

Teaching with Storytelling: An Investigation of Narrative Videos for Skills Training

Ilda Ladeira and Edward Cutrell

Abstract—We present a study on using storytelling for teaching skills to low-income workers in the developing world. Taking a cue from work on using dramatized stories and video to promote technology use and agricultural and HIV/AIDS education, we investigated storytelling’s ability for teaching low-literacy populations. We created a series of videos to teach domestic workers in urban India bed-making and vacuuming. We tested the effect on learning of a) embedding instructional content in narratives and b) adding motivational content on the benefits of learning these skills. We compared: 1) instruction-only videos, 2) instructional videos book-ended with voice-overs describing skills’ benefits, 3) combined instructional and narrative videos showing no skill learning benefits; and 4) combined instructional and narrative videos which portray benefits for learning a skill. Narrative framing and motivational content each improved learning, but combining them resulted in dramatic improvement.

Index Terms—Education, Low-literate, Storytelling, Video

I. INTRODUCTION

AN important branch of development work involves teaching new skills in communities with low levels of literacy and education. Skills training is used to better equip people for finding work (e.g., LabourNet in Bangalore, India, and LearnToEarn in Cape Town, South Africa) and improving their efficiency at everyday tasks by using technologies such as mobile phones or the Internet. Previous work has shown that videos and storytelling may each be effective for teaching low-literate populations. The research presented in this paper investigates the use of narrative videos for skills training. We begin by outlining the previous studies that prompted our research direction and then describe our own research approach. Next we describe a controlled study for testing the effectiveness of four types of video content, ranging from purely instructional to fully story-driven. Finally we present our results and make recommendations for using storytelling to effectively teach new skills.

II. RELATED WORK

Two main areas of previous work are relevant to this research: first, using video and narratives for teaching and,

second, instructional design. Video-mediated instruction is hardly novel and has been explored in many educational studies. However, much of this work focuses on literate populations in teaching domains such as schools, universities or distance-learning. And, while there are organizations that teach uneducated populations in the developing world, we know of little empirical investigation on effective pedagogy for this domain. It is our aim to draw from existing work on teaching with video and add to it by applying principles from storytelling and instructional design in a way that is novel and effective in the developing world.

A. Teaching with Video

A particularly successful example of teaching with video in the developing world is Digital Green, where rural Indian farmers are taught and encouraged to adopt modern agricultural techniques [1]. Digital Green videos typically feature non-government organization (NGO) workers and progressive farmers demonstrating successful agricultural practices. The authors compared a classical “Training and Visit” approach, where agricultural extension officers would visit and teach farmers periodically, with an approach which combined “Training and Visit” with public Digital Green video screenings. The addition of video screenings increased adoption rates of new agricultural techniques sevenfold. Also, farmers identified more with videos featuring successful farmers in the same socio-economic strata as themselves. Digital Green videos combined instructional content, such as the steps comprising a particular farming technique, with content about the various techniques’ benefits.

In their work on text-free UI’s for illiterate users, [2] engaged in an extensive participatory design process to create a job-search application, but participants failed to use the resultant application successfully [3]. Adding a video demonstrating an instructional walk-through of the application did not improve performance. Next they introduced a “full-context video,” which presented a short narrative of a domestic worker successfully finding work using the application [4]. In their experiment only 6% of participants who did not view the full-context video were able to complete a task using the job-search application successfully. Meanwhile 100% of participants who viewed the full-context video were able to complete the task successfully. Furthermore, those viewing the video required far less help and prompting and showed greater enthusiasm for using the application. The authors conclude that the full-context video’s success could be attributed to its demonstrating how the job-

Manuscript received April 2, 2010.

Ilda Ladeira is a student at the Department of Computer Science, University of Cape Town, South Africa. This work was done while she was an intern at Microsoft Research India (e-mail: iladeira@cs.uct.ac.za).

Edward Cutrell is with Microsoft Research India (e-mail: cutrell@microsoft.com).

search application applied to a real-life scenario to which participants could relate.

A more extensive example of storytelling as a teaching aid in the developing world is the Sabido methodology [5]. This method employs an entertainment-education strategy in the form of mass-media serial dramas featuring characters and plots audiences can relate to. This approach seeks to engage listeners in a long-running story series illustrating changes in characters' behavior and attitudes. This method is based on numerous social science theories, perhaps the most famous of which is Social Learning, which describes how children learn by observing role models [6]. In the Sabido methodology, characters typically begin a story series in opposition to the value being presented. Then, through plot progression and interactions with other characters, they come to agree with the series' underlying message. This approach has been deployed in the form of radio soap operas that teach about HIV/AIDS and family planning in Africa and Mexico [5], [7], [8]. These programs are not only cost-effective, they also have been shown to engage target audiences. Researchers have observed greater willingness to address family planning methods and awareness of HIV/AIDS risks and prevention [5], [7], [9].

B. Instructional Design

When explaining how to perform a task, it is intuitive to use instructions; these are often sequential (“do this, then do that”) and may include conditional information (“if this happens, do this”). Reference [10] reviewed three techniques researchers have studied in an attempt to increase the effectiveness of written instructions. Two of these were found to improve meaningfulness and performance and the third was not: (1) adding functional information, such as explanations of what the instructions achieve; (2) adding operational information, such as rationale for instructions; and, (3) situating instructions in real life contexts via illustrations or scenarios. However, a number of education studies have shown that anchored instruction, which situates instructions in real-life scenarios, can be very effective [11]. Videos for teaching subjects such as geometry have shown that anchored instruction improves students' attitudes and their ability to recall information [12] as well as their ability to apply content [13].

III. RESEARCH APPROACH

We began our work with the broad goal of exploring optimal ways of using technology to teach low-literate populations. The success of video in teaching prompted us to pursue it as our medium. Additionally, we chose to apply our investigation to teaching skills to low-literacy populations.

