Research Article

Development of a learning set on animal injection training tools for beef cattle raising course: a case study at Ubon Ratchathani College of Agriculture and Technology

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Article Info

Abstract

The research on the development of a learning set on animal injection skill training tools for beef cattle raising at the vocational certificate level, Ubon Ratchathani College of Agriculture and Technology, Ubon Ratchathani Province, is combined research to solve the teaching and learning problems in beef cattle raising. Three stages of the study were carried out. The following are the study's findings: 1) A research of the requirements for improving teaching management in a particular sample group of 68 students and 10 teachers in the Animal science department revealed that the demands were the greatest. High-level management of the skill training tools' overall learning was problematic. There weren't enough experimental animals for training, and the equipment was out of date; 2) The learning set was mostly created using the data from phase 1. One essential tool, a learning set on animal injection skill training tools, was chosen. It included a demonstration manual, a tool quality assessment form, and an animal injection skill training tool. Overall, it was determined that the tools were of excellent quality, suitable, and consistent with a number of components. The sample group had the greatest satisfaction with the design, content, and use after testing; and 3) the learning set was used with Vocational certificate students, a sample group of 25 individuals who enrolled in the course, used the learning set. Findings showed statistically significant at the 0.01 level in learning accomplishment results before and after studying. Thus, it can be said that the sample group was the most satisfied and that this set of learning activities can be employed effectively.

To cite this article

Introduction

Beef cattle farming in Thailand has experienced steady growth in recent years. However, the supply of domestically produced beef remains insufficient to meet increasing consumer demand, both in quantity and quality. This rising demand is driven by population growth, economic development, and heightened awareness of food safety and nutrition (Bunmee et al., 2018). As a result, there is a growing need to upgrade traditional smallholder beef cattle operations—typically low-investment and secondary in nature—into knowledge-based, commercially viable enterprises (Prasitwuttisak & Prakarnkamanant, 2020). Despite progress, over 90% of beef cattle in Thailand are still raised by smallholder farmers who often lack access to modern technologies, veterinary knowledge, and farm management systems (Department of Livestock Development, 2022). This underscores the urgent need to strengthen human capital through

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vocational education, particularly in animal science programs offered by agricultural and technological colleges. At institutions such as the Ubon Ratchathani College of Agriculture and Technology (URCAT), beef cattle farming is a core subject designed to develop students' technical competencies through theory, hands-on practice, and collaboration with industry. The course emphasizes practical skills in animal health, breeding, farm management, and production, aligning with the needs of Thailand's evolving livestock sector (OECD, 2021). Rooted in the belief that structured learning and practice can help all learners reach their full potential, this study explores the challenges and needs faced by both instructors and students in the beef cattle farming course at URCAT. The findings aim to support curriculum development and teaching strategies that align vocational training more closely with real-world labor market demands, contributing to the modernization and sustainability of Thailand's beef cattle industry (Eamcharoen, 2024).

In the context of large animal science education—particularly in courses related to beef and dairy cattle—it is essential that students acquire not only theoretical knowledge but also critical hands-on skills directly applicable to professional practice. Practical competencies such as administering injections, managing animal health, handling livestock safely, and applying herd management strategies are fundamental for graduates aiming to work in livestock production, veterinary services, or agricultural extension. Without structured and repeated practice in these areas, students may lack the confidence and proficiency required by modern animal husbandry enterprises. Embedding skill-based training into the curriculum is vital to ensure that vocational graduates are workplace-ready, capable of contributing effectively to the livestock sector, and equipped to meet both industry standards and the expectations of future employers. This emphasis on practical skill development aligns with the objectives of agricultural vocational education in Thailand, which is designed to produce graduates competent in hands-on practice and capable of transitioning directly into the workforce. According to the Vocational Education Curriculum for Agricultural Programs 2019 issued by the Office of the Vocational Education Commission (OVEC, 2019), the curriculum prioritizes experiential learning, technical proficiency, and the application of knowledge in real-world agricultural settings. By integrating core skills such as animal health management, breeding techniques, and farm operations into student training, the program ensures that learners are not only equipped to meet industry needs but also empowered to pursue careers with confidence and quality. This approach supports national strategies to strengthen the agricultural sector through human resource development and practical innovation. Studies have shown that integrating practical skill development into vocational education enhances student engagement and learning effectiveness (Panyakom *et al.*, 2020; OECD, 2021). Moreover, sustainable approaches for developing professional skills in vocational education students have been explored to ensure long-term success in the workforce (Srisuantang et al., 2014).

