

**DEVELOPMENT AND EVALUATION OF E – NUTRITION EDUCATION MATERIAL
FOR RURAL WOMEN**

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ABSTRACT

Most of the rural population have difficulty with computer technology. They are computer illiterate, and this limitation can be lessened using the multimedia elements to assist in their interaction with computers. One of these multimedia elements is 2D animation. The present study was conducted to develop e-learning nutrition education package (EWE) for rural women by following appropriate guidelines to achieve better design interface and incorporating modifications based on evaluation from field functionaries and rural women.

An experiment was carried out to measure the user acceptance. The findings showed positive feedback and acceptance Overall, the results showed that the 2D animation was helpful in facilitating an understanding of the content. These initial findings indicate the possibility of using a digital educational package. Further exploration with larger samples and modules is essential in order to increase the nutritional and health knowledge and awareness among the rural population.

Introduction

In the developing countries, rural areas comprise the major population. Mostly these areas lack resources in access to health care, access to quality education, access to technology, transportation, communication and lack of guidance. Thus it is necessary to develop their interest in the latest educational technology and equip them with proper skills. This may increase their ability to learn, experience and master the latest technology and utilize the technological

applications. By utilizing their basic education and learning skills they can raise their living standards and consequently contribute in the overall economy.

The tremendous development in Information and Communication Technologies (ICTs) has paved the way for e-learning. The modern educational technology facilitates the designing, delivery and management of educational activities for learners. E-learning facilitates means to the learners for accessing learning material any time and at any place. Effective e-learning can help in spreading of modern education, improve the quality and equip learners with skills that lead them to contribute to better socio-economic development.

A concept closely related to e-learning but preceding the birth of the Internet is multimedia learning. Multimedia uses two or more media, such as text, graphics, animation, audio, or video, to produce engaging content that learners access via computer.

According to Gould & Anderson (2002), combining multimedia elements could help people who are illiterate. 2D animated objects are widely used today, especially in the fields of medicine and educational application areas. These interaction designs allow for the learning process to become easier and more effective than traditional reading methods. Evidence suggests that e-learning is more efficient because learners gain knowledge, skills, and attitudes faster than through traditional instructor-led methods. This efficiency is likely to translate into improved motivation and performance. E-learners have demonstrated increased retention rates and better utilization of content, resulting in better achievement of knowledge, skills, and attitudes. Multimedia e-learning offers learners, the flexibility to select from a large menu of media options to accommodate their diverse learning styles (Clark, 2002)

Thus Multimedia technology integration is becoming a core part in the development of e – learning technologies.

Economic empowerment of women might help in improving their health status, but it cannot work alone. It has to be achieved by maintaining a good nutritional status, so there is need to educate and create awareness among women about a balanced diet during pregnancy and lactation, nutritional needs and requirements of infants, toddlers and young children, common nutritional deficiency diseases observed in these vulnerable groups with a special emphasis on basic health and hygiene. Thus recognizing the importance of nutritional education for the rural women, an attempt was made to develop an e – learning nutrition educational material for the rural population, so that they can gain confidence and attain maximum health potential in their lives. The subsequent choice to develop a 2 D animated film was a novel approach to overcome the barriers of boredom experienced by women by participating in nutrition education intervention

programmes as they stated it as monotonous. Thus it was decided to develop e – learning nutrition education content using the most fascinating component of multimedia technology which is animation.

Animation done in the form of a 2D animated film would combine education with entertainment which is an effective way to create interest and motivate rural audience to participate in health promotional activities.

Based on the study by Brug et al.(1999), nutritional education using computers is more effective than traditional nutrition education, as the digital nutrition education package is more readable and memorable than the traditional education materials, including booklets and pamphlets

In addition, combining text, audio, video and graphics helped people who were illiterate (Gould et al.2000).

Materials and methods

Tackling nutritional and hygiene issues among the rural population is a challenge because of illiteracy and thus nutritional knowledge of rural women in rural areas is inadequate. Illiteracy is widespread but often a hidden problem.Those with the lowest literacy rates also have the poorest health status. These facts must be considered when developing and evaluating suitable educational intervention for rural families. Therefore, development of an appropriate nutritional education package could be effective in improving the quality of life and living of rural women.Thus the aim of the study was to develop E – nutrition education material covering aspects like nutritional needs of children (0-6 years) pregnant and lactating women, the common nutritional deficiencies seen in these vulnerable groups of rural population and strategies to prevent and control these deficiencies with a major focus on maintaining proper hygiene and sanitation, diarrhea, immunization, malaria and deworming.

