THE DEVELOPMENT OF STUDENTS' LEARNING ACHIEVEMENT AND IRRIGATION SYSTEMS IN FARM SHOP SKILLS BY THE GROUP INVESTIGATION MODEL

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Abstract

This study aimed to compare the learning achievement of crop production students and irrigation systems in farm shop skills of crop production between students who study by the Group Investigation and students who study by the Traditional Model. The samples participating in this study were 48 students gathered by a cluster random sampling divided into two sections consist of four groups. The researchers employed examination, assessment abilities, and observation to collect the data. The result showed the GI model improved the students' learning achievement indicated by the examination score (Mean equals 27.01 and highly significant difference to the TM at level 0.01 (Mean equals 24.21). The GI model enhanced irrigation systems in farm shop skills from the students' abilities assessment showing that the students in the GI group. The mean value in each irrigation system was 3.44, 3.54, and 3.67 respectively which was significantly higher than the TM group with 3.24, 3.30, and 3.40 mean values respectively. Moreover, the GI model developed students' social skills obtaining from their communication and collaboration in teamwork under teacher observation.

Keywords: Group investigation, Irrigation systems, Learning achievement.

1. Introduction

Farm shop skills are becoming an essential part of every farm with the numerous influences that are so greatly changing in agriculture [1]. This subject area being introduced and taught to Crop Production students in the Faculty of Agricultural Technology at Rajamangala University of Technology Thanyaburi (RMUTT), causing the students to learn new operations and to acquire necessary skills in the Farm Shop subject.

Moreover, the irrigation system is an important role in this subject that the researchers take priority as water is very essential in crop growing [2]. To design and choose irrigation systems or watering plants to grow and give high compensation, some problems are often encountered: when we should water the plant and the amount of water that should be distributed to the plant [3]. Hence, choosing an appropriate irrigation system should consider the soil, water, and types of crops. It will be the use of water with maximum efficiency and reflecting the actual production cost in the condition that water for agriculture is limited [4].

There are many applications in the irrigation system. In this study, the researchers explored three main applications as it is commonly used in farming such as sprinkler irrigation, drip irrigation, and mists spray irrigation. Sprinkler irrigation is an application of watering which is similar to natural rainfall which requires high pressure to distribute the water through a system of piles, water breaks up into small water drops, sprays into the air, and drops down to the ground in the area where needs watering. Drip irrigation is a watering system that water distributes particularly to the crop and around soil in which plants can flourish. The key advantage of this method is the very high efficiency of watering, less weeds grow and can supply fertilizer along with being opened for watering [5].

Furthermore, mists spray irrigation spreads mist and requires high pressure to distribute water through a system of pipes and spread it into the air through foggier to produce water at lower volumes. The low water volume combined with the high pressure creates a mist effect. Mist spray irrigation is primarily popular in the greenhouse and nursery.

Each system selection is tailored to the needs and conditions of the land for farming. Teachers should improve and adjust the learning method to be appropriate with the new context in the world of technology [6]. There is a need for implementing a proper strategy to encourage students to target searching for knowledge, collaborative learning, satisfaction on the outcome, exchange ideas and social behavior, and comprehended on themselves and others by allowing students to train themselves to be responsible for teamwork. The members can exchange their thinking and collaborative working method to other equally in the concept of learning, causing learner thinkable, skilful, and can overcome all problem in every situation [7].

Various learning strategies have been developed to improve the student's ability. Group investigation is a potential strategy because it is related to the activities of gathering, analysing, and synthesizing information to solve a multi-task problem. Students can research information from inside and outside the classroom [8]. One strategy that can be done as a solution to this problem is by implementing the group investigation model (GI). GI is an effective learning approach to develop students with various skills such as investigation, participation, interaction, critical thinking, collaboration, teamwork, leadership, logical thinking, problem-solving, and decision

making ultimately improving their speaking skills [8]. The researchers implemented the GI model as an activity in the practical part including sprinkler irrigation, drip irrigation, and mists spray irrigation.

2.Methods

This study is an experiment with randomized posttest only control group design using paired samples statistics to compare pretest and independent samples test to analyse the different methods of instruction between experimental group students who studied by GI and control group students who studied by the TM. Then student's abilities assessments were compared on irrigation systems in farm shop skills of crop production students.

The participants of this study were 48 third-year students in crop production, faculty of agricultural technology enrolled at RMUTT, Thailand. The population distributed into two sections and each section was gathered by their registration in the academic study. A section consisted of 24 students with mixed-gender in it. The group gathering was a cluster random sampling, consisting of six participants in a group and four groups in a section. Section 1 is a control group applied with the TM model and section 2 is an experimental group applied with the GI model.