Objectives

➢ To study the needs, problems of teaching and learning, and solutions for the subject of beef cattle raising, vocational certificate level, Ubon Ratchathani College of Agriculture and Technology, Ubon Ratchathani Province

➢ To create a Learning set on the subject of animal injection skill training tools, beef cattle raising, vocational certificate level, Ubon Ratchathani College of Agriculture and Technology, Ubon Ratchathani Province

➢ To study the learning achievement and satisfaction in learning by using the learning set on the subject of animal injection skill training tools, beef cattle raising, Ubon Ratchathani College of Agriculture and Technology, Ubon Ratchathani Province

Method

The research on the development of a learning kit on animal injection training tools, beef cattle raising, vocational certificate level, Ubon Ratchathani College of Agriculture and Technology, Ubon Ratchathani Province, is combined research to solve the teaching and learning problems in beef cattle raising. The research was conducted in 3 phases:

Phase 1: Conduct survey research on the needs, problems of teaching and learning, and approaches to solving problems in the beef cattle raising course, vocational certificate level, Ubon Ratchathani College of Agriculture and Technology, using questionnaires and interviews. Data was collected by purposive sampling from 10 teachers of the

Animal Science Department and 68 students studying in the Animal Science Department who had studied the beef cattle raising course in the 2022 academic year out of a total of 252 students. The instruments in this phase were use in-depth interview and questionnaire

Phase 2: Creating a learning set: This was done by using data from the study results in Phase 1 as important data for creating the learning kit. The learning kit was evaluated by 5 experts using the learning kit quality assessment form.

Phase 3: Using the learning set by studying the learning achievement and satisfaction in learning using the learning kit on animal injection training tools with vocational certificate students. There were 14 people who registered for the meat farming course in the second semester of the academic year 2023. The learning achievement test, behavioral observation form, and satisfaction questionnaire were used as data collection tools.

Table 1. Criteria for interpreting the formula

Score	Scale Limits	Description
5	4.21 - 5.00	Highest
4	3.41 - 4.20	High
3	2.61 - 3.40	Moderate
2	1.80 – 2.60	Low
1	1.00 – 1.80	Lowest

Research instruments in this phase included testing form, questionnaires, and assessment forms. The content validity and consistency of objectives were inspected using the IOC value (0.06-0.10), followed by improvements based on expert suggestions. The collected data were analyzed using descriptive statistics and paired-samples t-test, with the results interpreted through content analysis. He satisfaction ratings were utilized as estimation scales, employing a 5-point rating scale. Criteria for interpreting the formula calculation were Table 1 (Punpinij, 2011; Leekitwattana, 2012).

Results

The needs, problems of teaching and learning, and solutions for the subject of beef cattle raising

Research of the requirements for improving teaching management in a particular sample group of 25 students and 10 teachers in the Animal Science Department revealed that the demands were the greatest. High-level management of the skill training tools' overall learning was problematic. There weren't enough experimental animals for training, and the equipment was out of date.

Table 2. The need for tools to facilitate training in injection skills in animals raising and management of the respondents

Items	Teachers (N=10)		Students (n=25)	
	Frequency	Percentage (%)	Frequency (n=68)	Percentage (%)
Need	10	100.00	59	86.76
Don't need	0	0	9	13.24
Total	10	100.00	68	100.00

It can be seen at Table 2, it was found that 86.76% of the respondents expressed a need for tools to facilitate training in injection skills for animal husbandry and management, while only 13.24% indicated no such need. In term of teachers need, it was discovered that all of the teachers needed tools to help them learn how to inject animals and handle the respondents.

