

The Use of Instructional Videos and Notes in Teaching Agricultural Knowledge and Skills: An Experimental Study at Universiti Putra Malaysia

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Keywords: instructional video, instructional notes, video and teaching of agriculture, agricultural knowledge and skills, experimental study on instructional video

ABSTRAK

Ini adalah kajian yang berbentuk separa eksperimen di kalangan pelajar tahun pertama program Diploma Pertanian, Universiti Putra Malaysia untuk menentukan kesan penggunaan Multi-media dalam pencapaian pengetahuan dan kemahiran semasa latihan praktik kerja ladang. Pelajar tahun pertama dibahagikan kepada lima kumpulan mengandungi 30 orang setiap kumpulan dan diberikan rawatan eksperimen yang berbeza. Kandungan teknikal kajian ialah kemahiran mengetut pokok jambu batu (*Psidium guava*). Hasil kajian menunjukkan video dan nota pengajaran adalah berfaedah dan berkesan kepada pelajar sebelum mereka menjalani latihan praktik di ladang. Kumpulan pelajar yang menonton video mempunyai peningkatan pengetahuan yang signifikan berbanding dengan kumpulan yang tidak didedahkan kepada video. Walau bagaimanapun nota pengajaran didapati tidak memberikan kesan yang ketara. Kajian juga mendapati bahawa pengajar yang diberi latihan penggunaan media pengajaran mempunyai kesan yang signifikan dari segi meningkatkan kemahiran pelajar dalam membuat tut.

ABSTRACT

A quasi-experimental research study was conducted with first-year Diploma of Agriculture students to find out the effects of instructional multi-media on their knowledge and skills achievement during their fieldwork training at the farm. The students were divided into five groups of 30 students each, and each group was assigned a different treatment. The skill selected for the experiment was marcotting of guava (*Psidium guajava*). The findings of the study show that an instructional video and notes are beneficial and effective to the students before they carry out their fieldwork training. Students who watched the instructional video had significantly higher knowledge than the students who did not watch the video. However, instructional notes did not have any significant effect. The results also show that an instructor trained in using multi-media had a significant effect on the students' skill in making the marcot.

INTRODUCTION

As an institution of higher learning, Universiti Putra Malaysia (UPM) has the reputation and credibility of producing graduates with the Diploma of Agriculture who have the skills and quality to carry out agricultural work. The Diploma of Agriculture programme was initially started in the 1930s by the School of Agriculture, and later continued by the College of

Agriculture (1947-1971). When Universiti Pertanian Malaysia was established in 1971, the Diploma of Agriculture became one of the foundation programmes. This programme aims to produce semi-professionals who are knowledgeable, skilful and possess the capability to play an important role in spearheading national development in the agricultural sector (UPM 1992).

One of the key requirements for Diploma students is to undergo fieldwork training in which they are exposed to both the theoretical and practical aspects of agricultural work. However, with changing times there are marked differences in the fieldwork training: the size of student intake, teaching staff and time allotted to fieldwork. The increase in the number of students has created a number of problems for the Farm Division of UPM which handles the farmwork practicals. Among the problems are:

- a. Difficulty in providing the facilities at the farm.
- b. Difficulty in arranging a suitable timetable of lectures and fieldwork training in order to give the students theoretical exposure before the fieldwork training. Often, the students do their practical training without enough theoretical exposure.
- c. Demand for qualified and experienced teaching staff due to the increase in student intake. Instructions for farmwork practicum are now given by the farm technicians who previously only provided support service to the course.
- d. The time for conducting farm practicum is limited to three hours per week. Within this time span, instruction is given, followed by actual practical work.

Given the circumstances and problems above, many concerned groups, including the employers and graduates themselves, observed that the quality of Diploma of Agriculture graduates has deteriorated. In order to maintain the quality of graduates and the image of UPM, efforts must be made to overcome the problems. The main concern is how to improve the teaching-learning process of fieldwork training so that it is efficient and effective. Among the factors that may influence skills teaching are teaching methods (Gronlund 1978), students' level of knowledge (Abu Zahari 1988), the length of time allocated and the skills of the instructor (Alang 1990).

Problem Statement

Teaching is a communication activity between the teacher and the students in which information or facts are transmitted from the teacher to the students, resulting in the students becoming knowledgeable.

