THAI NGUYEN UNIVERSITY UNIVERSITY OF EDUCATION

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DEVELOPMENT AND USE OF AUTHENTIC ASSESSMENT TOOLS IN TEACHING GENERAL PHYSICS

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The dissertation can be read at:

- National Library of Vietnam
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LIST OF RESEARCH WORKS RELATED TO THE THESIS

- Nguyen Thi Thu Hang (2016), "Current situation and some solutions to improve the learning quality of students for the General Physics module at the University of Agriculture and Forestry - Thai Nguyen University", *Journal of Science* and Technology - Thai Nguyen University, Volume 152, No. 07/2.
- Tran Trung, Le Thi Thu Hien, Nguyen Thi Thu Hang (2017), "Authentic assessment of students' academic results in competency-based teaching at universities", *Journal of Educational Management Science*. No. 3 (15) September 2017.
- Nguyen Thi Thu Hang, Le Thi Thu Hien, Nguyen Ngoc Anh (2018), "Diversifying assessment forms of students' academic results. Applying real assessment models in teaching the General Physics module", *Journal of Science* and Technology - Thai Nguyen University, Volume 186, No. 10.
- 4. Le Thi Thu Hien, Nguyen Thi Lan Ngoc, Nguyen Thi Thu Hang (2018), "Measures to foster pupils' self-study ability by Blearning", *Summary record of ICSS International Conference in Ho Chi Minh City*, Financial Publishing House.
- 5. Nguyen Thi Thu Hang, Nguyen Thi Thu Ha, Nguyen Do Huong Giang (2018), "Assessment for development of learners in the industrial revolution context 4.0", *Summary record of ICTER 1 International Conference at the Thai Nguyen University of Education*, Thai Nguyen University Publishing House.
- Le Thi Thu Hien, Nguyen Thi Thu Hang*, La Phuong Thuy, Le Thi Tuyet Trinh, Nguyen Thi Nhi, Nguyen Thuy Phuong Tram, Tran Trung (2020), "Factors affecting academic performance of first-year university students: A case of a Vietnamese university", *International Journal of Education* and Practice, ISSN 2311-6897, 2020 Vol. 8, No. 2, pp. 221-232. DOI: 10.18488/journal.61.2020.82.221.232.

PREAMBLE

1. Reasons for choosing the topic

To address the current social context's demand for high-quality human resources, fundamental and comprehensive innovation in education and training is required. In order to follow the innovation and training orientations associated with social needs in Vietnam, the assessment of learners' academic results must be based on outcome standards, which is the need to evaluate exactly the level of achievement of learners according to the thinking levels specified in the outcome standards of each module, component, and training program [4]. The actual assessment is a sort of student assessment that satisfies the purpose of comprehensively assessing learners' capacity development and can effectively assess levels and minimal requirements for knowledge, skills, attitudes, and responsibilities for jobs that learners achieve today. Authentic assessment is a form of assessment in which learners are asked to perform real-life tasks that require meaningful application of essential knowledge and skills [92].

The training curriculum at universities in general, and agroforestry universities in particular, spends the first 1 year to 1.5 years on basic knowledge modules. The General Physics module is the foundation of many areas of science, engineering, and technology; it is distinguished by the fact that it requires time to practice, linking theory with reality; bring the gained knowledge and apply it to the field of study and create real products. As a result, adopting the method of authentic assessment is ideal for the teaching process of the General Physics module. However, authentic assessment is not widely employed in teaching the General Physics module in agroforestry universities nowadays, mostly in the form of assigning short learning themes, practical projects, and so on with the method of performance, assessment process and criteria are still not clear and specific. Some competencies of learners such as creative ability, problem solving ability, ability to apply knowledge in practice, etc., to meet the outcome standards have not been assessed.

Stemming from the above reasons, we chose the research topic "Development and use of authentic assessment tools in teaching General Physics".

2. Research purpose

Development and use of authentic assessment tools in the teaching process of General Physics to assess students' academic results according to the outcome standards at agro-forestry universities.

3. Objects, subjects and scope of research

3.1. Research objects

Tools to evaluate student's academic results according to outcome standards.

