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Kuselan K
Student, Department of Agriculture Ext., COA, IGKV, Raipur, Chhattisgarh, India

Mooventhan P
Senior Scientist, ICAR-NIBSM, Baronda, Raipur, Chhattisgarh, India

Rajesh Singh Sengar
Prof., Department of Agriculture Ext., COA, IGKV, Raipur, Chhattisgarh, India

Uttam Singh
Senior Research Fellow, ICAR-NIBSM, Baronda, Raipur, Chhattisgarh, India

Corresponding Author:
Kuselan K
Student, Department of Agriculture Ext., COA, IGKV, Raipur, Chhattisgarh, India

Developing and testing the effectiveness of foldscope mobile application on knowledge of agricultural graduates

Kuselan K, Mooventhan P, Rajesh Singh Sengar and Uttam Singh

Abstract
In the present day, we find ourselves in an age where media holds significant sway, with mobile devices emerging as the preeminent communication medium due to their widespread use and extensive reach. As technology continues to advance in the realm of education, a plethora of digital applications are now accessible to educators. Among these, educational mobile apps and digital magazines stand out as prime examples of technologies that have the potential to enhance the learning journey for students. With this background, Mobile application was developed on foldscope and it was tested for its effectiveness in terms of knowledge gain by the agricultural graduates. The present experimental study was conducted in College of Agriculture, Raipur. Totally 120 agricultural graduates was selected for the study randomly. Information provided in the developed foldscope mobile application was selected as learning module for the study. Respondents will undergo pre exposure and post exposure knowledge test about the selected learning module. The study revealed that, the overall knowledge gain on foldscope among the agricultural graduates through mobile application was effective (p<0.01). The study clearly demonstrates that information and communication technologies and devices play a substantial role in facilitating knowledge gain.

Keywords: Effectiveness, knowledge gain, foldscope, mobile apps

Introduction
The growth of agricultural knowledge among the next generation of farmers especially many of whom come from fields unrelated to agriculture are keen to practise farming and some of whom want to practice gardening. Due to their lack of inherent agricultural knowledge, those individuals are not well trained in indigenous approaches on infection prediction in crops. This will lead to flaws in how anti-microbial agents are applied to the crops. Due to carelessness, it causes native wild paddy and other grain species to become extinct. Pests and microorganisms are also increasing over time. It is one of the challenges that young farmers and horticulturists encounter. They are being prevented from engaging enthusiastically in farming and horticulture by these situations. It's possible for skilled agricultural practitioners to occasionally encounter challenges while predicting and treating fungal infections.

The foldscope is an optical microscope that may be made for a very low cost out of basic, common items like paper and a lens. The foldscope is designed to be durable, offer optical quality that is similar to that of conventional research microscopes, and can be produced at a fair price. It is inexpensive, costing less than $1, and was developed by Manu Prakash of Stanford University in the United States. It is a component of the "frugal science" movement, which seeks to make inexpensive and simple technologies accessible for scientific usage in developing countries. It has a 140 X magnification and is a paper-based, portable microscope. Following that, an agreement was reached by the Department of Biotechnology (DBT), Government of India, and the Prakash Lab at Stanford University, USA, to bring the foldscope to India and promote scientific curiosity

The main reason for invention of foldscope is that microscopes are crucial scientific tools, but obtaining and maintaining one can be expensive. The design of the foldscope allows everyone to study the microscopic world for a fraction of the cost while yet providing a research-quality microscope. The 140x magnification and 2-micron resolution of the foldscope lens are impressive foldscope also enables the study of non-biological samples, such as air pollution-causing particles or the minute crystalline variations between genuine and counterfeit medicines innovative technologies like foldscope when applied to students learning conditions

can help to improve the technical skills of students and also incorporating information about foldscope through Mobile application can improve communication, increase participation, disseminate knowledge and skill. In this context, mobile application on foldscope was developed and its effectiveness in imparting knowledge gain was analysed.

Materials and Methods

The present study was carried out in College of Agriculture, Raipur. It is a major agricultural college in the Chhattisgarh. It is a significant centre for agricultural education. It was purposefully chosen for the study. Students from neighbouring states and almost students from all over the state are also enrolled here. So, sample respondents would be covered diversely from all the states. 120 agricultural graduates were chosen randomly to assess the effectiveness of mobile application. The study employed an experimental research design known as the Before-and-After without control design. In this approach, agricultural graduates were initially evaluated through a comprehensive knowledge test to establish their pre-exposure knowledge scores. Subsequently, they were introduced to a mobile application focused on foldscope usage. Following this exposure, their knowledge concerning foldscope technology was re-evaluated to measure the knowledge gain.

Statistical Analysis

In order to test effectiveness of the developed mobile application statistically, 'Paired t test' was applied to find out, whether there existed any significant difference between the pre-exposure and immediate post-exposure knowledge due to the treatment i.e. exposure to the mobile application.