A. Skills Training

We partnered with LabourNet, an NGO focused on the informal workforce in Bangalore. LabourNet seeks to find its worker members employment and provides ongoing skills training and support. At the time of our research, the organization maintained a database of more than 30,000 registered workers and a call centre that prospective employers can call to find employees for work ranging from construction to domestic jobs. LabourNet's management

reported considerable difficulty in engaging members in training lectures. Most members were unaccustomed to classroom settings, which resulted in obvious inattention and even walking out during lectures. To remedy this, LabourNet created videos to cover new worker orientation topics. Although the videos were costly to make, LabourNet's management felt videos were more effective at engaging workers and were planning to create more videos for teaching specific skills. They were uncertain about which content forms would be optimal for effective training and were eager for empirically informed recommendations. We chose to focus our investigation on teaching domestic work skills using narrative videos.

In order to understand the domestic work market, including which skills would be worthwhile to teach and which kinds of narratives might appeal to domestic workers, we interacted with LabourNet facilitators and contacted Stree Jagruti Samiti, another NGO providing support for many domestic workers in Bangalore's urban slums. We learned that, while domestic work is a primary income source for many underprivileged, uneducated women, work opportunities are typically unpredictable, and rates of employer dissatisfaction and domestic worker turnover are high. As a result, most domestic workers prefer flexible work arrangements that allow them to hold a number of jobs simultaneously to safeguard against this instability. We also approached a luxury hotel in Bangalore that ran an outreach program providing free training in domestic and hotel housekeeping. This training featured in-house videos and was provided during apprenticeships at the hotel and in one-off training sessions at partner NGOs. Among the skills the hotel chose to teach were bed-making and vacuuming, as these were perceived as desirable in both households and hotels.

Lastly, we observed LabourNet's first-ever domestic work training program, which consisted of seven weekly sessions presented to a group of nine domestic workers. We attended the first three sessions in order to note topics covered and teaching formats used. The trainer was a volunteer with a background in supervising hotel housekeeping. Fig.1 shows the trainer and NGO facilitator interacting with the domestic worker group. The program covered such skills as bed-making, dusting, bathroom cleaning, table setting and



Fig. 1. Images from the domestic worker training program we attended. At left, the trainer and facilitator address and interact with the group of domestic workers, shown on the right.

professional etiquette. These choices were based on LabourNet's perception of what most employers want.

Subsequent training programs would cover more “advanced” skills, such as vacuuming, clothing washing, first aid and childcare. The sessions took the form of lectures, presented collaboratively by the trainer and facilitator, using a lot of physical demonstration and hands-on practice. For example, the trainer would demonstrate a skill, such as bed-making or dusting, and then allow the domestic workers to practice for themselves.

Informal interviews with the trainer and facilitator suggested that most domestic workers were not motivated to participate in training because they felt that they already knew how to perform domestic chores. Another concern was that often domestic workers did not pay attention to detail in tasks such as bed-making. Finally, domestic workers were often reluctant to abandon familiar manual methods, such as sweeping or hand washing, for new methods involving unknown equipment, such as vacuum cleaners or washing machines.

For our study, we chose to create and test videos for teaching two skills that were relevant to domestic workers and somewhat dissimilar to each other: (1) bed-making, a common task often done imperfectly, and (2) vacuuming, a more advanced skill likely to be new to many domestic workers.

B. Teaching with Narrative and Motivational Content

We were particularly interested in building upon the concept of full-context videos, where a dramatized story on video had been so effective in encouraging usage of a job-search application [4]. The full-context video “pulled out all the stops,” providing viewers with a fully fleshed-out narrative which incorporated an instructional walkthrough of their application. Dramatizations are inherently appealing, and we were interested in understanding which aspects, i.e., the setting and characters or the narrative tension, might be most valuable for teaching low-literacy populations. Therefore, we chose to test the effectiveness of embedding instructional content in a typical narrative structure. The idea here is to situate a set of instructions in a story where an event, known as the *Complicating action*, disrupts the story world’s harmony introducing tension which can only be resolved by a main character learning a new skill. The main character, in turn, is shown to reap strong positive outcomes from acquiring new skill during the *Resolution*, leading to a happy ending (*Coda*) [14], [15]. This idea is fully illustrated in Figure 2.

We were interested in discovering what might drive the effectiveness of using storytelling for teaching in the developing world. Was it the use of a setting and characters to which viewers could relate, as noted in [1], [4] and [5] or the use of narrative tension which is beneficially resolved by instructional content, as in [4] and [5]. Therefore, we decided to test the scheme shown in Figure 2 with and without the *Complicating action* component. The *Complicating action* is the source of a narrative’s tension. One might refer to it as a story’s “hook” – a story event that grabs audiences’ attention so that they want to find out how the plot’s tension resolves and what happens to the characters by the end.

We created *high motivation narratives* that included a compelling *Complicating action* whose resultant tension is beneficially resolved by characters learning a new skill via instructional content embedded in the narrative. We contrast

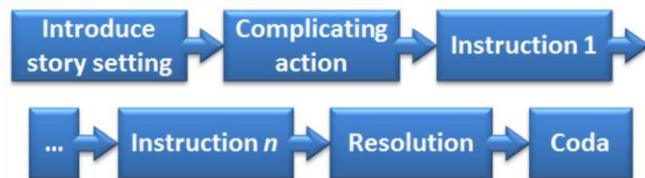


Fig. 2. We wanted to test the effectiveness of embedding sequential instructions (*Instruction 1* to *Instruction n*) in a typical narrative structure such that the instructions were preceded by the introduction of a story setting and characters and a *Complicating Action* that introduces tension. The instructions then serve to resolve the tension, leading to the *Resolution* and a happy ending, signified by the *Coda*.

this with *low motivation narratives* where no major *Complicating action* takes place and the embedded instructions still appear but do not serve to resolve any tension. In developing narratives for these videos, we used guiding principles from the Sabido methodology described earlier [5], [7]. Thus, the main character was typically hesitant to learn or practice the new skill (bed-making or vacuuming). However, another character encourages them to learn the skill by showing that it is achievable. The high motivation narratives go further: The *Complicating action* creates a situation that requires the main character to learn the new skill, and the story *Resolution* illustrates concrete benefits of learning the skill.