3.2. Research subjects

Students of agro-forestry branch of universities.

3.3. Research scope

General Physics modules for students of agriculture, forestry, animal husbandry and veterinary branches of agroforestry universities. 4. Scientific hypothesis

If authentic assessment tools can be built and used in teaching General Physics modules, students' learning outcomes will be assessed according to the outcome standards at agro-forestry universities.

5. Research mission

- Research on assessment in education

Research on authentic assessment: concepts, roles. characteristics, implementation principles; design process of building and using authentic assessment tools in the teaching process.

- Survey the current situation of testing and evaluation in teaching General Physics at a number of agroforestry universities today. Conduct analysis of the achieved results, limitations and find out the causes of those shortcomings as a practical basis for the topic.

- Build a authentic assessment tool according to the outcome standards and used in the teaching process of General Physics:

+ Find out objectives, content and outcome standards of the General Physics modules at a number of agro-forestry universities.

+ Build a authentic assessment tool according to outcome standards in the teaching process of General Physics.

+ Use authentic assessment tools in the teaching process of General Physics at some agro-forestry universities.

- Conduct pedagogical experiments at agro-forestry universities, evaluate feasibility and effectiveness of the built tools, thereby in order to test the correctness of the scientific hypothesis set out in the thesis.

6. Research Methods

6.1. Group of theoretical research methods

6.2. Group of educational practice research methods

6.3. Pedagogical experience

6.4. Case-study method

7. New contributions of the thesis

- In terms of theory: Systematize theoretical basis of assessment in education: contribute to concretize the theoretical foundations of concepts, characteristics, principles and processes for building authentic assessment tools in the teaching process.

- In terms of practice:

+ Build authentic assessment tools according to the outcome standards and use the tools in teaching General Physics module.

+ Tools can be used as a reference for the authentic assessment according to the outcome standards of other modules in the training program of agroforestry universities.

8. Structure of the thesis

In addition to Preamble and Conclusion, the thesis content includes 4 chapters:

Chapter 1: Overview of research problem

Chapter 2: Theoretical and practical basis of authentic assessment in teaching process

Chapter 3: Development and use of authentic assessment tools in teaching General Physics at agro-forestry universities

Chapter 4: Pedagogical Experiment

Chapter 1: OVERVIEW OF RESEARCH PROBLEM

1.1. Overview of research on assessment in education

Assessment in education is not a new issue in teaching theory and practice, there have been many studies on assessment and development of the assessment process under different angles and aspects such as concepts, characteristics, roles, functions, forms or techniques of assessment. In general, assessment research is a method for determining learners' cognitive capacity and adjusting the teaching process. There are numerous perspectives on the categorisation of assessment forms. It is an important problem to consider while learning about assessment, summative assessment, self-evaluation, or assessment of students' learning process; studies have shown the variety of ways of assessment in the teaching process. As education progresses, the measurements used to judge whether students' knowledge and understanding that have been gained will gradually become more formal and standardized.

In Vietnam, implementing the policy of fundamental and comprehensive renovation of our education, a breakthrough solution is stated as the innovation of assessment, including the renewal of exams and tests. We will move from testing what pupils learn to testing the application of knowledge and skills in practice. Therefore, the high school education program is built according to the orientation of developing learners' capacity, so the way to assess the educational results in accordance with the orientation of the program development must be the assessment of learners' capacity. The request for innovation assessment in the direction of improving learners' ability must move from emphasizing end-to-end evaluation to emphasizing process assessment. In general, the research works show that only when the assessment of teaching results is properly organized, it will have an effect on the teaching process, from which pupils can see what they need to do in understanding knowledge, stimulating and promoting systematic learning, helping teachers organize the entire teaching process in the most basic and reasonable way. For teachers, assessment helps teachers know the effectiveness and quality of teaching. For learners, assessment helps pupils know the quality of learning. For managers, the assessment results help them to adjust training programs, organize teaching and learning as well as make accurate and reliable decisions about the assessment of learners' academic results.