Results and Discussions

Development of mobile application on Foldscope

Various books, journal, research articles, websites were referred to get the data and to validate the content for incorporation of material. After collection, data was compiled in both the language *viz*. English and Hindi. Further the compiled data were shown to the experts and was enriched with their suggestions to make information more meaningful. Relevant images of all the samples and diseases which were identified through foldscope and all these images were processed. Photographs were arranged as per the content/information presented in script for easy understanding of the content for graduates. The components of mobile apps have been broadly classified in to two major parts *viz*. technical component and subject matter component.

Subject matter

Subject matter Information on foldscope had been taken as the subject matter (Table 1) to develop the Mobile application. In apps there were 11 components and were presented in the following table 1.

Table 1: Subject matter components provided in the app

Sl. No	Components	Content
1	Introduction to foldscope	It includes introduction about the foldscope
2	How to use foldscope	It covers procedure and handling of foldscope
3	Cereal crops diseases diagnosis	It covers diagnosis of some important cereal crops diagnosis, causal organisms images seen through foldscope
4	Pulse crops diseases diagnosis	It covers diagnosis of some important pulse crops diagnosis, causal organisms images seen through foldscope
5	Oil seed crops diseases diagnosis	It covers diagnosis of some important oil crops diagnosis, causal organisms images seen through foldscope
6	Horticultural crops diseases diagnosis	It covers diagnosis of some important horticultural crops diagnosis, causal organisms images seen through foldscope
7	Observations through foldscope	It covers various diseases causal organisms images seen through foldscope
8	Histology	It covers pdf of the booklet about foldscope
9	Management of selected crops diseases	Here, Pdf was enclosed about management of important crops diseases
10	Capacity building programmes	It covers demonstrations and training programmes conducted about foldscope
11	Achievements of foldscope	Semen quality and counting in artificial insemination in cow has been identified

Table 2: Supporting components provided in the app

Sl. No	Components	Description and uses
1	Choose language	In this we can change language at ease. Two languages present in apps *viz*., Hindi and English
2	Home	11 components of subject matter about foldscope has been mentioned in this section
3	Team	Name of the members who guided to development of apps was mentioned here
4	Acknowledgement	Acknowledgement was given to ICAR-NIBSM, Hon. Director & Senior scientist for providing grants and guidance for development of mobile on foldscope
5	Foldscope app play store link	https://play.google.com/store/apps/details?id=com.icarnibsmfoldscope.app&hl=en-IN

Effectiveness of foldscope mobile application on knowledge of agricultural graduates

The Knowledge aspects of the selected subject matter areas (Foldscope) were exposed to respondents through single treatment. The Knowledge level of the subjects before and immediately after exposure was assessed using developed knowledge test to find out the knowledge gain. The Maximum attainable knowledge score was 20. The result of the knowledge gain was presented in table 3. It could be observed that majority of respondents (74.2%) possessed medium level of knowledge on foldscope prior to exposure of foldscope mobile application. Followed by (25.8%) of respondents Possessed low level of knowledge and none of the respondents had high level knowledge about foldscope.

Table 3: Distribution of respondents on the basis of their knowledge level on foldscope at pre-exposure and post exposure stage

No.		Pre-exposure		Post-exposure	
Sl. No.	**Category**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
1.	Low (< 7)	31	25.80	0	0.00
2.	Medium(7-12)	89	74.20	15	12.50
3.	High (13-20)	0	0.00	105	87.50

However, the situation was completely changed upon post-exposure to foldscope mobile application wherein, Majority of respondents (87.5%) fell in High level category and rest (12.5%) fell in medium level category.

The mean scores of the knowledge level of the respondents at pre - exposure and post-exposure stages were analysed through Paired 't' test and the results are presented in the Table 4.

Table 4: Mean knowledge score at pre - exposure and post-exposure stages

	Pre-exposure	**Post -exposure**
Mean score	7.4	15.1
Mean difference 't' value	7.7 31.43**	

Table 4. Illustrates that the average knowledge score Pre-exposure was 7.4, while Post exposure, the mean knowledge score during the post-exposure stage nearly doubled to 15.1. The mean difference score was calculated at 7.7, indicating a substantial increase in knowledge among the respondents regarding foldscope due to their engagement with the foldscope mobile app.

This increase in knowledge was further substantiated by the statistically significant 't' value of 31.43 (with a significance level of $p<0.01$). This value reinforces the notion that the knowledge gained was not likely due to chance and was indeed a result of the respondents' exposure to the mobile app. Consequently, it can be confidently concluded that the developed mobile app was highly effective in enhancing the respondents' understanding of foldscope.

Conclusion

The effective dissemination of technology among the agricultural graduates through mobile-based dairy health management practices. Intl. J. Edu. and Devel. Info. and Comm. Tech., 6 of livelihood opportunities in developing nations. Consequently, extension personnel should consider employing ICT tools, particularly mobile applications, to educate dairy farmers and enhance their profit potential. In summary, mobile applications not only boost respondents' knowledge but also contribute to the retention of the knowledge acquired.

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