Table 3. Teaching needs in the subject of beef cattle raising

Item	$\bar{x}$ (n=68)	S.D.	Description
1. Theoretical content in beef cattle raising is sufficient.	3.86	0.91	High
2. Practical content in beef cattle raising is sufficient.	3.73	0.88	High
3. You can apply both theoretical and practical content well.	3.46	0.91	High
4. Materials, equipment and tools used in the study are sufficient.	3.26	1.03	Moderate
5. Materials, equipment and tools are modern.	3.40	0.92	High
6. You can use materials, equipment and tools well.	3.66	0.81	High
7. You can apply the skills from using materials, equipment and tools in the practice to your future career.	4.06	0.88	High
8. Are you interested in developing new innovations or tools in the beef cattle breeding course?	3.93	0.79	High
9. What level of beef cattle breeding practice hours and practice training do you want?	4.00	0.75	High
10. What level of materials, equipment and tools do you want to provide for the practice?	4.20	0.86	High
11. Animal injection skills are another important skill for future animal production careers.	4.26	0.88	Highest
12. What level of tools do you want to provide for animal injection skills?	4.20	0.86	High
13. What level of smart farm (IOT) materials, equipment and tools do you want?	3.93	0.70	High
14. What level of modern private farm training do you want?	3.95	0.79	High
15. What level of beef cattle breeding practice training do you want?	4.00	0.75	High
Over all	3.84	0.86	High

It can be revealed that the overall level of students' teaching needs in the beef cattle raising subject was high ($\bar{x}$= 3.87; 0.86) at Table 3. With a man score of 4.26, it was discovered that one item stood out as having the greatest level: animal injection skills are another crucial ability for future professions in animal production. Just one item was at a moderate level, while thirteen items were at a high level.

According to data from in-depth interviews with 10 animal science teachers and 25 animal science students—15 vocational certificate students, first through third year, five students per year, and 10 advanced animal science certificate students, first through second year, five students per year—teachers of large animals, like dairy cows and beef cattle, and small animals, like pigs, must teach their students how to inject animals. They must also make an animal injection skill training kit before students inject real animals, so that students can practice injecting animals until they are proficient before the practice. Additionally, it is advised to develop a model that includes media and a handbook that students may readily learn on their own using internet channels. It is portable, long-lasting, and easy for teachers to use for field instruction. Students also believe that models ought to be made in the same manner as professors' remarks, and they recommend making material that is readily available online so that it may be viewed and studied later on mobile devices. Furthermore, the injection skill training model needs to be portable to the animal enclosures for comparison. and is capable of parallel training.

Creating a learning set

This was done by using data from the study results in Phase 1 as important data for creating the learning set, according to the findings, there are five steps for creating a learning set:

➢ Gaining an understanding of the user's issue by conducting interviews with Ubon Ratchathani College of Agriculture and Technology's Animal Science Department teachers and administering questionnaires to students pursuing bachelor's degrees, higher vocational certificates, and vocational certificates. Finding the true issue through interviews or questioning the problem-seekers directly requires time and in-depth understanding of the issue.

➢ Identifying the problem and problem framework, defining the problem, summarizing the information, and responding to the questions of who must do what and why. Having a clear answer and defining the problem that needs to be solved are essential after comprehending the issue.

➢ Thinking creatively, gathering ideas, and looking for fresh concepts that can best address user wants and issues as well as next-step suggestions. A timeline for innovation must be established, concepts must be chosen, and any other problems must be taken into account.

➢ Developing inventions that can assist in addressing user demands and assessing, following the development of a learning set, whether or not the developed concept can address users' issues and requirements. Before moving on to the leaing set creation phase, evaluation of the innovation might gather feedback and recommendations.

➢ The last stage is to evaluate the learning set in order to gather data. The design thinking process will assist guarantee that the products we create can effectively address user demands and issues.

Figure 1. Developing a set of educational resources to support instruction in injection techniques for animal care and management

Figure 2. Shows the learning set's documentation and data in the form of video files recorded on DVDs for online upload

Table 4. The assessment of the learning set on Animal injection skill training tool in the beef cattle raising subject in terms of learning set and structure for support instruction in injection of experts

Items	Level of opinion (N=5)		
	Mean ($\bar{x}$)	S.D.	Description
1. A robust and long-lasting learning set and structure for support instruction in injection	4.50	0.87	Highest
2. The framework and learning materials for assist training in injection design are innovative.	4.75	0.56	Highest
3. The structure and learning materials for support instruction in injection color are lovely	4.50	0.87	Highest
4. Every part is detachable for effortless mobility	4.63	0.60	Highest
5. The materials utilized are usable	4.75	0.54	Highest
Over all	**4.63**	**0.72**	**Highest**

It can be revealed that the mean score of 4.63, the experts provide the greatest overall score of opinion The items with the highest mean were the framework and learning resources for help training in injection design are unique and the materials utilized are useful, with a mean of 4.75 for both items. It was discovered that all specialists expressed the highest level of opinion while evaluating each item.