1.2. Review of studies on authentic assessment

Among the forms of assessment, authentic assessment (also known as authentic assessment) was first mentioned from studies in the late 1980s, when forms of assessment used traditional tools like a test for scoring, such indicators convey very little about the specific quality and achievement of pupils. To give an assessment system to provide information about specific tasks that pupils can perform, Archibald & Newmann researched and provided valuable, important and meaningful tasks. These are changes in assessment methods to align with educational standards, but the meaning of the "authentic" term here is more related to achievement than assessment. John Mueller has made a thorough study on authentic assessment, according to him, authentic assessment is a form of assessment in which learners are asked to perform real-life tasks that require meaningful application of essential knowledge and skills. This is the definition of authentic assessment that is used by many later studies. He also pointed out that in order to design a authentic assessment form, it must include steps (1) setting standards; (2) assigning authentic task; (3) selecting standards; and (4) designing assessment criteria (rubric) of the tasks that learners have to complete [91]. Besides, there are studies on the use of authentic assessment tools including studies by Scott (1992) on the context of using authentic assessment tools or research by Pate, Homestead, & McGinnis (1993), Leonhardt (2005)) Diller & Phelps (2008), Ghosh, Bowles, Ranmuthugala, & Brooks (2016),... on assessment form (rubrics) design. When performing the authentic

assessment, many tools can be used for assessment, depending on the context, purpose and program to apply accordingly.

After the researches of John Mueller, authors in many countries have made practical applications in the process of teaching for pupils at schools from preschool, primary school, high school to undergraduate and postgraduate students of Gulikers, Bastiaens & Martens, 2005; Rennert-Ariev, 2005 ... Studies on authentic assessment at universities include a number of studies by Gulikers. Bastiaens and Kirschner (2004) that determined that in the context of professional and vocational training, programs will be combined would combine curricula and assessment based on capacity. To better prepare students for their future workplace, it is necessary to have assessment tasks used in professional and vocational education to resemble the tasks that students will encounter in future professional practice. Or as the study by Norazah Yusof et al., the authors discussed the method used to assess industrial training students focusing on authentic assessment that is related to contextual tasks and allows students demonstrate their competence for meaningful learning, the study presents the methodology used to evaluate industrial training students at Universiti Teknologi Malaysia, especially for students in Computer Science. The authors also uses a course assessment report as an example to measure achievement levels and determine the overall effectiveness of Flores industrial training. Or research by Brenda C. Litchfield, John V. Dempsey (2015) has stated that authentic assessment is the intention to determine how their students can use their knowledge, it provides students with meaningful activities that have directly relate to world situations and prepare them for success after they leave university. This means giving them a hands-on environment to experience in order to develop their best knowledge, skills and attitudes. Tungkasamit & Junpeng's report addresses the development of authentic classroom assessment for research-based classrooms in Thai higher education.

In line with the general trend of the world, in Vietnam, the authentic assessment form has also been approached and studied by scientists in the last two decades. According to Nguyen Cong Khanh (2016), authentic assessment is one of the types of assessment that focuses on practical capacity and action capacity to solve practical problems. The author also points out the basic forms of authentic assessment including: product, learning project, demonstration, task performance. Or as in the training document of Dao Thi Hoa Mai,

"Capability-based assessment" also mentioned that authentic assessment is one of the methods of performance assessment; the author also gives concept, advantages and limitations of this method. Also referring to the authentic assessment, however, the author Duong Thu Mai includes the authentic assessment as one of the three forms of modern assessment with the analysis of the characteristics, advantages and disadvantages and the practical application of the assessment methods of the modern form of assessment in the world. In addition, there are articles and research papers by Nguyen Duc Chinh "Authentic assessment of academic results in higher education and training of human resources" which have raised the common problems of the authentic assessment; compared the advantages and disadvantages with traditional assessment and introduced how to build a authentic assessment in general. Along with Nguyen Duc Chinh, there is also a study by Phan Thi Thanh Luong, which also provides a structure of the steps to build a authentic assessment in general with specific tools such as learning records, rubrics),.... However, the researches of the authors only stop at giving definitions, advantages and disadvantages and pointing out some typical products of authentic assessment without extensive research on the design process or tools used for the form of authentic assessment in the teaching process. Especially the ways to apply the steps to build the authentic assessment lesson in a specific subject or field, how to use the authentic assessment tools in the teaching process at all levels for pupils or university students, have not yet discussed by the authors.