In this study, there were three main instruments used by the teacher to collect data with the learning process and student activities to evaluate learning. There were three stages, namely examination, assessment of student abilities, and observation. The first examination, before participating in practical skills, the students obtained a test-sheet as a pretest to evaluate their knowledge on that practical skill and their skill in the irrigation system to assess what they have learned from the lecture part. At the end of the practical part, the teacher examined the students in each section with the QCM sheet to evaluate their skills and knowledge after applying each teaching method (TM and GI) and to acquire the data to identify the development of the students' learning achievement and to compare the learning achievement between the TM and GI model. The data collection was obtained from the examination score.

In the student's ability assessment, the instrument was adopted for the students to evaluate their skills in the irrigation system practice in the class. The teacher provided a checklist sheet to all students that contained 5 items for each category including irrigation system design, equipment selection, irrigation installation, irrigation maintenance, and application to agriculture. The score uses to range from 1 to 4 in which 1 =poor, 2= fair, 3= good, and 4= very good. The collected data was to compare the irrigation system skills of the students between TM and the GI models. This instrument was designed to gain data that hardly acquires through other instruments especially on the student's behavior [9].

3. Results

The results of data analysis were obtained from students' learning achievement and the student's irrigation skills in the farm shop after participating in the learning process and to measure the difference achievement between TM and GI model [10].

The statistical analyses of the examination score to compare the learning achievement between the TM and GI using an independent sample t-test can be seen in Table 1. As shown, Table 1 represents the comparison of two teaching

methods, regardless of the examination scores, the mean score of TM's score was 24.21 with a standard deviation of 0.75 and the mean score of GI was 27.01 with a standard deviation of 0.82. Consider its mean value, the score of GI was significantly higher than the TM's score with a statistically significant difference at the 0.01 level. Thus, the students who studied by GI have improved the learning achievement higher than students who studied by the TM model. The statistical analyses of the students' abilities assessment to compare irrigation systems in farm shop skills between the TM and GI using an independent sample t-test can be seen in Table 2.

**Table 1. Comparing learning achievement
of the examination score to between TM and GI.**

	$\overline{X}$	S.D.	t-value	Probability*
Traditional Model	24.21	0.75	12.34	0.00
Group Investigation	27.01	0.82		

*significant 0.01

Table 2 shows the collected data through students' abilities assessment revealed that from the score of the range from 1-4, both teaching models obtained a good score on all categories (Mean>3). It indicates that either taught by TM or GI students' skills in each irrigation system were developed but when comparing the irrigation skills between both teaching methods found that in every irrigation skill in the GI group (with the mean value and the standard deviation 3.44/0.26, 3.54/0.30, and 3.67/0.29 respectively) were statistically significantly different to the TM group (with the mean value and standard deviation 3.24/0.28, 3.30/0.33, and 3.40/0.32 respectively). It indicates that the students in GI have significantly developed their skills in the irrigation system higher than the students in TM.

Table 2. Comparing students' farm shop skills score to between TM and GI.

Assessment	$\overline{X}$	S.D.	t-value	Probability*
Sprinkler Irrigation				
Traditional Model	3.24	0.28	2.60	0.013
Group Investigation	3.44	0.26		
Drip Irrigation				
Traditional Model	3.30	0.33	2.67	0.01
Group Investigation	3.54	0.30		
Mist Spray Irrigation				
Traditional Model	3.40	0.32	3.02	0.004
Group Investigation	3.67	0.29		

*significant 0.01

4. Discussion

Regarding the statistical analysis on the examination scores, it shows that either the TM model or GI model students have remarkably increased their learning achievement on the test score. With a full mean score of 30, when compared to the GI group with TM group based on the means score, it revealed that the GI was a highly significant difference to TM (GI's mean score equals 27.01 and TM's mean score equal 24.21) (see Table 1). This agrees with the mean score of students' assessments finding in this study released that students who participated in GI

distributed 3.55 on the total mean score out of full mean score 4 and TM's students gave 3.31 on the total mean score. And if comparing the mean score of each kind of irrigation system between the TM and GI, it was found that the students in the GI group have highly significantly developed their skills in every irrigation system than the students in the TM group. The GI's mean value and the standard deviation 3.44/0.26, 3.54/0.30, and 3.67/0.29 respectively, and the TM's mean value and standard deviation 3.24/0.28, 3.30/0.33, and 3.40/0.32 respectively (see Table 2).