Another possibility is that narrative *per se* is not as important as the strong motivation provided by a compelling *Complicating action* and beneficial *Resolution*. In this case, learning might be motivated by a description of potential beneficial outcomes that are not couched in the form of a story. We refer to this presentation as *high motivation instructional*, where instructional content is bookended with voice-overs describing the benefits of learning the skills bed-making or vacuuming. Finally, we contrasted this with a baseline called *low motivation instructional* that comprised only the instructional steps incorporated in the other presentations with no additional narrative or motivational content.

IV. STUDY

A. Study Design

The aim of our study was twofold: to test the effectiveness (1) of embedding instructional content in a narrative structure; and (2) of motivational content which either described (via voice-overs) or illustrated (via a narrative) the benefits of learning a new skill. Thus our study had two independent variables:

--**Content**, either instructional (*I*) or combined instructional and narrative content (*N*)

--**Motivation**, either low motivation (*LM*) or high motivation (*HM*) is given for learning the skill demonstrated.

We used a 2x2 between-subjects study design, shown in Table 1, to allow us to test all combinations of Content (*I/N*) and Motivation (*LM/HM*). To make all the required comparisons, four videos for each task, bed-making and

TABLE I
2X2 EXPERIMENTAL DESIGN

	Instructional (I)	Narrative (N)
Low Motivation (LM)	LMI	LMN
High Motivation (HM)	HMI	HMN

Our study had two factors: *Content*, which was either instructional (I) or combined instructional and narrative (N), and *Motivation* which was either low (LM) or high (HM). In this table: LMI represents the low motivation instructional video, our baseline. HMI represents the high motivation instructional video, where instructional content was bookended with voice-overs describing the benefit of learning the skill demonstrated. LMN represents the low motivation narrative video, where instructions were embedded in a story featuring characters and a setting viewers could relate to, but no benefits for learning the skill demonstrated were portrayed. Finally, HMN represented the high motivation narrative video where instructional content was embedded in a story featuring relatable characters and settings and whose tension was driven by a main character's need to learn the skill demonstrated; in the end the main character reaps positive outcomes from learning the skill.

vacuuming, were required:

--*Low Motivation Instructional (LMI)*: shows only step-by-step instructions for completing the task of bed-making or vacuuming; this served as our baseline.

--*High Motivation Instructional (HMI)*: shows the step-by-step instructions bookended with introductory and concluding voice-overs which describe the benefits of acquiring the new skill and completing the task (either bed-making or vacuuming) correctly.

--*Low Motivation Narrative (LMN)*: the step-by-step instructions are embedded in a narrative featuring characters and settings that the viewer can relate to. However, this narrative has no real tension and illustrates no positive outcomes for acquiring the new skill and completing the task correctly.

--*High Motivation Narrative (HMN)*: the step-by-step instructions are embedded in a narrative featuring characters and settings that the viewer can relate along with a high tension plot driven by the main character's need to learn either bed-making or vacuuming. Ultimately, this narrative shows the main character experience a number of positive outcomes of acquiring the new skills and completing the task correctly.

We wanted to measure how effectively participants were able to learn the skills presented in the above videos. Because we were aiming to teach skills, we chose to measure how well participants were able to physically reproduce the tasks of bed-making and vacuuming as demonstrated in the videos. We designed our experimental procedure such that participants were asked to physically perform the bed-making and vacuuming tasks subsequent to viewing the videos (we describe this procedure in more detail below). During these hands-on tasks, we measured the following dependent variables as indicators of task performance:

- Score* for performance during the hands-on task
- The number of verbal *Encouragements* required during

the hands-on task

--The number of verbal *Reminders* required during the hands-on task

--The physical *Instances of Help* required during the hands-on task

Score was measured using a scoring system based on the videos' numbered instructional steps. As we will describe in the next section, the bed-making videos presented six distinct steps while the vacuuming videos contained nine. Thus, for the vacuuming task, participants were evaluated on nine steps corresponding to those in the vacuuming videos. For the bed-making task there were six points of evaluation. For each instructional step evaluated, the items comprising the step were identified. For instance, the "strip the bed" in bed-making step consisted of:

- strip all the bed items
- take each item off one at a time
- shake each item

Constituent items for each step were completely determined by what was demonstrated in the videos' instructional footage. Each individual item was awarded a score from 0 to 2 where 0 indicated that the item was omitted or incorrectly attempted, 1 indicated partial achievement and 2 complete achievement of the item. Since a requirement of bed-making is that the bed be neat by the end, we added an additional item to the bed-making to scale to score the neatness (also on a scale from 0 to 2). *Encouragements* were all instances where participants hesitated or seemed unsure and the experimenter offered verbal encouragement. *Reminders* refer to all instances where the participant needed verbal reminders of a step or item. And *Instances of Help* refers to instances where the participants required physical help or intervention to complete a step. A sample our scoring tool is shown in Fig. 3.

1. **Plugging in the vacuum cleaner**

	Not achieved	Partially achieved	Completely achieved
Inserting plug into wall socket	0	1	2
Turning on wall socket switch	0	1	2
Encouragements	Reminders		Instances of Help

Fig. 3. Sample from our scale showing how each task step was evaluated. A *Score* of between 0, 1 or 2 for each item comprising a step. We also noted the number *Encouragements*, *Reminders* and *Instances of Help* required by participants during each step. There were nine steps in total for the vacuuming task and six for the bed-making task.