The process of designing and development of the e – nutrition education material was in the following manner:

The relevant content for each area by referring to different study materials were prepared by the researcher.Firstly, specific data collection techniques were employed to elicit facts and gather data from various sources of information such as documents, guidelines, protocols and targeted respondents. In this study involvement of rural women in developing and evaluating the e – nutrition education material was essential representing the underpinning philosophy held by the researcher.

An extensive literature review on available nutrition education packages related to rural population was studied to develop a suitable nutritional educational intervention package. Thus a

content analysis approach was employed to study and examine the various related documents which was then finalized to make a short educational film.

The e – learning content developed using multimedia technology was delivered via CD – ROM. Multimedia CD – ROM technology provides several benefits over print and video used in educational resource development. The flexibility of the CD –ROM format permits users to learn at their own pace. The CD –ROM use of graphics and animations with voice over eliminates some of the obstacles to independent learning encountered by people with limited literacy.

A multimedia software professional was employed to design the graphics of the 2D animation education film using Adobe flash software cs6 and Photoshop CS5 that would assist rural women have information for better understanding the nutrition, health and hygiene.

Images of rural village, characters, foods and meals were designed according to each scene in the film. A series of meetings were conducted with the dieticians, nutritionists, public health physicians and an anthropologist to finalize the content to be incorporated in the film as well as its suitability with regard to the rural settings. Script and storyboard content development was guided also by feedback from various focus groups.

The 2D animated film developed was for 15 minutes and prepared in English and it was translated in Telugu as it was the local language.

After a “first draft” of the CD-ROM was completed, it was presented to a group of experts belonging to the staff of Department of Food and Nutrition, College of Home science and their suggestions were incorporated in the final version of the software to the program to test the suitability of the developed package and to improve clarity.

Finally the researcher decided ‘EWE’ –educating women through e – learning as the name/title of the 2D animated short educational film. Suitable dialogues were written for each scene. In view of the low literacy level of the respondents the dialogues were kept simple and clear. The e – nutrition education material/2 D animated short film developed in local language i.e. Telugu was pre – tested with 30 field functionaries and 30 rural women who had a formal education and were able to read and write. Subjects were asked to complete a checklist consisting of acceptance evaluation of the e- nutrition education package with respect to various indicators like the script, 2D animation, language and dialogues, voice recording, lip synchronization, speed of the animation, the layout and design, background music used, color and the overall concept. They were also asked to give their suggestions and comments on the film. They were given ample time to review the package. Data was analysed descriptively using numbers and percentages.

Description of each scene

The 2D animated film EWE – Educating women through e – learning comprises of 9 scenes in total and the film covers basic issues on nutrition, health and hygiene for the vulnerable groups.

This short 2D animated educational film is culturally appropriate communicating messages that addressed educating rural women. In this film the doctor has been used as the main tool to impart important messages on growth and development of children and prevention and control of the nutritional deficiency diseases occurring among the vulnerable groups in rural population. Creative and exciting storyboard has been designed to promote the nutrition, health and hygiene issues in an appealing and provocative way for the rural women. This animated film is the flagship medium through which a set of characters come to life capturing the attention and imagination of audience and providing a creative focus.

Scene 1 is an introductory scene showing a village where a cradle ceremony of a baby girl is going on for which the women of the village gather for lunch. This scene deals with the importance of diet during pregnancy and lactation.

Scene 2 deals entirely with the causes, symptoms and preventive measures of anemia.

Scene 3 explains the women about the harmful effects of pre-lacteal feeds and importance of colostrum and benefits of breastfeeding. The doctor in the animation even tells the women about the importance of a growth chart and immunization card.

Scene 4 talks about the right type of food at the right time to be given during complementary feeding.

Scene 5 discusses about the diet of pre – school children and the importance of giving frequent nutrient dense meals.

Scene 6 focusses on the importance of a balanced diet for school going children.

Scene 7 explains all about iodine deficiency disorders and its harmful effects on pregnant women as well as on the newborn.

Scene 8 advocates about the importance of vitamin A its causes, symptoms and treatment.

Scene 9 is the last scene of the film which talks all about prevention of diarrheal diseases particularly in children and importance of ORS.

Results and discussion

Evaluating the effectiveness of any project is considered the most significant issue. As Reeves and Hedberg (2003) stated that effectiveness is used to determine whether the interactive learning system accomplishes its objectives within the immediate or short-term context of its implementation.