Kemp and Smellie (1978) stated that instructional media have the following effects: (1) learning is productive due to the planned learning experience useful to the students, (2) self-learning is encouraged through the use of audio-visual materials, (3) learning is more balanced because the audio-visual materials can be easily moved from one place to another, and (4) learning is more scientific and systematic through a well-prepared teaching plan. The use of instructional media, especially video, has several advantages. Instructional video is flexible in that it can be used at different speeds; it can be stopped for explanation, and it can be replayed instantly for clarification. Video recordings can be stored for later use and can be viewed individually by the students. In this way, both learning and skill achievement are enhanced (Sharifah 1986).

Based on the concerns about improving the fieldwork training for the Diploma of Agriculture students and the potential of instructional multi-media, this study sought to address the following questions:

1. Will the use of instructional multi-media produce the desired effect of increasing students' knowledge if they are exposed to the media before they go for field work?
2. Will the skill of the instructors in using the instructional multi-media increase the level of skill attainment of the students?
3. What is the students' perception of the usage of instructional multi-media for fieldwork training?

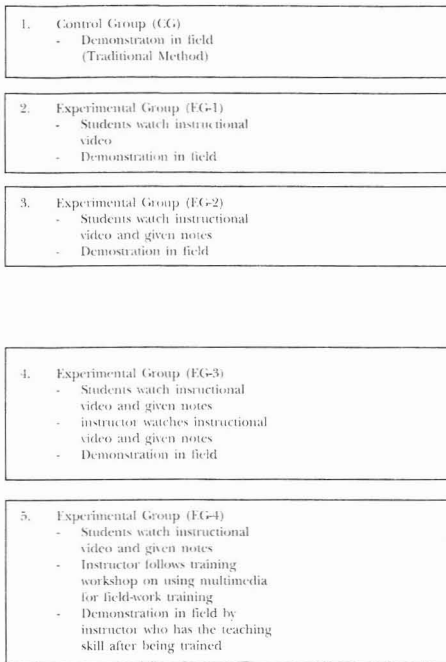
Research Objectives

The general objective of this study was to determine whether the use of instructional multi-media in fieldwork training will increase the knowledge of the students and help them in improving their farmwork skills.

The specific objectives were:

1. To assess the students' perceptions of the use of instructional video and notes for fieldwork teaching.
2. To identify the effect of instructional video and notes on the knowledge of the students doing fieldwork training.
3. To identify the effects of instructors' skill in using instructional media on the level of the students' skill in fieldwork training.

**INDEPENDENT VARIABLES
(TREATMENTS)**



DEPENDENT VARIABLES

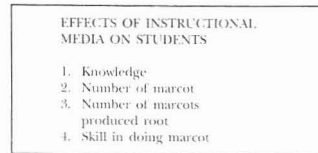


Fig 1. Research framework

Research Hypotheses

1. The student group using instructional media will have significantly higher knowledge compared to the student group who did not use any instructional media.
2. The student group using instructional video and notes will have significantly higher level of knowledge compared to the student group that uses only instructional video.
3. The level of skill achievement in field work training among the student groups taught by an instructor who is trained in using multi-media techniques will be significantly higher than student groups taught by an untrained instructor.

METHODOLOGY

Research Framework

In this study, instructional video and instructional notes on plant marcotting were prepared to test the level of knowledge and skills accomplished by the groups of students involved in this quasi experimental research. The research framework of this study is shown in Fig. 1.

Research Design

This experiment was carried out using pre-test and post-test non-equivalent control group design with the use of a control group as suggested by Campbell and Stanley (1966). The samples were randomly divided into five groups as shown in Fig. 2.

0	X1	0	(Experimental Group 1 = EG-1)
0	X2	0	(Experimental Group 2 = EG-2)
0	X3	0	(Experimental Group 3 = EG-3)
0	X4	0	(Experimental Group 4 = EG-4)
0		0	(Control Group = CG)

Where, 0 - pretest and post-test
 X1 - treatment given to EG-1
 X2 - treatment given to EG-2
 X3 - treatment given to EG-3
 X4 - treatment given to EG-4

Fig 2. Research design

Sample and Population

The subjects for the study were 150 first-year Diploma of Agriculture students who were selected randomly from the 180 first-year students. The selected students were divided into five groups: control group (CG) and experiment groups (EG). Of the 150 students selected, only 137 participated as the other 13 students could not participate for a variety of reasons.

