of these challenges, the need and potential for the use of technology in teacher development has been recognized by donor agencies. This is apparent in USAID’s statement of its fundamental belief that, “science and technology, when appropriately applied, can have transformative effects” (USAID, n.d.).

Other reasons for the delayed adoption of ICT in developing countries include lack of policies and little or no integration with the current curricula (Toure, 2008). Donor agencies have funded initiatives in an effort to help countries recognize the value of ICT and to encourage the development of appropriate policies and curricula. Pilot and implementation projects, like the one described in this article, provide examples of the types of ICT projects (Al-Siyabi and Sales, 2009, Easton, 2010) that have been funded by USAID and other agencies. These projects also investigate potential solutions to the limitations imposed by the unique conditions found in developing countries.

Over the past decade a number of projects in sub-Saharan countries, some of the poorest and least developed countries in the world, have undertaken the application of one form or another of technology to provide teacher training. For example, interactive radio instruction (IRI) has been used to provide in-service training for teachers, interactive DVDs to provide pre-service training for teachers and handheld devices to provide focused in-service and pre-service instruction. The Educational Development Center (EDC) uses radio in Sudan to provide training to teachers on

specific lessons that can be taught in the classroom (Namadi and Simon, 2011) and Malawi uses IRI to support in-service CPD training (EDC, 2010). As part of the Malawi Teacher Training Activity, Miske Witt and Associates developed interactive DVDs for use in pre-service teacher training. The role of the DVDs was to provide model teaching and interviews with experienced teachers to better prepare teachers for the field. Ahga Khan University incorporates mobile learning with formal learning to strengthen courses for educators and education leaders (Onguko, 2010).

In spite of the efforts of donor agencies to promote the use of ICT for pre-service training and in-service professional development of teachers, few ICT interventions have proven to be sustainable once the project funding has ended. Cost is the single largest contributor to this outcome. Put simply, the total cost of ICT solutions is too high to be supported by ministries in poor countries where a high reliance on donor support for ICT activities exist (Trucano, 2005; Trigammic, 2005). Other factors that have contributed to the failure to sustain ICT solutions include the need for specialized knowledge or skill to operate the systems, the lack of durability required to continue operating in the harsh and rugged environments of remote schools (van Reijswoud, 2009), and the limited availability and time-based/scheduled nature of interventions such as broadcasts of interactive radio instruction (Easton, 2010).

Teacher professional development in the resource-poor environments of developing countries often suffers from a lack of cultural supports, among them incentives for teachers, including such items as stipends, rewards and recognition for participants, or access to new or additional resources (Gaible & Burns, 2005). The pilot described below attended to these cultural supports in providing the ODL participants with locally developed training, relevant classroom-based practice, an opportunity to be recognized by the leaders and peers in their schools, and by the opportunity to use a new educational resource.

METHODOLOGY

In this study, three distinct activities took place in Malawi. These were (1) preparing the participants (ODL Desk Officers and ODL student teachers) from two Teacher Training Colleges (TTCs), (2) providing time for the learners to study using the technology at the schools where they were working, and (3) through the use of interviews, evaluating the viability of the media players as an alternative technology for the delivery of ODL instruction.

The media player chosen for the pilot was an E-Matic EM404CAMB. This device stood out above the other options because it offered the best combination of features and price. The key features needed for the pilot included a 3" touch screen, audio and video playback, e-book/text support, audio recorder, and still and video camera functionality. In addition to core functionality, the battery life and recharge time, approximately 3 hours, were considered extremely important. Other features included in this device that had the potential to greatly expand their usability and long-term sustainability include digital radio functionality that allows users to listen to and record IRI instruction and an expandable memory slot that can be used for delivery of additional training.

The MTPDS team worked with staff from the Lilongwe Teacher Training College and St. Joseph's Teacher Training College, in Dedza, to identify and recruit ODL students to participate in the project. All ODL participants were working in remote rural schools. The only other criteria used in the overall selection of participants were that they had to be working in schools at standards 1-4 and that we generate roughly equal numbers of males and females. Of the 26 participants, approximately 54% (14) were females, enrolled at St. Joseph's Teacher Training College. The remaining 46% (12) were males, enrolled at the Lilongwe Teacher Training College. The average

age for the participants was 25.3 years. All participants received their instruction in English, except for videos that were in Chichewa (the language of instruction in standards 1-4).