B. Video Content

The content of our videos drew heavily from our observations at LabourNet’s training program, both for the correct steps in completing our chosen domestic tasks and the story elements used. We began by compiling instructional steps for correct bed-making and vacuuming. The low motivation instructional (LMI) videos present a demonstration for each of the steps making up these tasks. The steps were presented sequentially and numbered onscreen. As mentioned earlier, there were six steps for bed-making and nine for vacuuming. In all the videos the finished products (i.e., the neatly made bed and clean carpet) are clearly shown at the end. Screenshots from the instructional footage, including how the steps were numbered, are shown in Figures 4(a) and (b).

For the high motivation versions of the instructional videos, we added introductory and concluding voice-overs that echoed the benefits described in the high motivation narratives (which we will describe next). In the high motivation narrative (HMN) video for bed-making, the main character learns to make a bed neatly and subsequently rewarded with a stable, well-paying job. Thus, this was reflected in voice-overs used in the high motivation instructional (HMI) video for bed-making:

People who employ domestic workers value a high level of professionalism. Many domestic workers know how to make a bed but don't know how to do it so that the employer thinks it is very neat and well done. This can affect domestic workers chances of finding and keeping jobs. (instructional footage)

Making a bed this way takes a bit longer but it looks very neat and will impress employers. This improves a domestic worker's chances of getting a regular job and earning a good wage.

The high motivation narrative for vacuuming presents a domestic worker who is used to cleaning carpet by sweeping and is hesitant to use a vacuum cleaner. However, in the story she needs to clean a carpet very quickly. Vacuuming resolves her problem, leading to an impressed employer and the promise of extra employment. These elements were reflected in the voice-overs for the high motivation instructional (HMI) video for vacuuming:

Many domestic workers don't know how to use a vacuum cleaner and don't want to learn. But sometimes employers would like them to be able to use their vacuum cleaners. When a carpet is very dirty and needs to be cleaned up fast a using vacuum cleaner is faster and easier than using a broom. (instructional footage)

Once domestic workers show that they are able to use a vacuum cleaner, employers will be impressed and happy with their job. Knowing how to use a vacuum cleaner can improve a domestic worker's chances of getting more jobs.

The narrative videos showed the same instructional footage

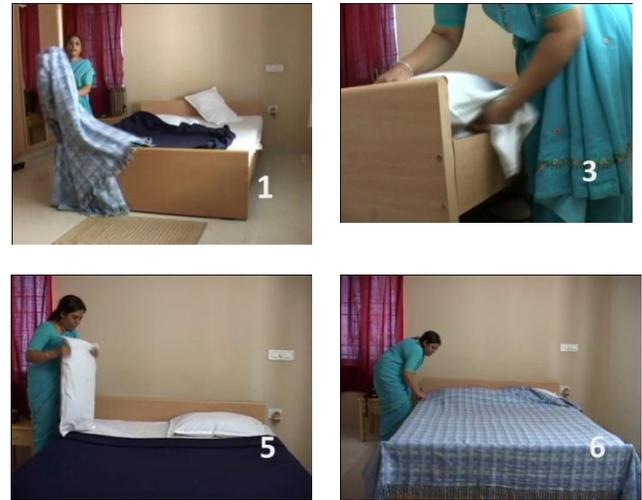


Fig. 4(a) Sample screenshots of the instructional footage for bed-making. Each step was numbered on-screen and there were six steps in total: bed stripping, mattress placement, even sheet placement, tucking, pillow placement, bed cover placement and tucking the bed cover over pillows.



Fig. 4(b) Sample screenshots of the instructional footage for vacuuming. Each step was numbered on-screen and there were nine steps in total: plugging in, where to start vacuuming, switching on, vacuuming in a line, covering a carpet's whole area, adjusting power settings, using attachments, switching off and unplugging.

used in the purely instructional videos edited together with story footage. In the narratives, the woman demonstrating the instructional steps is a character called Shukuntala who teaches another character, Lakshmi. We will first describe the narratives used for bed-making. In the high motivation narrative (HMN) for bed-making, Lakshmi is introduced, by voice-over, as a domestic worker in need of work. She has a chance at landing a stable job, but the potential employer has asked her to work a trial week. Lakshmi is shown making a bed and few close-up shots reveal that it is very messy. The potential employer enters and begins angrily pointing out all the things that are wrong with the bed and alludes to no wanting to hire Lakshmi. The employer exits, leaving a distraught Lakshmi who then calls Shukuntala to beg her for help. Shukuntala invites Lakshmi over to learn how to make a



Fig. 5(a) Screenshots depicting the storyline of the high motivation narrative (HMN) video for bed-making. The story starts (top left) with an disgruntled employer, leading Lakshmi to seek Shukuntala's help (top right), Shukuntala demonstrates correct bed-making (bottom left) and the next day Lakshmi impresses her employer and secures a daily job with a good wage (bottom right).

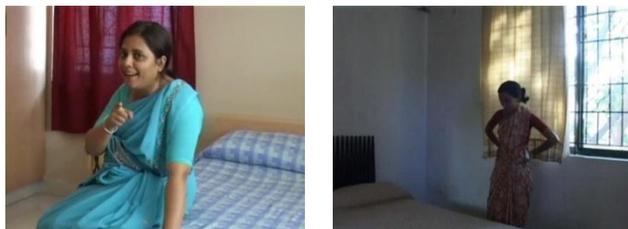


Fig. 5(b) Screenshots depicting the storyline of the low motivation narrative (LMN) video for bed-making. The story starts (top left) with Lakshmi noticing that her bed-making skills are lacking, leading her to seek Shukuntala's help (top right), Shukuntala demonstrates correct bed-making (bottom left) and the next day Lakshmi makes a neat bed successfully (bottom right).

bed properly. The next scene shows Shukuntala greeting Lakshmi and leads into the instructional bed-making footage. The instructional footage is intercut with shots of Lakshmi reacting to Shukuntala's demonstration and thinking back to all the things that were wrong with the bed she made earlier. When Shukuntala is finished, she invites Lakshmi to practice making the bed. The final scene shows Lakshmi making the bed from the first scene, this time very neatly. The potential employer enters and comments on the bed's neatness. Lakshmi says that she learned the proper way to make a bed, which leads the impressed employer to offer Lakshmi a regular job and a good wage. Screenshots for this narrative are shown in Figure 5(a).