Treatment

Different treatments were given to each group of students. Instructors (agricultural technicians) were also given two types of treatment according to the research objectives and hypotheses formulated, as shown in the research framework (Fig. 1).

Research Tools

Instructional video and notes were used as research tools in the treatments given to the students and instructors. The content of the instructional media consisted of instructions on how to marcot planting materials. The subject matter chosen for this study was guava (*Psidium guajava*).

The technical notes and script for the video were developed by the research team and the technical content was verified by an agronomist. After several meetings the script was approved and was ready for production. Preparation for conducting the experiment was finalized with the Farm Division, UPM which conducted the farmwork practical. A workshop on how to use the instructional video for skill teaching was conducted for farm technicians who were responsible to provide farmwork training to the

students. This was done as a requirement (treatment) in the experimental design.

Research Instruments

Five research instruments were used:

- i. Questionnaire to determine the students' perception of the use of instructional video and notes.
- ii. Pre-test and post-test questions to measure the knowledge of the students.
- iii. Report form - to record the number of marcottings done by each student.
- iv. Observation form - to record the marcots that produced roots.
- v. Skill Evaluation Form - to evaluate the skill of students in carrying out the marcotting.

Sequence of Research Activities

Table 1 shows the sequence of the experiment from step 1 to step 8. All groups carried out the pre-test (step 1) and post-test (step 5).

Data Analysis

Data analysis was conducted using the computer program SPSS/PC+ Version 4.0. Data were analysed using descriptive statistics and analysis of variance. F-test and Scheffe-test were employed to determine the differences among groups. The significant level of 0.05 was used for the analysis.

RESULTS

Students' Perceptions towards Instructional Video and Notes

In this research the students were asked to give their perceptions on the advantages of watching instructional video and reading notes before they attended the fieldwork. The results of the data analysis are shown in Table 2.

TABLE 1
Sequence of research activities

Group/ Step	Pre-test	Treatment		Demonstration in field	Post-test Do marcotting	Perception towards video	Observed rooted marcots	
		Video	Notes					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CG	XX	-	-	XX	XX	XX	XX	XX
EG-1	XX	XX	-	XX	XX	XX	XX	XX
EG-2	XX	XX	XX	XX	XX	XX	XX	XX
EG-3	XX	XX	XX	XX	XX	XX	XX	XX
EG-4	XX	XX	XX	XX	XX	XX	XX	XX

TABLE 2
Perception of student towards instructional video and notes

No. Items Analysis	Frequency	Percentage
1. Marcotting experience of Diploma of Agriculture students (All Groups n = 137)		
1.1 No experience	137	100.0
1.2 Have experience	<u>0</u>	<u>0</u>
	<u>137</u>	<u>100.0</u>
2. Students attending fieldwork training on marcotting (n = 112)		
2.1 Have seen video	108	96.4
2.2 Have not seen video	<u>4</u>	<u>3.6</u>
	<u>112</u>	<u>100.0</u>
3. Video seen : (n = 108)		
3.1 By individual	12	11.1
3.2 By group (2-13 students)	<u>96</u>	<u>88.9</u>
	<u>108</u>	<u>100.0</u>
4. Frequency of video viewing during treatment of three days (n = 108)		
4.1 Once	63	58.3
4.2 Twice	<u>45</u>	<u>41.7</u>
	<u>108</u>	<u>100.0</u>
5. Reasons for viewing video only once (n = 63)		
5.1 Lot of other assignments	31	49.2a
5.2 Content of video is complete and easy to understand	27	42.9a
5.3 Content of video interesting	20	31.7a
5.4 Content of video not interesting	10	15.9a
6. Reasons for viewing video twice (n = 45)		
6.1 Need to repeat in order to be clearer in understanding contest	45	100.0
6.2 Content of video interesting	20	44.4a
6.3 Need to record and write facts	10	22.2a
6.4 Accompany friends	4	8.9a
7. Advsn tage of notes to increase understanding after viewing video (n = 80)		
7.1 Most advantageous	66	82.5
7.2 advantageous	<u>14</u>	<u>17.5</u>
	<u>80</u>	<u>100.0</u>
8. Do you feel any gain in viewing the video (n = 108)		
8.1 There is a gain	108	100.0
8.2 No gain	<u>0</u>	<u>0.0</u>
	<u>108</u>	<u>100.0</u>
9. What are the gains from viewing the video (n = 108)		
9.1 Know better what to do in the field	87	80.6a
9.2 Easy to understand teacher's briefing	80	74.1a
9.3 Make discussion easier	44	40.7a
9.4 Gain more knowledge and experience	38	35.2a
9.5 More confidence in doing marcotting	34	31.5a