Participants from each TTC received approximately 2 hours of training one evening while they attended a between-term meeting on campus. The training consisted of instruction on the operation of the devices and how to access and complete the lessons. On a second evening, the trainer was available at the TTCs to provide individualized help to any participant who requested it. In the event that ODL students might request additional training once they had returned to the field, selected MTPDS staff and MoEST personnel also received training on the operation of the devices and the lessons being assigned.

ODL students participating in the pilot accessed and completed the instructional lessons between May 2 and June 3, 2011. While it was recommended that they complete one lesson per week, reading and viewing of the content was to be completed on any schedule and at any time the learner preferred. Each lesson, or lesson component, could be viewed as many times as desired, at the discretion of the user. Similarly, completion of the assigned activities, that is teaching the lessons in their own classrooms, recording lesson activities and responding to questions, could be scheduled by the ODL students at their discretion.

As the training period was ending, evaluation interviews were scheduled by ODL officials. They contacted the pilot participants, with assistance from the Primary Education Advisors (PEAs) working near the pilot schools. Participants were asked to attend an interview session about the alternative technology pilot and schedules for the interviews were created. The participants were instructed to bring their media players with them to the interviews. Interviews were held at three sites: the TDC offices at Ludzi, Kamwendo and Waliranji. Evaluation of the pilot was conducted from June 5-11, 2011. The MTPDS Pilot Liaison arranged interview trips for the evaluator.

Interviews were conducted individually with only one participant from the pilot group in the interview room at a time. While all interviews were conducted in English, assisting the interviewer was a MTPDS staff person with local language skills. This person was available to assist if clarification of questions became necessary. An interview protocol was constructed that allowed the interviewer to ask standard questions but also to follow up on responses, if it was deemed a follow-up would clarify or enrich the information gathered.

After each participant was welcomed, the purpose of the interview was explained. Interviewees were urged to speak candidly about their experiences and opinions regarding the pilot, as such candor would allow the evaluator to establish accurate findings. Interviewees were told that if they did not understand a question or were confused by it, they should ask for it to be further explained and were told that the Malawian professional assisting the evaluator was present to help ensure that the meanings of the questions were clear and understood.

EVALUATION QUESTIONS

The primary goal of the pilot was to determine the viability of an alternative technology for ODL. To this end, the evaluation focused on examining the durability, operation, and usability of the technology. Additional areas of interest on which data were gathered included participants' attitudes toward and use of the devices, learning from the instruction, and application of the learning in the classroom. Specific questions guiding the study included:

1. Is the technology usable?
 - Does it function?
 - Can the participant keep the technology functioning (e.g. charged)?

- Can participant operate it efficiently?
 - Is it suitable for the environment in which it is being used (e.g. durable enough)?
2. Are the participants motivated to use the technology?
 - Will they use it as directed?
 - Do they enjoy using it?
 - Do they prefer using it?
 3. Do participants learn from the lessons completed using the technology?
 - Can they discuss what they were exposed to?
 - Can they answer questions about what they learned?
 - Can they demonstrate techniques they were exposed to?
 4. Does their learning transfer to participants' teaching in the classroom?
 - Is there documentation that the participant has attempted to use the content, skill, or practice in the classroom?
 - Is there evidence that the practices or procedures covered in the instruction were adopted by the participant?

In addition, the evaluation attempted to address affordability for the schools. Would the use of this technology be cost-effective and financially feasible?

Each interview followed the same procedure. First, participants were given several practice items to ensure they understood the nature of the rating scale.

Then, they completed the first set of items. This section of the interview probed the "ease of use" factors related to the operation of the media player. Items explored operation of the device plus ease of access to the instructional assets (the lesson introductions, the readings, the videos, and use for recording one's own materials). For these items, students were provided a scale on which they could rate the item (1=very difficult to 5=very easy).