In order to remove tension for the low motivation narrative

(LMN), there is no potential employer. Instead, viewers see only Lakshmi making the first bed badly and looking dissatisfied when she is finished. Lakshmi then calls Shukuntala and subsequently arrives at Shukuntala's to learn how to make a bed. Again, the instructional footage that follows is intercut with Lakshmi's reactions and flashbacks. The final scene shows Lakshmi making the first bed neatly and ends with her looking happy with the final product. This story has no tension and shows no clear reward for Lakshmi's improving her bed-making. Screenshots from this video are shown in Figure 5(b).

The vacuuming videos follow the same approach where high motivation narrative (HMN)'s tension is driven by a time constraint. The video starts with Lakshmi sweeping a carpet with a traditional broom as "4 p.m." is shown on screen. Lakshmi's employer enters and remarks that using her vacuum cleaner would surely be easier. Lakshmi says she hasn't used electrical appliances and prefers to sweep. The employer then reminds her that there are guests arriving at 5 p.m. and the house should look perfect. However, as the employer turns to leave, she knocks over a potted plant onto the rug. Both react in shock with the employer exclaiming that Lakshmi had better clean it up before the guests arrive. She also retorts "I hope that broom of yours is as good as my vacuum cleaner!" before leaving the room. As Lakshmi laments her situation, Shukuntala happens to call. Lakshmi tells her what has happened, and Shukuntala asks whether there is a vacuum cleaner in the house and offers to help. Shukuntala is shown arriving at 4:30 p.m., leading to the instructional footage where she shows Lakshmi how the vacuum the carpet. Again, this intercut with reactions from Lakshmi. When she has demonstrated four of the six vacuuming steps, Shukuntala hands Lakshmi the vacuum cleaner as a time of 4:40 p.m. is displayed onscreen. Although Lakshmi is reluctant to vacuum, Shukuntala insists and, next, Lakshmi is shown easily handling the vacuum cleaner. To finish off, Shukuntala demonstrates the final two steps (turning off and unplugging). By this time it is 4:57 p.m. and Shukuntala offers to let herself out. When the employer and two guests arrive, one guest immediately remarks on the clean house and the second asks Lakshmi if she is available for more jobs. The employer ushers the guests to the next room, leaving her alone with Lakshmi to express her delight at the clean carpet. Lakshmi tells her that she used the vacuum cleaner, which impresses the employer even more. The final shot shows Lakshmi remarking to herself what an "amazing" help the vacuum cleaner was and showing her excitement at the possibility of securing an extra job. Screenshots for the high motivation narrative (HMN) video are shown in Figure 6(a).

As with bed-making, the employer is removed from the low motivation narrative (LMN). This video starts with Lakshmi sweeping and then pausing to think about the vacuum cleaner (a shot of the vacuum cleaner in a cupboard is shown). Then she says to herself, "If I knew how to use that vacuum cleaning machine, I could be finished faster..." This leads her to call Shukuntala, who comes over and shows her how to vacuum. At the end, the two domestic workers admire the clean carpet. Screenshots from this video are shown in Figure 6(b).



Fig. 6(a) Screenshots depicting the storyline of the high motivation narrative (HMN) video for vacuuming. It all starts (top left) with an accidental pot plant spill and an irate employer demanding that it be cleaned within the hour; as Lakshmi laments her situation (top right), Shukuntala phones and offers to come help. Shukuntala shows Lakshmi how to use a vacuum cleaner (bottom left), and by the time the employer and guests arrive (bottom right), everything is clean, and one of the guests expresses interest in employing Lakshmi.



Fig. 6(b) Screenshots depicting the storyline of the low motivation narrative (LMN) video for vacuuming. The story starts (top left) with Lakshmi wondering if she could clean faster by using the vacuum cleaner (top right). She calls Shukuntala, who comes over and shows her how to use the vacuum (bottom left) and, finally, they both remark on how fast and easy the vacuuming was (bottom right).

C. Experimental Procedure & Sample

Thirty-four domestic workers, recruited by our NGO partner, participated voluntarily in our study. They were not offered compensation but were encouraged to participate for the training benefit. Of the 34 participants, 41% were completely illiterate. The rest reported being able to read and write in at least one Indian language. Schooling for the group ranged from none to Grade 10 with an average schooling grade of 4. Additionally, 41% did not make beds as part of their regular work, and 53% had never used a vacuum cleaner.

Each participant viewed two videos with each viewing directly followed by performing the task demonstrated in the video. Thus, the order of events for each participant was:

- Watch first video
- Perform first hands-on task
- Watch second video
- Perform second hands-on task
- Feedback on both tasks

The ordering of the two tasks, bed-making and vacuuming, was alternated across participants. Then, to maintain a balanced between-subjects design for our independent variables, *Content (I / N)* and *Motivation (LM / HM)*, participants watched one of the following two combinations of videos:

- Low Motivation Instructional (LMI) and High Motivation Narrative (HMN); or
- High Motivation Instructional (HMI) and Low Motivation Narrative (LMN).