(a) Total percentage more than 100 because students gave more than one response

It was found that nearly all students (96.4%) who were assigned to view the instructional video did it (individually or in a group). The number of students who viewed the video in groups and did the fieldwork was eight times higher (88.9%) than those who watched the video individually. Even though there was no direction to have a discussion after viewing the video, group viewing is a good habit if followed by discussion. This will increase the students' understanding of the video content. Romiszowski (1988) noted that discussion of the content after watching a video can increase the understanding of what has been viewed. Another advantage is that viewing the video in a group saves time as more students are able to view the video.

During a period of three days, 58.3% of the students viewed the instructional video once; 41.7% viewed it twice. This was due to the content of the video being easy to understand (42.9%) and also because the students had a lot of other assignments from other courses to be completed (49.2%). Only 15.9% of the students found that the video was not interesting.

All the students who watched the video twice expressed the view that by repeatedly watching the video the contents became clearer; 44.4% said that the contents were of interest to them, 22.2% wanted to take notes on the video contents and a few of the students were just viewing with friends.

All of the students who responded to the question on the advantage of video viewing said that video was indeed advantageous in their learning process.

Based on the background of the students who did not have any knowledge and experience in doing marcotting, their responses were reasonable. By viewing the instructional video they were more knowledgeable about what they were going to do in the field (80.6%), and this knowledge helped them to easily understand the instructor's briefing (74.1%).

By viewing the instructional video for 20 minutes and also by reading the notes, the students felt that they were more knowledgeable and more ready to follow the fieldwork. With the knowledge they had gained from watching the video, 40.7% said that it was an advantage for them in their discussions, 35.2% had understood more and 31.5% were more confident in doing marcotting. This means that the students should be given adequate and

appropriate knowledge before they perform fieldwork activities.

The perception of the students was found to be in line with previous research. Campbell (1971), and Wittich and Charles (1979) were among the few researchers who found that video has a good effect on cognitive and affective teaching. Bowers (1982) found that using instructional multi-media in the form of a video package and printed media increases student knowledge.

Students' Knowledge Before Treatment

Students were pre-tested on their knowledge of marcotting before they were given a treatment. To establish whether there were any differences between the knowledge of the five student groups, analysis of variance and F-test were carried out as in Table 3.

From Table 3, the value of F (1.33) was found to be not significant, where $p = 0.26$. This showed that all the five groups of students had about the same knowledge level about plant marcotting before they went for their fieldwork.

Effects of Different Kinds of Instructional Media Towards the Students' Knowledge

After being exposed to the instructional video and notes, the students went for their fieldwork at the farm. Afterwards, the student knowledge was measured by answering post-test questions. Analysis of the post-test is shown in Table 4.

The F-value obtained from the analysis was 25.95. The result indicated that there were significant differences among the five groups of students in relation to the knowledge they gained after being taught this method. Thus, the treatments had produced effects on the knowledge gained by the students.

In order to determine which group showed significant difference, Scheffe's test was performed. The test results showed that there was a significant difference among CG and EG-1, EG-2, EG-3 and EG-4. However, there was no significant difference among EG-1, EG-2, TMEG-3 and EG-4. Thus, this result supported the first hypothesis of the study i.e. student groups using instructional media will have significantly higher knowledge than those who did not use any instructional media.

The results of this analysis showed that the use of an instructional video on marcotting had

TABLE 3
Analysis of variance of student groups before treatment (pre-test)

Sources	DF	SS	MS	F	P
Between groups	4	482.48	120.62		
Within groups	132	11972.38			
Total	136	12454.86	90.70	1.33	.26
	CG	EG-1	EG-2	EG-3	EG-4
n	29	28	26	27	27
Mean(a)	30.66	28.07	30.99	33.54	32.56
SD	2.94	2.54	2.02	2.40	3.97

(a) Means connected by a line underneath are not significant at the 0.05 level.