For the next set of items, participants were queried about the five instructional lessons included in the pilot. These items were intended to enable the interviewer to assess whether the lessons had been read and the assignments had been followed. With each item, the ODL students were asked to explain or elaborate on their response in order to assess what they had retained and whether they could articulate the knowledge gained from the experience. In addition to the interview protocol, the evaluator asked several questions to help assess the ODL students' enthusiasm for the use of the media player as a technology for helping teachers learn new skills.

Finally, a few pieces of additional demographic information were collected from each ODL participant. This included age, gender, the number of students in his/her classroom, whether the ODL participant had a partner teacher in their classroom, and how many total teachers were in their school.

FINDINGS

All but one of the ODL students (96%) indicated that as a result of the initial training, they felt totally confident to use the devices. They did not have to seek out a manual or another resource to receive further instruction on its use.

Of the 26 ODL participants interviewed, 23 (89%) indicated that operating the media player for this instruction was rated as Easy or Very Easy across seven of the eight dimensions, such as moving from one lesson to another, recording their own comments, taking pictures or videos. Table 1 displays the frequency of the categories of ease of use ratings by the participants. To provide a more meaningful breakdown, all “easy to use” (4) and “very easy to use” (5) ratings were consolidated, as were all of the first three ratings on the scale of “very difficult” (1), “somewhat difficult” (2) and “not so difficult” (3).

With respect to the eighth dimension in Table 1, charging the device, 20 (77%) of the 26 participants rated it as Easy or Very Easy. This suggests that while the majority of participants found charging the media player easy, almost 1 in 4 perceived charging the devices as challenging. (It is interesting to note that 25 of the 26 pilot teachers reported having cell phones and that they charged the media player at the same place they charged their phones.)

Table 1: Rating Scale (n=26)

Rating Scales: Ease of Use of Media Player	1, 2, or 3		4 or 5	
	#	%	#	%
On/off	1	4	25	96
Controlling volume	3	11	23	89
Playing videos	3	11	23	89
Moving between text and video	3	11	23	89
Using the camera	2	8	24	92
Moving between lessons	3	11	23	89
Recording my voice	3	11	23	89
Charging the Media Player	6	23	20	77
[Key to ratings: 1=very difficult; 2=somewhat difficult; 3=not so difficult; 4=easy; 5=very easy]				

One media player was reported stolen during the pilot but was later located by the police and returned to the ODL participant. In the meantime, this teacher was able to share a pilot colleague’s media player. Two additional participants reported a problem with their devices. In one case, it was reported that the person who had charged the device had also eliminated some lesson content. As a result, this teacher could no longer access everything. In a second case, the On/Off switch stopped working. This problem developed late in the pilot and did not prevent the participant from completing the instruction. Except for the device that had been stolen, all of the devices came back in the original bags in which they were distributed, along with all of the accompaniments, such as manuals and charging cords.

One evaluation activity asked participants to share the pictures they had taken in their classes, videos taken of themselves teaching, and audio recordings of their own observations. Overall, nearly 85% of the pilot teachers were able to demonstrate evidence that they had completed all of these activities. In approximately 15% of the cases, one or more pieces were not shown to the interviewer, either because the interviewee did not do the piece (e.g. she never recorded her comments or never videotaped herself teaching a lesson) or because the interviewee did not recharge their media player before attending the interview and the batteries were dead, thus they were unable to access these items.

Participants were asked to comment upon their favorite lessons. This technique was used to elicit participants' knowledge of the lessons and to delve into their understanding of specific lesson content. The results are shown in Table 2.

Table 2: Best Liked Lesson

Lesson Topic	#	%
1—Adding 4 numbers	6	23
2—Place value	8	31
3—Number Patterns	11	42
4—Rounding	0	0
5—Observing other teachers	1	4
Total	26	100

The lessons identified as the most popular were Place Value (31%) and Number Patterns (42%). When asked why they liked these lessons, the respondents often cited:

- they had learned about the ability to use local resources to teach these topics,
- the perception that their students responded well to the approaches that the teacher used when teaching these two lessons, and
- their students were heavily engaged when they used these new ideas or demonstrated the skills learned. In this case, interviewees were able to cite specific examples of student behaviors that indicated high levels of engagement.