Note that no participant repeated any level of either Content (I / N) or Motivation (LM / HM). Each experienced only one instructional, one narrative, one low motivation and one high motivation video. So, no one viewed low motivation or narrative content more than once, for instance. The ordering for the video combinations was also balanced. For example, in the case of the first combination, the ordering of LMI and HMN videos was alternated across participants.

After watching each of the videos, participants were asked to reproduce what they had seen in the video as best as they could. For this they were provided with the same materials shown in the video. For bed-making they were provided a half-made bed with a sheet, pillows and bed cover. For vacuuming, they were provided a rug and the same vacuum cleaner shown in the video. The experimenter scored each participant's *Score* using a scoring system based on the videos' numbered instructional steps. We also recorded the number of *Encouragements*, *Reminders*, and *Instances of Help* required. Giving of *Encouragements*, *Reminders* and *Instances of Help* followed a strict procedure. At the first sign of participant uncertainty, the experimenter offered verbal *Encouragement*. If the participant was still unsure, they were given a *Reminder* related to the particular part of the task they were struggling with. If, after receiving both a verbal *Encouragement* and *Reminder*, a participant was still unable to complete the current step, they were offered an *Instance of Help*. Help usually took the form of pointing out the correct switch on the vacuum cleaner or demonstrating how to correctly tuck in a sheet. If a participant completed a step incorrectly, but did not seek any assistance, the step was scored as "Not Achieved" and the participant moved on to the next step. After both videos and subsequent tasks were completed, comprehensive feedback which covered their performance in both tasks was given. This feedback was tailored to each participant and picked out things that they did well and did incorrectly. The final feedback step did not form part of our experiment as it took place after all measurements were completed. Recall that participants were not offered

material or monetary compensation for partaking in our study. They participated to gain the benefit of learning or solidifying domestic work skills; thus we wanted to ensure that the experience served the purposes of our experiment while offering a complete training experience for participants.

Since our experimental setting required that the same experimenter who scored participants' task performance allocated the experimental conditions, we sought to counteract any scoring biases by using a second, independent scorer who was blind to each condition. To achieve this all hands-on tasks during the experiment were video recorded so that they could be scored later by the second evaluator. The second evaluator scored each task using the same scale described earlier in Section A and judged the number of *Encouragements*, *Reminders*, and *Instances of Help* given. Thus the experimenter scored task performance during the experiment while the second evaluator scored task performance later based on the video footage without knowing which video had been viewed by participants. The two sets of scores (from each evaluator) were then compared and all differences were identified. Each difference was individually examined and addressed by the two evaluators to reach agreement. Ultimately the data underwent five passes before full consensus was reached.

For analysis, we eliminated 8 data points for the following reasons:

- The hands-on tasks for two participants were not video recorded successfully and could not be independently scored.
- Four participants were simultaneously enrolled in LabourNet's domestic training program and were thus already familiar with the bed-making instructions shown in our videos.
- One participant did not speak Kannada (the language used in the videos).
- One participant accidentally viewed segments of the bed-making video twice before her hands-on task.

V. RESULTS

For each task (vacuuming and bed-making), we conducted a 2x2 factorial ANOVA to test for the effects of using instructional-only content (I) vs. combined instructional and narrative content (N) and using low motivation (LM) vs. high motivation (HM) content. We tested the effect of these manipulations on *Score*, *Encouragements*, *Reminders* and *Instances of Help* measured during the hands-on tasks. We found no significant results for the latter three variables in either task. We also found no significant differences for vacuuming scores. However, the vacuuming scores were also not normally distributed within the HM and N groups (necessitating the use of non-parametric ANOVAs) and were significantly skewed ($skew = -1.17$) towards high scores. This skew makes it difficult to observe any effects because the task appears to have been too easy for most participants, thus obscuring differences within the factors. The lack of significant results in the vacuuming task most likely indicates a ceiling effect. Figure 7 (top) illustrates the mean normalized task scores for the vacuuming task for each video. Note that for each video condition, scores were between 80 and 90% of

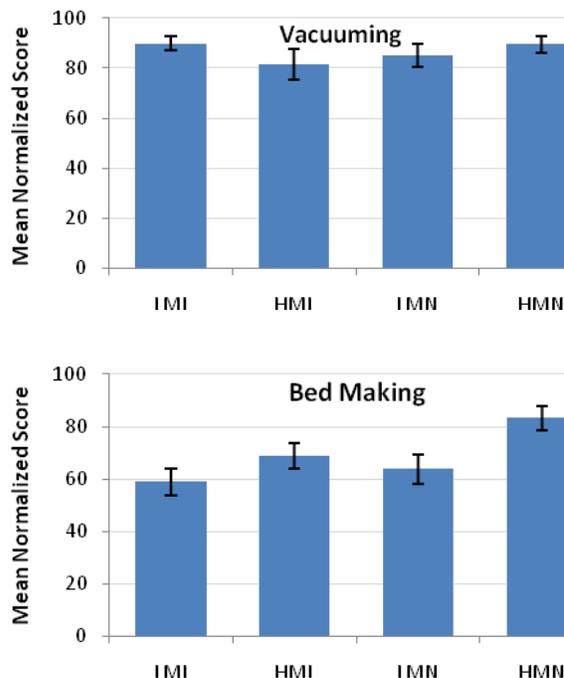


Fig 7. Mean scores for each task for each of our four different videos: low motivation instructional (LMI), high motivation instructional (HMI), low motivation narrative (LMN), and high motivation narrative (HMN). Bars indicate the standard error for each group. Note that for Vacuuming, all scores are near ceiling. For Bed Making, performance on high motivation narrative (HMN) is superior to all other conditions.

perfect.