- CG : Untreated (taught by traditional method)
- EG-1 : Students watching video + traditional method of teaching
- EG-2 : Students watching video and given notes + traditional method of teaching
- EG-3 : Students watching video and given notes + instructors watching video and given notes + traditional method of teaching.
- EG-4 : Students watching video and given notes + instructors followed workshop on the use of video + field training + skills of instructors to use traditional method.

TABLE 4
Analysis of variance of student groups and post-test results

Sources	DF	SS	MS	F	P
Between groups	4	8718.47	2179.62	25.95	0.00
Within groups	132	11087.76	84.00		
Total	136	19806.23			
	Student Groups				
	CG	EG-1	EG-2	EG-3	EG-4
n	29.00	28.00	26.00	27.00	27.00
Mean(a)	57.87	76.59	75.44	75.23	80.29
SD	8.83	8.21	11.10	8.27	9.25

(a) Means connected by a line underneath are not significant at the 0.05 level.

resulted in significant upgrading of the knowledge of the students before doing the marcotting. The findings from this analysis were supported by the answer of all the respondents (100%) who said that the use of video was beneficial, especially in familiarizing them with what was to be taught in the field (80.0%) and making it easier to understand the briefing given by the instructor (74%) (see Table 2). Therefore, the findings of this research are similar to those of previous studies which showed that instructional videos are effective in improving knowledge.

Although all of the students (100%) who used the notes said that the notes were useful in

improving knowledge after viewing the video, no significant difference was seen in the results (EG-1, EG-2, EG-3 and EG-4 showed no significant difference in the score that they obtained in the post-test). Following the second hypothesis, knowledge gained by students EG-2, EG-3 and EG-4 who viewed the video and were given notes should be higher compared to EG-1 which only viewed the video. However, the findings from this experiment did not support the second hypothesis.

Number of Marcots Made by Students

Table 4 shows the effect of treatments towards the number of marcots made by the students. It

can be seen that significant differences between CG, EG-1, EG-2, EG-3 and EG-4 existed in the number of marcots made by the students. This was indicated by $F = 41.64$.

In order to determine which groups showed significant differences in the number of marcots made Scheffe's test was used. The results showed that there were no significant differences between CG and EG-1 and between EG-2 and EG-3 in the number of marcots made. Significant differences existed between CG and EG-2, CG and EG-3, CG and EG-4; between EG-1 and EG-2, EG-1 and EG-3, and EG-1 and EG-4; EG-2 and EG-4; and EG-3 and EG-4. The results showed that EG-4 had the highest mean in terms of the number of marcots made (Table 5).

Although knowledge gained by EG-4 was not significantly different from that of EG-1, EG-2 and EG-3 (Table 4), EG-4 made the highest number of marcots. The average number of marcots made by EG-4 was almost twice that of the control group (CG). This means that the treatment of training the instructor in instructional video and notes for fieldwork had a significant effect on the students' skills (EG-4). The finding supports the third hypothesis.

Students must be given basic knowledge before working in the field because they spend a maximum of only three hours there. If the students are equipped with knowledge before going to the field, the limited time available can be used solely for doing practical work.

In this study, the group EG-1 who had been exposed to the instructional video only did not indicate any significant difference in the number of marcots made with the group which had not

been exposed to it (CG). Similarly, there was no significant difference between the groups EG-2 and EG-3, although the latter group should have made more marcots due to the exposure the instructor had on the video and notes. The reason why there was no significant difference between the groups was probably related to the skills of the instructor in using instructional media. Although the group EG-1 had viewed the video, only their knowledge had increased and was significantly different from the CG (see Table 3). However, to gain skills, the students not only need knowledge, but also an instructor who can help them. Even though the knowledge of CG and EG-1 was different, the two groups were trained by the same instructor. The role of the instructor during the students' training influenced the students' achievement in acquiring skills.

No difference existed between EG-2 and EG-3, probably because of the instructor. Although both EG-2 and EG-3 were exposed to the video and notes, and had similar knowledge before the fieldwork, the latter group should make more marcots than EG-2 because the instructor was exposed to the video and notes. However, the treatment given to the instructor did not upgrade the instructor's skills in the use of instructional media for practical training.