Thus, in Vietnam, although the authors have gradually approached the issue of authentic assessment in the classroom to certain extents, assessment tools and techniques have been put into use at all levels, but most of the new studies only mention the general viewpoints and orientations or just goes into the study of applying authentic assessment in a narrow scope, a stage of the teaching process. In addition, it is a fact that at universities, in order to assess learners' capacity, teachers use almost very limited new and modern forms of assessment, most of the teachers are using traditional assessment methods: based on essay writing, major exercises, midterm test, semester end test..., and through some form of multiple choice or essay, the teacher himself is not clear what skills or abilities he intends to assess in students? When teachers have not diversified the types of assessment, it will make learning activities boring, it will be difficult to develop higher-order competencies in learners (such as problem-solving ability, creative thinking ability, force to apply knowledge in practice...). Meanwhile, the requirement of innovation in assessment is to apply various forms of assessment: in addition to assessment by multiple choice, by written test in the form of essay, question and answer, etc., it is necessary to evaluate through products, through presentation, through group interaction, through group products..., assessment by case study, essay forms, ...; and authentic assessment through practice is to present learners with real challenges and assessment through the ability to perform those tasks in practice.

From the above studies, it is shown that authentic assessment is a reliable form of assessing learners' learning competency, consistent with the goal of competency-based teaching. The authentic assessment does not depend on a single assessment method. In authentic assessment, learners are assessed a lot of skills through different situations in real life. Practical assessment clearly shows the strengths and weaknesses of each individual. This form of assessment has the nature of process assessment, so it promotes student learning. True assessment helps students' learning to be motivated and effective, thereby improving the quality of training. Through the synthesis and analysis of the above documents, we realize that authentic assessment should be put into use in all subjects at all levels. The construction and use of authentic assessment tools for a specific subject is the goal that the topic is aiming for. Through the research, we found that currently, there are no published works at home and abroad on the construction and use of the authentic assessment tool in teaching General Physics at the Universities of Agriculture and Forestry. That is the reason why we chose the research topic "Development and use of authentic assessment tools in teaching General Physics".

Chapter 2. THEORETICAL AND PRACTICAL BASIS OF AUTHENTIC ASSESSMENT IN THE TEACHING PROCESS 2.1. Assessment in education

2.1.1. Assessment

Inherit perspectives on assessment in education: Assessment in education is the process of collecting information and using this information to make decisions about the subjects to be assessed (pupils, educational programs, etc.), including qualitative and quantitative information collected during the teaching process to make comments, judgments and decisions. This information helps teachers understand pupils better, plan their teaching and monitor and adjust their teaching, etc., establish a socio-cultural interactive environment to help pupils progress in their learning.

2.1.2. Assessment according to the outcome standard

Outcome standards are the minimum requirements for knowledge, skills, attitudes and professional responsibilities that learners achieve after completing a training program, committed by the training institution to learners, society and publicly disclosed together with performance guarantees. These standards are included in the training objectives/outcome standards of the program and concretize it in each subject in the training program. In order to assess the standards of knowledge and skills according to the published outcome standards of a program, universities need to improve in training management, content and teaching methods, especially innovate the assessment of students so as to determine the level of outcome standards when graduating from the program.

Outcome standard-based assessment is a way of assessing learners' learning outcomes designed to match the level of achievement of the outcome standards. Regulations on assessing learners' learning outcomes (including time, methods, standards, criteria, weights, feedback mechanisms and related contents) should be clear and publicly communicated to learners. Methods of assessing academic results should be diverse, ensuring validity, reliability and fairness. Assessment results are promptly feedback to learners to improve learning and ensure easy access for learners to the performance complaint process.