As seen in Table 3, watching the videos and taking photos of their own teaching were identified as the most popular features of the instruction. The activities that required recording an auditory response were selected as the favorite by only 3 of the 26 pilot participants.

Table 3: Best Liked Activity

Components of the Instruction	Number who chose this	Percentage
Watching videos	11	42
Reading introductions to lessons	2	8
Reading lesson plans	2	8
Taking pictures	8	31
Recording my own voice	3	11
Total	26	100

As has been mentioned, the goal of this pilot was to assess the validity of the media player for delivery of instruction, not the quality of the instruction. That said, much was learned about the instructional effectiveness of the course. The participants were able to demonstrate how they had incorporated the skills/concepts/practices presented in one or more of the five lessons into their own teaching. When asked if they had used what they had learned in their own teaching, participants were able to show the evaluator, using their videos and recorded comments and to provide additional explanations. In their recordings, a number of the participants critiqued their experience at "trying out" a practice that they had observed an experienced teacher demonstrate in the video portion of the lesson.

A hypothetical question was asked of participants in an effort to determine the degree to which they valued this media device-based alternative to teacher training. When asked if they were given an opportunity to advise the Minister of Education on the best way to help teachers develop—that is, whether to provide media players with instructional lessons, like those they had just completed using, or to spend equivalent funds on additional materials for the teacher's classroom, nearly 90% of the participants indicated they would advise the Minister to provide media players to teachers with more lessons like these. Reasons cited for this preference included the following:

- the multimedia lessons helped teachers identify available resources and to use them more effectively,
- it made it easier to learn because they could observe effective teachers modeling skills in front of learners,
- the lessons on media players can be used over and over again, and
- learning could take place from the media players at any time and in any place.

Themes that emerged from interviews with the administrators included:

- The media players could be shared by multiple teachers within a building, each teacher need not have their own device. The goal of more collaboration between and among teachers was cited as important and to the extent the devices could contribute to this goal, that would be viewed as an advantage. Several of these administrators had observed non-participating teachers use or speak about using the media players.
- The notion of a technology that could be used on an independent basis was seen as an important advantage by these administrators, citing the issues with distance and transportation faced by so many teachers when required to attend training.
- The motivational level among participants created by this technology was high, administrators unanimously reported. They observed that their ODL pilot participants embrace technology and prefer to learn by using it. The media player approach leverages that natural preference. Pilot participants, with whom these administrators interacted, demonstrated enthusiasm for receiving professional development assistance in this manner.
- Purposeful preparation for lessons was seen as being fostered by this instruction. Teachers developed more concrete ideas on how to present their lessons, using techniques such as active learning, use of local resources, and use of different types of questioning.
- The notion of being able to maintain the equipment was raised as a concern by the administrators. They believed that, while charging the devices would not be a problem (most of their students routinely charge their cell phones), it would be challenging if something gets broken. They questioned whether it would be possible to get the devices fixed without establishing a systematic procedure for dealing with these instances.

DISCUSSION

After reviewing responses from participants and administrators, a set of preliminary conclusions emerged. These conclusions address issues of collaboration, control of learning, scheduling, and enthusiasm. The pilot also revealed information that speaks to the cost effectiveness, competing resources and sustainability, capacity, and reality of new and emerging technologies. Each of these is discussed below.

A large majority of ODL participants in the pilot reported that other teachers in their school had also made use of their media player. In almost all cases where the participant had a partner teacher in the classroom, that partner teacher used the participant's device. Other teachers in the school also used the media player, some to watch the videos of expert teachers, some to have one of their own teaching episodes recorded by the student teacher or a peer, some to help record their colleague teaching, and some to observe the pilot teacher's video. While these non-pilot teacher peers needed help on using the media player because they had not received training, once they received this help, they were apparently able to take advantage of the lessons on the device. Only a small number of the participants reported that no other teacher in their school made use of the media player, citing that their colleagues didn't understand it, were not curious, or expressed anxiety about using it. Overall, these data suggest that the instructional power of even a limited number of these devices could be leveraged because multiple teachers in these rural schools find ways to use them.