The data also showed the importance of training on educational media for the instructors. This training provided knowledge and expertise to the instructors so that they could be more effective in teaching the use of time and, more importantly, in increasing the skills of the students. This was indicated by the achievement

TABLE 5
Analysis of variance of student groups with marcots made

Sources	DF	SS	MS	F	P
Between groups	4	157.60	39.40	41.64	0.00
Within groups	132	124.90	0.95		
Total	136	282.50			
Student Groups					
	CG	EG-1	EG-2	EG-3	EG-4
n	29	28	26	27	27
Mean(a)	3.24	3.43	4.88	4.33	6.19
SD	0.83	0.63	0.99	1.39	0.88

(a) Means connected by a line underneath are not significant at the 0.05 level.

made by EG-4, which obtained the highest number of marcots than all other groups. The instructor had attended a multi-media workshop (video and notes) for fieldwork training before giving instructions to the students in EG-4.

Naim (1991) has noted the importance of providing training on media use to instructors. According to him, educational technology does not replace the role of the teacher. His view supported Bower's (1982) contention that even though the media could improve or provide teaching, the imagination and creativity of the teachers were still required. Dale (1957) and Faris (1984) shared this same opinion when discussing the use of film as an instructional medium.

Number of Successful Rooted Marcots

The analysis of the data on the number of successful rooted marcots is shown in Tables 6, 7 and 8.

The results of the analysis in Tables 6, 7, 8 show that the F-values obtained were 45.78, 51.45 and 37.26, respectively. The results indicated that significant differences existed in the number of successful rooted marcots at the sixth, seventh, and eighth week among CG, EG-1, EG-2, EG-3 and EG-4. Differences occurred because of the treatments given. The results of Scheffe's test revealed that significant differences existed between the means of EG-4 (3.74, 4.37 and 4.81), and means of all other groups, namely EG-3 (1.74, 2.15 and 2.56), EG-2 (1.27, 2.12,

2.81), EG-1 (0.29, 0.71 and 1.29) and CG (0.00, 0.17 and 0.76) at the 6th, 7th and 8th week.

The results showed that EG-4 had the highest number of roots on marcots at weeks 6, 7 and 8. The performance of EG-4 was the best amongst all the groups. The results of this study again show the importance of a trained instructor in effective teaching for fieldwork training. An instructor who had been trained was capable of encouraging or motivating students to their highest achievement. The instructors could also carry out remedial work on the students' practical. These remedial approaches are important to strengthen the skills of the students, who would then be aware of their mistakes and use this learning experience to do a better job in the future. To enable the students to achieve the maximum skill, the principles of repetition, continuity, and reinforcement should be used in the teaching and learning process. When the performance of the students is at its peak, the learning experience at this level will form the basis for them to attain greater skills in carrying out their tasks in agricultural fieldwork.

Marcotting Skills of Students

Table 9 provides the analysis of variance for the group of students and their skills in making marcots. Similar results to those obtained for the previous two variables (number of marcots made and the number of successful rooted marcots) were obtained for the skills of students in making marcots.

TABLE 6
Analysis of variance of student groups with number of marcots producing roots at week 6

Sources	DF	SS	MS	F	P
Between groups	4	243.06	60.77	45.78	0.00
Within groups	132	174.20	1.33		
Total	136	418.26			
	Student Groups				
	CG	EG-1	EG-2	EG-3	EG-4
n	29	28	26	27	27
Mean(a)	0.00	0.39	1.27	1.74	3.74
SD	0.00	0.60	1.54	1.16	1.65

(a) Means connected by a line underneath are not significant at the 0.05 level.

TABLE 7
Analysis of variance of student groups with number of marcots
producing roots at week 7

Sources	DF	SS	MS	F	P
Between groups	4	293.43	73.36	51.45	0.00
Within groups	132	188.21	1.43		
Total	136	481.64			

	Student Groups				
	CG	EG-1	EG-2	EG-3	EG-4
n	29	28	26	27	27
Mean(a)	<u>0.17</u>	<u>0.71</u>	<u>2.12</u>	<u>2.15</u>	4.37
SD	0.38	0.76	1.48	1.29	1.64

a) Means connected by a line underneath are not significant at the 0.05 level.