2.2. Some basic concepts used in assessment

Criterion Criteria Level Evidence Tool

2.3. Traditional assessment

The term of "traditional assessment" refers to the types of assessment tests on paper such as the group of written test methods, the group of oral test methods,... [13]. In the process of teaching, teachers need to choose and use appropriate assessment methods. Each method has one or several corresponding tools to collect information and data for assessment.

* Observation method

* Practical method

* Question and answer method

* Written assessment method

* Investigation method

2.4. Authentic assessment

2.4.1. Concept of authentic assessment

The term of authentic assessment is used in contrast to the term "traditional assessment" that is familiar to all education systems around the world.

According to John Mueller, authentic assessment is a form of assessment in which learners are asked to perform real-life tasks that require meaningful application of essential knowledge and skills.

According to Nguyen Cong Khanh, "Authentic assessment (also known as assessment through practice, assessment of practical capacity) is a type of direct assessment of learners' ability to perform practical tasks, including all forms and methods of assessment carried out with the aim of testing the competencies required in daily life and carried out in a practical context". Authentic assessment focuses on practical capacity, ability to act to solve problems posed in practice, which can overcome the disadvantages of traditional assessment, mobilizes their own abilities to solve problems from real contexts.

Currently, authentic assessment is a reliable form of assessing learners' learning ability, in line with objectives of competency-based teaching. Because it does not depend on a single assessment method and learners can assess many skills across different situations. The authentic assessment shows an individual's strengths and weaknesses. This form of assessment has the nature of process assessment, so it promotes student learning. Students' learning is motivated and effective, thereby improving the quality of training.

2.4.2. Characteristics of authentic assessment

Gulikers et al. have proposed a theoretical framework consisting of five characteristics to define the authentic assessment in the context of professional and vocational training. Similar to Wiggins (1989) and Newmann and Archbald (1992), they argue that the validity of assessment is a multifaceted concept. To determine the authenticity of the assessment, it is necessary to take into account the students' perception of authenticity. In other words, students' perception of the significance or relevance of assessment is central to determining authenticity. The five characteristics for the authentic assessment are the authentic assessment task, actual (physical) context, social context, results of the authentic assessment, and the authenticity standards/criteria. Those five characteristics aim to answer five questions:

+ Mission: What do you have to do?

+ Actual (physical) context: Where do you have to do it?

+ Social context: Who do you have to do it with?

+ Results of authentic assessment: What must come from it? What are the results of your efforts?

+ Authenticity standards/criteria: How does what you have been evaluated?

2.4.3. Principles of making authentic assessments

Principle 1: Every authentic assessment will be a challenge:

Principle 2: Result of an authentic assessment must be in the form of a product or an academic achievement (outcome result).

Principle 3: The design of the authentic assessment must ensure knowledge transfer.

Principle 4: Metacognition is a component of the authentic assessment.

Principle 5: Ensure accuracy in the implementation of assessment.

Principle 6: Ensure the fidelity of the assessment context and tools used to carry out the assessment mission.

Principle 7: Assessment should require discussion and feedback

Principle 8: Cooperation in the authentic assessment.

2.4.4. Authentic assessment tool building process

We consider and propose a process for developing a authentic assessment tool and implementing assessment in universities to meet the Outcome Standards based on the joint research of the authors Darling-Hammond, L., Adamson, F., & Abedi; Gulikers, Bostiaens, & Kirschner; G. Wiggins...and the steps to develop the authentic assessment by John Mueller [92]. There are three steps to the process: Stage 1 is planning to create a authentic assessment tool, Stage 2 is designing a authentic assessment tool, and Stage 3 is implementing the design (Assessment and adjustment of tool). Specific implementation steps for each level are shown in Diagram 2.1:



Diagram 2.1: Authentic assessment tool building process

2.4.5. Authentic assessment tool using process

The process of using the authentic assessment tool consists of 3 stages: Stage 1: Planning to use the tool; Stage 2: using the authentic assessment tool; Stage 3: Feedback and adjustment of tool. Each stage will have specific implementation steps described in Diagram 2.2.