Each lesson consisted of a number of different elements – readings, videos, and assignments. Completing a lesson typically involved a sequence such as, reading about the skill/concept/practice in the written materials, watching the concept demonstrated by an experienced teacher, viewing a second video in which teachers discussed how they modified the lesson to fit their classroom, practicing it in one's classroom, recording oneself attempting to use it, and then critiquing oneself so that one could modify the next attempt of the performance of that skill/concept/practice. Participants described how they followed this sequence at their own pace, reviewing elements of the instruction as needed, as they worked through the five lessons. These examples are consistent with the findings of Sanders and Craig (2000) and speak to the importance of providing teachers with some level of control over the pacing and order in which they receive instructional content.

The participants valued that they could watch the video of an expert teacher many times, to study his or her technique/approach and to then try to incorporate such techniques into their own lesson planning and lesson delivery. As the teachers showed the video of themselves teaching to the evaluator, they often reported how they were using a technique used by a teacher in one of the instructional videos. As an example, the teacher would show how the expert teacher introduced or set up the lesson for her students and would then show how she used a strong introduction in the lesson she was teaching. It appears that pilot participants valued the ability to access and review the teaching acts of effective master teachers. This is consistent with the findings of Kpanja (2001) in Nigeria whose research found that teachers who were able to analyze videos of their own teaching made more progress in mastering teaching skills.

All participants indicated that they felt they had effectively learned curriculum content, as well as teaching methods and skills from this instruction. While some of their enthusiasm can no doubt be attributed to the use of a new technology, most teachers were quite explicit about why this was a good way for them to learn. Reasons, such as, being able to return to review an expert teacher's presentation repeatedly, the ability to document one's own teaching and to be able to analyze that teaching event to determine what one did well or less well, and the flexibility to use this technology at any time of the day at any location were specifics most frequently cited. This finding suggests that teacher participants found the use of this form of technology motivating for a variety of many reasons, not merely a single reason.

One administrator labeled the device a "tutor in the pocket" which captures the general sentiment expressed by those knowledgeable about the study. With great distances and transport limitations remaining a challenge for professional development of teachers in Malawi, this technology was viewed by teachers as one effective way that they could improve their knowledge and skills, regardless of where they are located. The luxury of access to instructional materials on one's own

preferred schedule appears to be a powerful motivator for the use of devices like the one piloted in this study.

Malawi is one of the poorest countries in the world. As such, its current education budget is inadequate to meet the basic education needs of the country. This is apparent in the lack of sufficient numbers of teachers to attain manageable student/teacher ratios, instructional materials, schools, classrooms, and classroom furnishings. Therefore, an analysis of the cost effectiveness of media players for the delivery of ODL training is critical. However, such an analysis also needs to explore strategies that make the affordability of the alternative technology and the benefits of its use in delivering teacher training attractive to potential funders. Below, such a strategy is presented.

If educational pricing strategies are used during procurement, a media player with the features needed to deliver the level of instruction used in this pilot will cost between \$30 - \$70 per unit. Each device could store up to eight lessons similar to the one used in the pilot (each lesson takes roughly 1 GB). Additional storage cards, with a capacity for an additional eight lessons, can be purchased for approximately \$3-\$7. Conceivably, if the devices and additional memory with lessons were maintained at the TDC, they could be available to the schools where ODL students are working. One device could serve the ODL needs of an entire zone, typically 3-7 schools. This could be accomplished by rotating device use among schools and teachers. (As noted earlier, this notion of sharing a single device was raised by both ODL administrators and some students.) Such an approach would require training of PEAs, establishing a secure location within the TDCs to protect the devices from the environment and theft, and establishing systematic procedures for distribution, use, maintenance and replacement of devices.