TABLE 8
Analysis of variance of student groups with number of marcots
producing roots at week 8

Sources	DF	SS	MS	F	P
Between groups	4	275.31	68.83	51.45	0.00
Within groups	132	243.80	1.85		
Total	136	519.11			

	Student Groups				
	CG	EG-1	EG-2	EG-3	EG-4
n	29	28	26	27	27
Mean(a)	<u>0.76</u>	<u>1.29</u>	<u>2.81</u>	<u>2.56</u>	4.37
SD	0.87	1.12	1.48	1.29	1.64

a) Means connected by a line underneath are not significant at the 0.05 level.

An F-value of 53.33 obtained by the analysis of variance indicated that differences existed amongst CG and all other four experimental groups. Scheffe's test showed significant differences existed between EG-4 and EG-3, EG-2, EG-1 and CG. Non-significant results were obtained for comparisons between CG and EG-1 and between EG-3 and EG-2 (See Table 9). The result of Scheffe's test also showed that EG-4 had the highest work skills in marcotting with a mean of 187.41. This was verified by the performance of EG-4, which had the highest

number of marcots and the highest number of successful rooted marcots.

As mentioned earlier, the average number of marcots achieved by the EG-4 was almost double the average obtained by CG, and the number was also higher than the other experimental groups. With greater numbers of marcots being produced, the students in EG-4 obtained more learning experience in sharpening their skills. Repetition of the same process over time will improve the students' skill in performing marcotting.

TABLE 9
Analysis of variance of student groups with capacity to carry out marcotting

Sources	DF	SS	MS	F	P
Between group	4	180040.20	45010.05	53.33	0.00
Within group	132	111411.64	844.43		
Total	136	291451.84			

	Student Groups				
	CG	EG-1	EG-2	EG-3	EG-4
n	29	28	26	27	27
Mean(a)	86.17	93.43	136.15	123.48	187.41
SD	21.08	19.87	29.24	41.83	28.72

(a) Means connected by a line underneath are not significant at the 0.05 level.

The high achievement of EG-4 can be attributed to the quality of remedial efforts of the instructor, as he had attended the workshop on how to use the multi-media package. By acquiring knowledge from the workshop, the instructor could motivate the students of EG-4 in making more marcots. This quality of instruction did not occur in other groups whose instructor had not undergone training.

After the instructor attended the workshop, there was a significant change in the way he taught and the way he approached the students. It was observed that the instructor's teaching method had resulted in more participation and communication from the students. The students were more willing to answer his questions, and thus created a two-way communication process. Other students learned from the answers and also the encouragement given by the instructor to the students to make more and better marcots. This had resulted in better skills of the students in the EG-4. This report supports the third hypothesis of this research.

DISCUSSION

The results of this study as found in Tables 5–9 indicate that there were significant relationships between the independent variables and the dependent variables in the research. The treatments given to different groups of students affected their level of knowledge and skill attainment (EG-4). Post-test results of knowledge level showed that there was a significant difference between the groups which watched

the video and the CG who did not watch it. Data from descriptive analysis also showed that nearly 81 per cent of respondents who watched the video had a basic knowledge about marcotting before going to the field.

In this research, instructional notes were given after the students watched the video. However, it was found that the technical notes did not significantly contribute to increase in knowledge. Further research needs to be carried out to find out the effect if the notes are given before the video is watched. The results of this study supported the first hypothesis, but not the second one.

The instructor's competency in training for farmwork was found to be the critical factor in enhancing the student's level of skill attainment. The limited time that the instructor had with the students was effectively used to teach them the skills of marcotting. Compared to the students in other groups, the students in the EG-4 were more skilful in making marcots and had successfully produced not only more marcots, but also a greater number of rooted ones. The results again indicate that instructional media can be used to give the basic knowledge to the students before doing their practical work. However, for better skill achievement besides using the instructional media, the instructor needs to be trained in the technique of how to use the instructional package. The skills possessed by the instructor in handling the students in EG-4 to make them more skilful clearly supports the statement in hypothesis 3.

CONCLUSION

The following conclusions were derived from this study:-

1. The students had a positive perception on the use of instructional video and notes for teaching. All the students in the study stated that the instructional video and the technical notes were beneficial to them in providing basic knowledge before they went for practical training in the farm.
2. The use of an instructional video was found to be effective as part of skill training especially in providing basic knowledge.
3. Students with basic knowledge and proper understanding of theory exposed through instructional video and notes achieved a higher level of skill if they were trained by a skilful instructor.
4. The research results supported the first hypothesis which stated that the student group using instructional media had greater knowledge than the groups that did not use any instructional media. The results also supported the third hypothesis which stated that the skill of the students in fieldwork training was higher when they were taught by an instructor who was trained in the methods of using multi-media. However, the results did not support the second hypothesis which stated that the student group using an instructional video and notes would have a higher level of knowledge than the student group that used only an instructional video.