Using the learning set

Using the learning set by studying the learning achievement and satisfaction in learning using the learning set on animal injection training tools with vocational certificate students. There were 25 students who registered for the meat farming course in the second semester of the academic year 2023. The learning achievement test, behavioral observation form, and satisfaction questionnaire were used as data collection tools. The results were follows:

Table 5. A number of students, an average mean score, and standard deviation of the score begin and after learning avidities.

Item	A number of students (n=25)	15 Points ($\bar{x}$)	S.D.	t	sig
Begin learning	25	5.06	1.48	-23.971	0.001[**]
After learning	25	13.88	0.81		

[**]statistical significance level of 0.1

It can be seen that the Table 5 students completed the pre-test and post-test, which had 15 items and had varying mean scores, according to the data analysis results displayed in Table 4. Learning outcomes using the learning set were better than learning outcomes prior to learning. Compared to the pre-test results, which had an average score of 5.06 points, the learning outcomes after learning had an average score of 13.38 points out of 15 points. The learning set on "Animal injection skill training tool" in the beef cattle raising subject could successfully improve learners, as evidenced by the learning achievement results that differed significantly at the 0.01 level.

Table 6. Mean, standard deviation and level of student satisfaction towards using the learning set

Items	Level of opinion (n=25)		
	Mean ($\bar{x}$)	S.D.	Description
1. The teacher clearly explains and informs the topic and teaching objectives	4.56	0.63	Highest
2. Able to explain the content and steps of the training continuously and in relation to each other	4.50	0.82	Highest
3. Uses appropriate and easy-to-understand language in teaching	4.62	0.72	Highest
4. Has teaching equipment, media/documents, making it easier to understand the content	4.76	0.58	Highest
5. Teaching methods make students interested in learning all the time	4.81	0.54	Highest
6. The teacher can answer questions clearly	4.75	0.59	Highest
7. Teaching methods make students interested in learning all the time	4.63	0.72	Highest
8. Starts and ends teaching on time	4.56	0.73	Highest
9. Teaches content that is in line with the objectives of the learning activity set	4.62	0.72	Highest
10. Summarizes issues/content in line with learning objectives	4.63	0.62	Highest
11. The teacher has a good personality, dresses well, and has a clear and appropriate tone of voice	4.68	0.70	Highest
12. To what extent do students like learning this topic?	4.75	0.58	Highest
Over all	**4.66**	**0.65**	**Highest**

It can be ssen that Table 5, the respondents′ satisfaction levels with the learning set, which showed the highest level of satisfaction overall with a mean of 4.66. With the highest mean satisfaction in the top three rankings, the respondents were most satisfied with all items: Teaching strategies consistently pique students′ enthusiasm in learning ($\bar{x}$=4.81, SD: 0.54), Features teaching aids, media, and documents that make the material easier to understand ($\bar{x}$=4.76, SD: 0.58); how much students enjoy learning this subject ($\bar{x}$=4.75, SD: 0.58); the teacher can clearly respond to questions ($\bar{x}$=4.75, SD: 0.59); and the teacher is well-mannered, has a pleasant demeanor, and speaks in a clear and appropriate tone ($\bar{x}$=4.68, SD: 0.70), respectively.

Discussions

The study focused on developing a learning module incorporating animal injection training tools for beef cattle raising course at the agricultural vocational level. Survey results indicated a strong demand for such tools among both teachers and students. Notably, significant challenges were identified in the management of skill-based learning, particularly in the practical aspects of animal injection. All participating teachers reported the need for appropriate instructional tools to support the teaching of animal injection techniques and livestock handling. These findings align with the emphasis in Thailand's vocational education curriculum on hands-on learning and competency-based training (Office of the Vocational Education Commission, 2019), and echo international research highlighting the effectiveness of simulation-based tools in improving veterinary students' practical skills and confidence (Chowdhury & Khalil, 2021). The evaluation of teaching needs revealed that students exhibited a high overall demand for instruction in beef cattle raising. Among the assessed competencies, animal injection skills ranked highest, reflecting their critical importance for students' future employment in the animal production sector. This is consistent with research by Raksasat and Phonchaiya (2022), which emphasized that practical competencies, such as animal treatment and injection techniques, are foundational for vocational students preparing for agricultural careers.