Diagram 2.2: Authentic assessment tool using process

2.5. Current situation of using assessment and testing methods in teaching general courses at some Universities of Agriculture and Forestry

2.5.1. Analysis of the influence of the use of assessment and testing methods on students' academic results

* Survey purpose

Research on influencing factors and analyze the influence of the use of assessment and testing methods on students' academic results at Universities of Agriculture and Forestry today.

* Time, location and subject of investigation

We conducted a situation survey in September 2018 at the University of Agriculture and Forestry - Thai Nguyen University.

Investigative subjects: The research was conducted using questionnaires completed by 403 first-year university students from the University of Agriculture and Forestry - Thai Nguyen University's faculties of Agriculture, Forestry, Animal Husbandry, Biotechnology and Food Technology, Agricultural Economics, Resource Management, and Environment during the academic year 2018-2019. Participants include students from families of farmers, civil servants, and self-employed company owners who reside in hilly, rural, and metropolitan regions.

* Analysis of the influence of the use of assessment and testing methods on the students' academic results

The study's results suggest that there are five aspects that influence first-year university students' academic results, including: learning motivation; pedagogical approaches; topic knowledge; learning environments; and subject organization. In which the lecturers' pedagogical approach is the element with the second greatest level of influence on the academic result of first-year students (in the regression equation, the Beta coefficient of the factor Pedagogy of lecturers equal to 0.202 is the second highest coefficient 2). The primary element that sparks students' attention and motivation is the lecturer's pedagogy [36]. In addition to helping students grasp the material, lecturers also need to design learning activities that will stimulate their interest in the material and help them become more adept at studying independently [49]. The use of methods to assess the assessment and testing methods on the students' academic results determines the success in improving the students' academic results among the issues that need to be reformed at Vietnamese universities, including program content, teaching methods, forms, and means of teaching. Teaching strategies establish the format and manner of instruction, as well as the substance of learning, assessment, and testing. They also provide direction and significant input into how well students learn. As a result, first-year university students are less stressed [88] and there is less pressure to change learning styles when going from the learning environment in high school to the learning environment at the university level [48]. The teaching method also fosters a comfortable, joyful, and positive learning environment for students.

2.5.2. Current situation of using assessment and testing methods in the teaching of general courses

* Time, location and subject of investigation

According to the survey's results on the factors influencing first-year students' academic results, the pedagogical approach that emphasizes the use of assessment and testing methods has a significant influence on students' academic results. Therefore, we conducted a survey and distributed questionnaires to lecturers at the University of Agriculture and Forestry - Thai Nguyen University in order to get a true assessment of the status of using assessment and testing methods in the process of teaching the current general modules in September 2018.

Subjects of the survey were 258 lecturers in specialized faculties and 33 lecturers teaching basic subjects in basic faculties.

From the obtained results, it is shown that: The first year is a crucial transition year from high school to university. Students must overcome several obstacles in their way of the demanding demands of the new living and learning environment. We have analyzed and discovered the factors affecting the first-year students' academic results at the University of Agriculture and Forestry - Thai Nguyen University, with levels ranging from the largest to the smallest. These factors are the learning engine, lecturers' teaching methods, classroom organization, learning conditions, and lecturer professional knowledge. These are the required foundations on which to suggest policies to enhance the academic results of first-year university students enrolled in higher education institutions. The ability of lecturers to recognize the benefits and drawbacks of the methods being used, as well as the need to diversify and employ new and contemporary forms and methods of assessment, is made possible by an understanding of the reality of the methods, tool, and methods of assessment and testing used in the teaching process of general modules. This helps students be motivated to study and enhances the standard of teaching and learning at training institutions.