Moreover, compared to the mean score of each category, it was found that the mean scores were increased from one category to one category in both teaching models and it agreed with the students' abilities assessment in Table 2 (mean value equal 3.24, 3.30, and 3.40 respectively in TM group and mean value equal 3.44, 3.54, and 3.67 respectively in GI group) as the teacher used the same teaching principle on each practical skill. This caused the students easily to understand from one practical skill to one practical skill. On the other hand, an irrigation system is a common application in Crop Production and students get used to it as it is applied in the greenhouse, nursery, and planting field that they worked on.

Besides, upon the observation by the teacher from the first week of participation to the end of the study, it was found that students in the GI group enjoyed their learning. They worked independently in their group for obtaining the topic and presenting it to the class. The students said, "Working in a group reduced the anxiety in learning and presentation". Depending on the observation, students in the GI group developed the social skills: communication skills, collaboration skills, teamwork that is indicated from the study activity in their group and class, their collaboration with the teammate, their research and evaluation on the topic, and their presentation [11].

The GI technique was divided into several groups that study in a different phase of a general issue. The study issue was then divided into working sections among the members of the groups. Students paired up the information, arrangement, analysis, planning, and integration of the data with the students in other groups. In this process, the teacher must be the leader of the class and ensure that students comprehend the explanations. This technique is suitable in science lessons because it encourages students to learn and attracts them to scientific research [12].

5. Conclusion

From the finding of this study, it can be concluded that the GI model developed students' learning achievement as shown on the examination scores. It revealed that the learning model based on students working in a group to achieve the desired result or group investigation is a remarkable effective model to develop students' learning achievement. Findings of this study show a significant raise in students' examination scores of the GI model and the scores were highly different from the traditional model. Further, the GI model developed the irrigation system in farm shop skills. It showed that in every irrigation system, the students in the GI group had a high score significantly different from the TM group. In addition, the GI model enhanced the students with the essential social skills: communication skills, collaboration skills, teamwork that is important in their work.

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References

1. Al-Najar, H.; Khalil, H.; and Rahayu, Y.S. (2019). High unemployment records of graduated students in the development of urban agriculture in the Gaza strip. *Indonesian Journal of Science and Technology*, 4(2), 196-203.

2. Al-Najar, H.; and El Hamarneh, B. (2019). The effect of education level on accepting the reuse of treated effluent in irrigation. *Indonesian Journal of Science and Technology*, 4(1), 28-38.

3. (2020). Changes of heavy metal concentrations in Shitalakhya river water of Bangladesh with seasons. *Indonesian Journal of Science and Technology*, 5(3), 395-409.

4. Martin, D.A.N.; and Rahmat, A. (2017). Relationship of soil physicochemical properties and existence of phytophthora sp. in pineapple plantations. *Indonesian Journal of Science and Technology*, 2(1), 81-86.

5. Sharmasarkar, F.C.; Sharmasarkar, S.; Miller, S.D.; Vance, G.F.; and Zhang, R. (2001). Assessment of drip and flood irrigation on water and fertilizer use efficiencies for sugar beets. *Agricultural Water Management*, 46(3), 241-251.

6. Sangsawang, T. (2020). An instructional design for online learning in vocational education according to a self-regulated learning framework for problem solving during the CoViD-19 Crisis. *Indonesian Journal of Science and Technology*, 5(2), 108-123.

7. Ana, A. (2020). Trends in expert system development: A practicum content analysis in vocational education for over grow pandemic learning problems. *Indonesian Journal of Science and Technology*, 5(2), 71-85.

8. Kaewet, S.; and Sonsupap, K. (2018). Development of organizing science learning, using graphic organizers with GI teaching to promote learning achievement and analytical thinking of third grade students, *Journal of Education Measurement*, 55(2) 238-249.

9. Iswardati, I. (2016). The implementation of group investigation to improve the students' speaking skill, *Dinamika Ilmu*, 16(2), 45-261.

10. Om, G.; and Chalermnirundorn, N (2019). The use of group investigation technique to enhance the English speaking skills of grade six Bhutanese students. *Rangsit Journal of Education Studies,* 6(2), 24-33.

11. Riza, L.S.; Firdaus, D.S.; Junaeti, E.; Hidayat, T.; Abdullah, A.G.; Nandiyanto, A.B.D.; and Abdullah, C.U. (2018). A concept and implementation of instructional interactive multimedia for deaf students based on inquiry-based learning model. *Journal of Engineering Science and Technology* (*JESTEC*), 13(7), 2016-2035.

12. Nandiyanto, A.B.D.; Asyahidda, F.N.; Danuwijaya, A.A.; Abdullah, A.G.; Amelia, N.; Hudha, M.N.; and Aziz, M. (2018). Teaching "nanotechnology" for elementary students with deaf and hard of hearing. *Journal of Engineering Science and Technology* (*JESTEC*), 13(5), 1352-1363.