The results of the evaluation of the 2D animated film are given in the table I

Majority of the subjects gave positive responses. The results showed that the field functionaries and the rural women found the animated film very delightful and interesting and it was the first time they witnessed something like this which was especially created for them.

1. Script

The script was clearly understood and they found it to be good as it facilitated content delivery of information. Results showed that 46.67% of the anganwadi workers found the script to be good and 53.33% found it to be excellent. Almost half of the rural women 48.58% found the script to be good and 51.42% expressed it as excellent.

2. 2 D animation

Results showed that 53.33% of the anganwadi workers found the 2 D animation to be good and 46.67% found it excellent. 51.30 percent of rural women found the animation to be good and 48.70 percent said it was excellent. They stated that the developed animation matched their understanding level as the concept was made very clear through it.

Anna et al. (2002) developed eight educational modules using the IMM concept with touch-screen technology and a mouse for heart disease patients (mean age 74 years). Most of the subjects were satisfied with the program and agreed that the program was user-friendly and did not require any computer experience. 2D animation can help to increase the rate of learning, and the understanding of the visuals viewed. As for animations in the package, each movement was slow, in order to make sure that the rural subjects can keep up with it. Higher frame rates were used to ensure the smoothness of animations.

3. Language and dialogues

The language and dialogues form the core part of any film and the animated film with script and dialogues, interesting with life relating event was one of the factors which facilitated the content delivery. About 43.33% of the anganwadi workers found it to be excellently written in a clear language with usage of familiar words and 56.67 percent of them found it to be good with insightful dialogues. More than half of the rural women 55.10 percent found the dialogues to be excellent and 44.90 percent of them rated it to be good and interesting as they could feel a sense of familiarity. The language used was generalised to be understood by novice computer users. In addition, few subjects (anganwadi workers) suggested that dialogues in EWE should be simplified and the use of some scientific terminology should be reduced.

4.Voice recording

Choosing the right voice is vital and just as the designs of an ensemble of animated characters should look distinctive so should their voices. Ninety percent of the anganwadi workers agreed that the audio and voice recording was excellent which helped them to understand the animation better. The subjects stated that the animated film had good performance by the voice artists too. Among the rural women 86 percent of them rated the voice acting to be excellent and only a part of them i.e., of about 12 percent stated it to be good. They were delighted to watch the change of voice with characters and expressions. This animation was the first of its kind which they witnessed and appreciated how so many characters were incorporated with different voices.

5.Lip synchronization

Lip synchronization is the technique of moving the mouth of an animated character in such a way that it appears to speak in synchronism with the sound track (Wikipedia, 2006). Fifty five percent of anganwadi workers expressed that found the lip synchronization was good and 45.00% of subjects said it was excellent. In the case of rural women 45.90 % regarded it as excellent and 54.10 percent of them stated it as good.

6.Speed of animation

The results showed that 80.00% of the anganwadi workers were satisfied with the speed of the animation and its appropriateness, where as 20 percent of them rated it as excellent. About 49.90 percent of the rural women rated the speed of the film to be excellent and 60.10 percent found it to be good

7.Layout and design

Layout is defined as the motion sequence of the object or as a set of basic events. 36.67% of the anganwadi workers found the layout and design of the rural plot to be excellent and 63.33% of them found it reasonably good where as the rural women 65.50 percent of them found the design to be excellent and only 34.50 percent of them found it to be good. The design and layout of each page was standardised and made consistent. More pictures, graphics and illustrations were incorporated to make it more attractive. The present study findings were similar to the study of Ruzita and Rasyedah (2001), which demonstrated that drawings, diagrams and illustrations play an important role in nutrition education materials and can facilitate understanding and keep up the reader's attention.

8.Background music

Continuous soft background music spanning across multiple shots was given to create an emotional response among the viewers. Thus the subjects stated that the background music directed attention to important scenes. About 20.00 percent of the anganwadi workers found the

background music to be average in certain scenes, 36.67 % found it to be good when 43.33 % found it excellent while among the rural women 20 percent of them found it average ,39.67 percent rated as good and 60.33 percent as excellent.

9.Color balance

Color balance is one of the visual factors that contributed to the mood of the animated film. About 85 percent of anganwadi workers found the color balance to be excellent and 15% found it to be good. Since the movie is created for the rural population it was stressed that the film be made as colorful and natural as possible. And thus the color balance has been adjusted accordingly.Regarding rural women 80 percent of them loved the color in the film and 20 percent of them rated it as good.