However, bed-making scores were normally distributed, making the effects of *Content* and *Motivation* clearer as shown in Figure 7(bottom). There was a significant main effect for *Motivation*, where participants viewing high motivation (HM) videos scored better than those viewing low motivation (LM) ones ($F(1,22)=8.36, p=0.008$). We also observed an almost-significant effect for *Content* ($F(1,22)=3.63, p=0.07$), where narrative (N) videos led to better scores than instructional (I) ones. We conducted post-hoc testing among the four different bed-making videos. Using simple t-tests with a Bonferroni correction, we found that scores subsequent to the high motivation narrative (HMN) video was better than those after any of the other videos (which were not significantly different from each other). Because of the small number of scores for each video condition, the only strongly significant difference was between the HMN video and, our baseline, low motivation instructional (LMI) ($t(11)=3.83, p=0.003$). The differences between the HMN video and both low motivation narrative (LMN) and high motivation instructional (HMI) videos were borderline significant ($t(9)=2.23, p=0.05$ and $t(12)=2.13, p=0.05$ respectively). What is interesting about this result is that the high motivation narrative (HMN) video was the only video leading to noticeably higher bed-making scores; the differences among the other four videos were negligible.

Figure 7 (bottom) shows a means plot of the four different videos where one can see the significant difference between the HMN and LMI videos. If one begins by looking at the scores with the LMI video (our baseline), one can see that the

individual additions of motivational content (in the HMI video) and a narrative devoid of tension or motivational content (in the LMN video) resulted in non-significant score improvements. But the addition of *both* high motivation content and narrative framing in the HMN video resulted in significant score improvement. Considering our earlier main effect of higher scores achieved with high motivation (HM), as opposed to low motivation (LM) videos, it would appear that high motivation content makes the bigger impact. But our post-hoc results suggest that high motivation content worked best when combined with a narrative.

VI. CONCLUSIONS AND FUTURE WORK

The primary motivation for carrying out this research was to test if and how teaching through storytelling is effective for developing-world contexts. We wanted to test whether presenting instructional content couched in narratives would be more effective than presenting instructional content alone. Additionally we wanted to test whether a narrative which presented only a context and characters to which viewers could relate (low motivation narrative) was sufficient to promote learning or if the story should also contain tension and illustrate compelling benefits associated with learning (high motivation narrative). Finally, we compared two ways of presenting the positive outcomes associated with learning: by dramatically illustrating the benefits afforded to story characters that learn a new skill (again, high motivation narrative) or through describing the potential benefits of skill learning in voice-overs that bracket the instructions (high motivation instructional). This investigation was applied to videos for teaching new skills to domestic workers. Of the two skills we chose to teach in our study, our vacuuming task proved to be too easy for participants while bed-making showed clear results.

Upon reflecting on the ceiling effect noted for the vacuuming task, we came to some conclusions we had not set out to find. Although more than half of the participants had never used a vacuum, scores for the vacuuming task were overwhelmingly high. In fact, we found no statistical correlation between vacuuming scores and previous vacuuming experience. On the other hand, the bed-making task produced a range of normally distributed scores. One possibility for these differences is that the novelty of vacuuming caused participants to watch that vacuuming videos more attentively. Secondly, vacuuming and bed-making are rather different types of tasks. Vacuuming quality is easier to achieve as the vacuum cleaner makes the task relatively straightforward, even when it is novel. But bed-making is a more manual task and requires greater attention to detail as it includes aspects of aesthetics and neatness. The relative ease of vacuuming and the greater complexity of bed-making could explain the overwhelmingly high vacuuming scores and the more variable bed-making scores we noted. Finally, because of the differences in the nature of vacuuming and bed-making, the instructional video footage demonstrating them also differed: vacuuming was presented in nine short, simple steps (e.g., “switch on the vacuum cleaner” and “place

the vacuum at one corner of the rug”) while the six bed-making steps were more complex. Sheet tucking, for example, consisted of tucking in the sheet all the way around the bed and neat corner tucking using three distinct tucks. Although we did not test this directly, our results suggest that describing a task using short steps made the procedure easier to reproduce, despite the task being unfamiliar.

Regarding those questions we did set out to test directly: high motivation narrative video was the richest type of video we created, and compared with the simplest video (low motivation instructional), it led to significantly higher scores. When compared with the other two videos, namely low motivation narrative and high motivation instructional, the high motivation narrative score improvements were borderline significant. It is worth noting that when the instructional content was embedded in a low motivation narrative or bookended by motivational voice-overs, the increases in scores were negligible. It was only when high motivation content and narrative were combined that a significant score increase was noted. It is also striking that such marked differences between the high motivation narrative video and the other three videos were observed with relatively small samples ($n=8$ for HMN, $n=5$ for LMN, and $n=7$ for HMI). Further research with larger sample groups would certainly help clarify this. We feel confident that, with larger sample sizes, these differences would be reproduced even more markedly.

People are naturally drawn to stories, and our findings suggest that this may be exploited to engage people in educational content. Even something as prosaic as bed-making can be made more appealing when presented in a narrative which illustrates learning benefits in an entertaining and compelling way. The motivational content used in our videos went beyond merely demonstrating a skill and showed the real-life benefits of learning that skill. This reinforces [4]’s finding where a dramatized video illustrating the real-life benefits of a job-search application acted as a catalyst for motivating illiterate women to use the application successfully. We believe the same mechanism was revealed in our study. The domestic workers were fully capable of learning the steps required to make a bed neatly and professionally. But, they were more motivated to pay attention to the videos and during the hands-on task when the video’s narrative engaged their attention and presented them with concrete benefits for learning proper bed-making.

Furthermore, we can conclude that local context and characters in videos was not enough to boost learning. Digital Green [1] found that videos with local farmers on local land allowed their target audience (farmers) to immediately identify with the setting. Our results show that having actors play the roles of domestic workers who wear saris and speak Kannada wasn’t enough to get the desired effect with domestic workers. It was the addition of an attention grabbing story “hook” and motivational content that significantly bolstered learning.