According to data from interviews, the respondents were emphasized the critical need for hands-on training in animal injection skills, particularly in the context of both large and small livestock. Teachers noted that students must first practice with simulation kits to build confidence and competency before handling real animals. Both teachers and

students agreed that the training model should be durable, portable, and suitable for classroom and field instruction. They also recommended integrating multimedia learning resources and self-study handbooks accessible through online platforms and mobile devices, to allow flexible, self-paced learning. This approach is consistent with OECD (2021), which stresses the importance of practice-oriented and self-directed learning tools in vocational education to better prepare students for specialized labor markets. The development of the learning set was guided by a five-step design thinking process: empathizing with user needs, defining problems, ideating creative solutions, prototyping, and testing. This approach ensured that the learning materials effectively addressed real-world challenges faced by learners. Expert evaluations yielded a high overall satisfaction, with the instructional framework and material usefulness receiving the highest ratings. The implementation of the "Animal Injection Skill Training Tool" in the beef cattle raising course significantly enhanced student learning outcomes. Students reported high satisfaction, particularly appreciating the engaging teaching methods and the inclusion of multimedia resources that simplified complex content. These findings align with Eamcharoen's (2024) study, which demonstrated that integrating design thinking into vocational education enhances student engagement and learning effectiveness. In addition, these findings align with studies demonstrating that integrating design thinking into vocational education enhances student engagement and learning effectiveness (Lin et al., 2023; Pratomo et al., 2021; McLaughlin et al., 2022).

In the context of large animal science education—particularly in courses related to beef and dairy cattle—it is essential that students acquire not only theoretical knowledge but also critical hands-on skills directly applicable to professional practice. Practical competencies such as administering injections, managing animal health, handling livestock safely, and applying herd management strategies are fundamental for graduates aiming to work in livestock production, veterinary services, or agricultural extension. Without structured and repeated practice in these areas, students may lack the confidence and proficiency required by modern animal husbandry enterprises. Embedding skill-based training into the curriculum is vital to ensure that vocational graduates are workplace-ready, capable of contributing effectively to the livestock sector, and equipped to meet both industry standards and the expectations of future employers. This emphasis on practical skill development aligns with the objectives of agricultural vocational education in Thailand, which is designed to produce graduates competent in hands-on practice and capable of transitioning directly into the workforce.

According to the Vocational Education Curriculum for Agricultural Programs 2019 issued by the Office of the Vocational Education Commission (OVEC, 2019), the curriculum prioritizes experiential learning, technical proficiency, and the application of knowledge in real-world agricultural settings. By integrating core skills such as animal health management, breeding techniques, and farm operations into student training, the program ensures that learners are not only equipped to meet industry needs but also empowered to pursue careers with confidence and quality.

This approach supports national strategies to strengthen the agricultural sector through human resource development and practical innovation. Studies have shown that integrating practical skill development into vocational education enhances student engagement and learning effectiveness (Panyakom et al., 2016; Poungsuk & Junlek, 2021). Moreover, a critical review of agricultural education in Thailand emphasizes the need for curricula that are responsive to the changing contexts of national development, balancing competitiveness and sustainability in Thai agriculture (Traimongkolkul & Tanpichai, 2005).

Recommendations

The following are the suggested for practice-related implications and future research:

➢ Expansion to Other Large Animal Science Courses: The training module and injection tool set should be extended to other relevant courses such as dairy cattle, swine, goats, and other livestock species, given the similar instructional needs identified among teachers and students.

➢ Integration with Blended and Self-Paced Learning: To enhance accessibility and flexibility, the module should be supported by digital learning components such as e-learning content, instructional videos, interactive

quizzes, and online manuals, allowing students to engage in self-directed learning through mobile and web platforms.

➢ Capacity Building for Teachers: Training programs should be provided to instructors to ensure effective use of the injection training tool, including strategies for simulation-based teaching, classroom facilitation, and competency-based assessment.

➢ Development of a National Teaching Innovation Model: the training module can serve as a best practice model for vocational agricultural education. It should be considered for recognition and dissemination as an innovative teaching tool supporting large animal science instruction and practical skill development.

➢ Longitudinal Studies on Graduate Outcomes: Future research should examine the long-term effects of the training module on students' performance during internships, professional licensing exams, and real-world employment in the livestock sector.

➢ Experimental Studies Comparing Instructional Approaches: Research comparing learning outcomes between students using the injection training tool and those receiving traditional instruction would help quantify its effectiveness in terms of skill acquisition, confidence, and job readiness.

Acknowledgment

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