10.Overall concept and presentation

Majority of the anganwadi workers concluded that 'EWE' animated film contained detailed information on nutrition, health and hygiene. Besides, they also perceived that such type of films, are capable of enhancing knowledge about a healthy lifestyle. 88.33 percent of subjects found the film to be excellent in its overall concept and presentation and 11.67 percent subjects found it to be good where as 13.67 percent of rural women found it to be good but 86.33 percent rated it as excellent.The rural women were more excited and showed enthusiasm towards the animated movie. Most subjects preferred e-nutrition education package in the digital form, as it was perceived as more interesting and readable than the nutrition education in the form of a booklet. The preference for the digital format is probably due to the integration of multi-elements, including graphics, image, audio and video, inconveying the nutritional information. This finding also agrees with a study by Brug et al. (1999), which showed that nutritional education in a digital form is more readable and memorable than commonly used traditional educational materials, such as brochures.Rifkin et al. (2001), who applied the IMM concept with a digital photo receiver as media, showed that most subjects opined that information was more readable and understandable in a digital form

The e-nutrition education intervention package developed was well accepted by both the anganwadi workers and rural women.However, modifications with respect to medical terminology and addition of more illustrations were needed to further improve the understanding and acceptability of the package. Thus the researcher sought suggestions regarding other areas which needed further improvement from the anganwadi workers and rural women of ways to improve understanding or comprehension of the e-learning material developed.It was modified and tested for face and content validity. However, some medical and scientific terms were

retained with the intention of educating the population, with explicit explanations provided in simple language.

The suggestion by health staff to incorporate more photos and illustrations in the flipchart and booklet are in agreement with the finding by Goldberg and Owen (1999) in that photos and illustrations should facilitate understanding of health messages without the need for text. Gould and Anderson (2000) also proved that using IMM can save costs in the long term when compared with traditional educational materials such as brochures.

Rifkin et al. (2006) conducted a study on a digital photo receiver called CEIVA, which was an image-sharing technology for receiving, storing, displaying and arranging photos. Their findings showed that the digital photo receiver was useful in providing nutrition education to lower income people.

Oh and Kim (2007) found that most Korean children like to play computer games; therefore, they developed a nutritional education program based on a computer game and applied the IMM concept to educate children about the importance of having a balanced diet and to encourage them to eat more fruits and vegetables.

Most research has applied the IMM concept, including that by Hans et al. (1996), which showed that the understanding level of the educational content and the method to use computers were satisfactory among heart disease patients.

The digital education acceptance level was also 100% among colon cancer subjects (Stefan et al. 2009).

Table I. Evaluation of the 2D animated short film (EWE) by the anganwadi workers and rural women

S.no	aspects	Evaluation by field functionaries (%) (n=30)			Evaluation by rural women (%) (n=30)		
		Average	Good	Excellent	Average	Good	Excellent
1	Script	0.00	46.67	53.33	0.00	48.58	51.42
2	2D-animation	0.00	53.33	46.67	0.00	51.30	48.70
3	Language and dialogues	0.00	56.67	43.33	0.00	44.90	55.10
4	Voice recording	0.00	10.00	90.00	0.00	12.00	86.00

5	Lip synchronization	0.00	55.00	45.00	0.00	54.10	45.90
6	Speed of animation	0.00	80.00	20.00	0.00	60.10	49.90
7	Layout and design	0.00	63.33	36.67	0.00	34.50	65.50
8	Background music	20.00	36.67	43.33	0.00	39.67	60.33
9	Color balance	0.00	15.00	85.00	0.00	20.00	80.00
10	Overall concept and presentation	0.00	11.67	88.33	0.00	13.67	86.33

Conclusion

Thus it can be concluded that the intervention package had the potential to increase the nutrition and health knowledge, motivate the rural women to adopt healthy eating and follow a healthy lifestyle, thus reducing morbidity risk and the cost incurred for health care.

It was also suggested that the 2D animated film was a useful and an engaging powerful tool to increase the attention span of the subjects. It can serve as a model for developing future health related documents. However, health related staff must be trained to use and implement the package to ensure its sustainability in improving health outcomes of older adults in the community. It would also be interesting to implement the package into a web-based application, so that more users can access and benefit from it. A technological system is considered successful when most consumers are interested in using the technology that helps them to believe that these systems are easy to use and beneficial.