Overall, our results suggest that, for low-literate audiences unused to classroom learning, it may not be enough to simply give information or instruction. Instead, illustrating or

describing real-life benefits in a compelling drama makes viewers *want* to learn the skill. In our study, we believe that high motivation narrative framing not only increased retention of instructional content but also prompted subjects to perform the hands-on bed-making task with more attention to detail, leading to better scores.

We believe there is a rich and exciting path forward in investigating narrative videos as a compelling, low-cost teaching tool in the developing world. It would, as a first step, be useful to repeat a study of the same form as presented in this paper using a within-subject design to reinforce our findings. A critical step forward in determining enduring benefits of narrative videos would be the investigation of long-term retention. Our study measured immediate learning, but a longitudinal study that measures recall after different periods of time would clarify the long-term benefits of narrative teaching videos. Additionally, such a study should investigate whether repeated viewings of videos are necessary to promote long-term retention and, if so, experiment with different numbers of repeat viewings. A variation suggested by our NGO partner would use narrative videos to attract people to training. An entertaining and compelling video could be used to grab their attention at initial screenings and, thereafter, videos could be made available at central locations for viewing at any time in order to reinforce learning. A good measure of the amount of interest generated in training would be the number of trainees who come back independently to view the videos. Because narrative videos may have the potential to operate as a standalone teaching tools that do not require a trainer to be present, this method would make the organization of training sessions easier and better accommodate informal workers' flexible and unpredictable schedules better than training sessions with fixed times.

Finally, in our study we measured task performance when participants reproduced the skill demonstrated in the videos. We have speculated that the success of the high motivation narratives lies in motivating people to pay attention to the instructional content and to approach learning with greater focus. Due to time restrictions with our participants, we were able to measure only task performance. A study that also measures participants' attention and motivation to learn would shed light on the ways in which narrative and motivational content might operate to encourage learning.

ACKNOWLEDGMENTS

We are deeply appreciative to LabourNet for collaborating with us on this study in particular Gayathri Vasudevan, Manju Muraleedharan and Gowri N. Thank-you to Prathiba G, Mallika Kaikaryam, Rashmi KY, Aishwarya Ratan, Angali US and Sahana Sharma for assisting in creating videos. We also thank Kentaro Toyama for valuable advice during this study's formative stages and Paige Bills for assistance during the experiment.

REFERENCES

- [1] R. Gandhi, R. Veeraraghavan, K. Toyama, and V. Ramprasad, "Digital Green: Participatory Video for Agricultural Extension", *IEEE/ACM International Conference on Information and Communication Technologies and Development*, Bangalore (2007).
- [2] I. Medhi, G. Menon, and K. Toyama, "Challenges in computerized job search for the developing world." In *CHI '08 Extended Abstracts on Human Factors in Computing Systems*, Florence, Italy, April 05 - 10, 2008.
- [3] I. Medhi, A. Sagar, and K. Toyama "Text-Free User Interfaces for Illiterate and Semi-Literate Users." *IEEE/ACM International Conference on Information and Communication Technologies and Development*, USA,(2006).
- [4] I. Medhi, K. Toyama, "Full-Context Videos for First-Time, Non-literate PC Users", *IEEE/ACM International Conference on Information and Communication Technologies and Development*, Bangalore (2007).
- [5] K. Barker, "Sex, Soap and Social Change – The Sabido Methodology" *AIDS LINK* Issue 104, July, 2007
- [6] A. Bandura, D. Ross, S.A. Ross, "Vicarious reinforcement and imitative learning." *The Journal of Abnormal and Social Psychology*. vol. 67(6), Dec 1963, pp. 601-607
- [7] K. Barker, M. Sabido. "Soap Operas for Social Change to Prevent HIV/AIDS: A training guide for journalists and media personnel" Available: <http://www.populationmedia.org/2005/01/06/soap-operas-for-social-change-to-prevent-hiv-aids/>
- [8] A. Singhal, E.M. Rogers "A Theoretical Agenda for Entertainment-Education" *Communication Theory* vol.12(2), May 2007, pp.117-135
- [9] P. W. Vaughan, E. M. Rogers, A. Singhal, R. M Swalehe "Entertainment-Education and HIV/AIDS Prevention: A Field Experiment in Tanzania" *Journal of Health Communication* vol. 5(supplement), 2000, pp.81-1000.
- [10] M. Steehouder, J. Karreman, N. Ummelen, "Making sense of step-by-step procedures" *18th Annual ACM Conference on Computer Documentation: Technology & Teamwork*, 2000.
- [11] T. Crews, G. Biswas, S. Goldman, and J. D. Bransford, "Anchored interactive learning environments", *International Journal of AI in Education* vol.8, 1997, pp. 142-178
- [12] J. D. Bransford, S.R. Goldman, T.S. Hasselbring, A. Heath, D. Hickey, J.W. Pellegrino, K. Rewey, N.J. Vye, "The jasper series as an example of anchored instruction: Theory, program description and assessment data", *Educational Psychologist*, vol.27, 1992
- [13] L. Zech, N.J. Vye, J.D. Bransford, S.R. Goldman, B.J. Barron, D.L. Schwartz, R. Kisst-Hackett, C. Mayfield-Stewart, and Cognition and Technology Group at Vanderbilt, "An introduction to geometry through anchored instruction", in *New Directions for Teaching and Learning in Geometry* R. Lehrer & D. Chazan (Eds) Mahwah, NJ: Erlbaum, pp. 439-463, 1998
- [14] V. I. Propp, "Morphology of the Folktale", L.A. Wagner (Ed), 1895 (Translated 1968) Austin, Texas U.P.
- [15] W. Labov, "The Transformation of Experience in Narrative Syntax", in *Language in the Inner City: Studies in the Black English Vernacular*, W. Labov, 1972. University of Philadelphia Press.