Conducting a per lesson cost analysis, requires establishing a set of assumptions. To that end, we assume the following:

- the cost of the device and an extra chip is \$77 (the maximum price for this system with one additional memory card)
- the device plus card combination would contain 16 lessons
- there are 3000 ODL students to be served
- these ODL students are found across Malawi's 315 education zones
- one device is made available in each zone, for use in rotation to different schools
- the creation of the lessons is a cost absorbed by the Ministry (just as they currently absorb this cost)

Then, \$77 per device with an extra chip x 315 Zones = \$24,255 (cost of technology)

3000 ODL students x 16 lessons = 48,000 lessons delivered

\$24,255 (cost of technology) /48,000 lessons = 51 cents per lesson delivered

The 51 cents per lesson rate represents the cost for one year. Each additional year the technology is used would reduce that cost (i.e., if the lessons were delivered in Year 1 and again in Year 2, the cost per lesson would be close to 25 cents). Of course, an amount, say 15% needs to be calculated into this formula to address the probable loss of equipment. Still, on a large scale, per lesson costs would be quite low, even less than printing and disseminating of paper-based instruction.

The media devices performed well in the hands of ODL student teachers in remote and rugged settings. The pilot group reported that the device worked fine throughout the 5 week pilot, thereby, addressing the durability and appropriateness concerns stated by Gichoya (2005) and

van Reijwoud (2009). That said, one recommendation on maintenance, which was of high importance to ODL staff, would be a system for repair of defective devices that would be widely communicated to teachers. This system, for example, would require that the teacher give a defective device to the school principal or the PEA who would in turn see that it gets to the TDC. From there, any devices needing repairs would be given to competent individuals who know how to maintain and repair the devices. Restored devices would then be returned to the TDC and eventually to the student teacher. Given the durability of the devices, this system would address the occasional problems encountered.

With respect to servicing and maintaining the media players, it is worth noting that throughout Malawi there are small shops that repair cell phones. One possible solution worth considering would be to provide training to the proprietors of these shops so they would be able to provide local service for the media devices as needed.

SUMMARY

There probably is no perfect substitute for a live mentor/coach for new teachers. Such a person could be on-site to guide the new teacher, observe their teaching and critique strengths and deficiencies, challenge them to try new behaviors and abandon those behaviors that are not effective. However, it is clear that this level of support is not currently available in Malawi. Some teachers do have regular access to skilled coaches in their head teachers or PEAs. Unfortunately, with the long distances that must be traveled by those who would visit student teachers to provide assistance, the frequency of such coaching is severely limited. The media player piloted in the study certainly cannot substitute for a successful one-on-one coaching relationship, but it can provide more opportunities for new teachers to learn about and observe successful teaching without leaving their schools. Combined with an effective teacher training program, this appears to supplement student teachers' education in ways that are flexible, immediate and motivational.

This pilot study has demonstrated that media players can effectively deliver instruction to ODL student teachers. Ease of use of the devices for this purpose was uniformly perceived to be high and student teacher motivation regarding its use was also high. The recharging of the device was not perceived by the majority of participants to be an obstacle, no doubt owing to the fact that most of them possess cell phones and are accustomed to getting them charged following the same process. While there were a couple of minor problems with devices (one mechanical and one operational), overall the devices worked well and did not present the participants with obstacles to completing their work. The participants reported great enthusiasm for the way in which the instruction was delivered. They appreciated the ability to read about and then observe senior teachers delivering instruction to real classes using the instructional concepts/skills/practices described in the five lessons. This capacity to observe more experienced teachers, on a repeated basis, provided an important opportunity rarely available to these younger, less experienced student teachers. The media player allowed participants to record their own teaching episodes so they could critique themselves.

The issue of affordability of the use of newer technologies in a country struggling with insufficient resources for teacher development is fundamental to scaling-up and sustaining the project. The simple analysis reported here suggests that an option worth considering is donor-funded, systematic, shared use of media players within each education zone. Such an approach would enable multiple ODL students to benefit from instructional lessons delivered via these single devices. Through such an approach, it might be possible to dramatically reduce the cost of using an alternative technology for ODL teacher training.

Overall, this pilot provides further corroboration for the finding reported by Gaible & Burns (2005) that teachers are open to adopting innovation “when they see it adds value, is easy to use, and when they are provided the time and support they need for learning and practice” (page 70).

ENDNOTE

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APPENDIX A

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