Implications for UPM

It is important for UPM to take appropriate measures to improve the teaching of skills during the practical fieldwork session. The students in the study mentioned the benefit of instructional video and technical notes in providing suitable knowledge. However, the university needs skilful and competent instructors to teach the necessary skills. Universiti Putra Malaysia therefore can improve the teaching of field agricultural skills through:

1. Developing a multi-media package for fieldwork. In preparing the package, inputs from respective experts are very important so that the technical contents are valid and suitable. The university should involve communication and education experts so that

the package is pedagogically sound and effective.

2. Training of instructors to use the instructional package needs to be intensive and comprehensive so that instructors are well-versed about the instructional package as well as know-how of incorporating it in their teaching.

Suggestions for Further Research

1. This research showed that instructional video is effective in providing knowledge to the students. However, the effect of the technical notes was not significant for increasing knowledge and understanding in the teaching-learning process. It is suggested that research be carried out to isolate the effect of the technical notes.
2. The techniques of utilizing the instructional video also need further research. In this study, the students watched the video in groups but there were no follow-up discussions. It is suggested that various learning strategies using the video be tested, e.g. watching the video alone, watching the video alone but followed up by discussion with the instructor, and watching the video in groups to be followed by structured discussion. By conducting the study, effective teaching methods of using instructional video could be identified.
3. This study has made a contribution in the form of an instructional video and technical notes on marcotting and their effect on students' knowledge. Research on other forms of instructional media could be similarly conducted to determine their effectiveness and suitability toward achieving certain educational objectives.
4. Instructional contents of the video and notes used in this study were agricultural. Further research on other topics or disciplines could be carried out.
5. A critical factor in the teaching-learning process is the teacher or instructor. Teaching approaches and styles may affect the learning process. The appropriate teaching approaches may differ in classroom, laboratory, or field setting. Research is needed to identify the teaching method and style that is appropriate for instructional multi-media use in the field, classroom and laboratory.

REFERENCES

- ABU ZAHARI ABU BAKAR. 1988. *Memahami Psikologi Pembelajaran*. Petaling Jaya: Fajar Bakti.
- ALANG PERANG ZAINUDDIN. 1990. Instructional video package, communication systems and technologies. Serdang: UPM Centre for Extension and Continuing Education. (unpublished)
- BOWERS, G. 1982. A video-print package. *Media in Education and Development* **15(4)**: 185-188.
- CAMPBELL, D.T. and J.C. STANLEY. 1966. *Experimental and Quasi-experimental Design for Research*. Chicago: Rand McNally.
- CAMPBELL, R.L. 1971. Videotape instruction in vocational agriculture. *Agricultural Educational Magazine* **44(4)**: 104-105.
- DALE, E. 1957. *Audio-visual Methods in Teaching*. New York: McGraw Hill.
- FARIS, J.P. 1984. How to use films in training. *Training and Development Journal* **38(5)**: 108-110.
- GRONLUND, N.E. 1978. *Stating Objectives for Classroom Instruction*. 2nd edn. New York: Macmillan.
- KEMP, J.E. and D.C. SMELLIE. 1978. *Planning, Producing and Using Instructional Media*. 6th edn. New York: Harper and Row.
- NAIM Hj. AHMAD. 1991. Teknologi pendidikan satu ikatan yang longgar. Kertas kerja *Konvensyen Teknologi Pendidikan Ketiga*, 5-7 Julai 1991, Plaza Fun Melaka.
- ROMISZOWSKI, A.J. 1988. *The Selection and Use of Instructional Media*. 2nd edn. London: Kogan Page.
- SHARIFAH ALWIAH A. 1986. *Teknologi Pengajaran*. Kuala Lumpur: Dewan Bahasa dan Pustaka.
- UNIVERSITI PERTANIAN MALAYSIA. 1992. *Buku Panduan 1992-1993*. Serdang: UPM
- WITTICH, W.A. and F.S. CHARLES. 1979. *Instructions Technology: Its Nature and Use*. New York Harper & Row.

(Received 21 July 1995)