Chapter 3

BUILDING AND USING AUTHENTIC ASSESSMENT TOOL IN TEACHING GENERAL PHYSICS AT AGRO-FORESTRY UNIVERSITIES

3.1. Knowledge content and training objectives of the General Physics module at University of Agriculture and Forestry - Thai Nguyen University

3.2. Building a authentic assessment tool in teaching General Physics according to the Outcome Standards at the University of Agriculture and Forestry

3.2.1. Stage 1: Planning to build a authentic assessment tool *Step 1: Determine the standard*

We used the following criteria to base the standards (which include content standards, process standards, and value standards) on the outcomes standards for the physics module:

+ Content standards meet knowledge outcome standards (from outcome standard no.1 to outcome standard no.15)

+ Process standards that meet the skill outcome standards (from outcome standard no.16 to outcome standard no.22)

+ Value standards that meet the outcome standards of self-control and self-responsibility (from outcome standard no.23 to outcome standard no.24)

Step 2: Build the context for the implementation of the authentic assessment task

Lecturers provide a setting for students to execute tasks in based on the information and skill objectives that they need to attain, such as: person or group work; live activities in class or delivered at home or online; activities that require help from lecturers or experts; students are required to take part in the building process.

3.2.2. Stage 2: Design a authentic assessment tool Step 3: Design the authentic assessment task

The lecturer will give students an exercise or task based on the material covered in class to assess how well they can apply their knowledge, abilities, and attitudes in accordance with step 1's requirements. This service is based on challenges in the real world. The task's output will consist of a class presentation PowerPoint report, a design or simulation product, and examples of group or personal activities (pictures, videos, activity diaries, etc.).

Step 4: Determine the assessment criteria

Table 3.3: Description of assessment criteria according to outcome

Standard	Criteria	Outcome	
		standards	
Content standar	ds	Outcome	
Knowledge	+ State relevant knowledge content	standard no.1	
content of the	+ Apply knowledge to	to Outcome	
report	explain/calculate/design	standard no.15	
Process standar	d	Outcome	
		standard no.16	
		to Outcome	
		standard no.22	
Product	+ Product design process: build	Outcome	
quality	plans, calculate materials,	standard no.16	
	estimate		

standards

	+ Product form; product operation features	
Application of knowledge in practice	 + Applicability in real life: practical value, + Applicability in the specialty (agriculture and forestry): practical value in agriculture and forestry. 	Outcome standard no.16
Report writing skills	+ Form, layout, expression, and use of language in the report	Outcome standard no.19
Presentation skills	+ Speaking skills, interactive skills, question answering skills	Outcome standard no.22
Value standard		Outcome standard no.23 to Outcome standard no.24
Attitude of self-control, self- responsibility	 + Honest, objective, capable of self- study and research + Sense of discipline, professional responsibility; have a spirit of demand, cooperation 	Outcome standard no.23 Outcome standard no.24

Step 5: Build Rubric (Determine the levels, describe the assessment levels) Table 3.4: Rubric table of assessment criteria according to Outcome

Standards

Outcome	A geogramont oritorio	Description of quality level *			
standard	Assessment criteria	Level 1	Level 2	Level 3	
Outcome	State relevant knowledge				
standard no.1	Application of knowledge				
to Outcome	to explain/calculate/design				
standard no.15					
Outcome	Product design process				
standard no.16					
Outcome	Product form, product				
standard no.16	operation features				
Outcome	Applicability in real life				
standard no.16					
Outcome	Applicability in the				
standard no.16	specialty (agriculture and				
	forestry)				

Outcome	Assocsmont oritorio	Description of quality level *			
standard	Assessment criteria	Level 1	Level 2	Level 3	
Outcome standard no.19	Form and layout of the report				
Outcome standard no.22	Speaking skills, interactive skills , question answering skills				
Outcome standard no.23	Honesty, objectivity, ability to self-study and research				
Outcome standard no.24	Sense of discipline, professional responsibility; Have a spirit of demand, cooperation				

**Note*: The lecturer actively describes the quality levels related to the number of points earned for each level for each particular task (detailed descriptions for the authentic assessment topics are developed in the following section).

3.2.3. *Stage 3: Assessment and adjustment of tool Step 6: Assess and collect information*

Based on the Rubric built in step 5, the lecturer uses Rubric to evaluate the test and collect the results into the assessment guidance form (for assessment lecturer, peer assessment, self-assessment). The assessment forms are as follows:

a. Form for lecturers

ASSESSMENT FORM

Task:....

- 1. Information section
- 2. Section for assessment of academic result corresponds to the Course Outcome Standards

	Outcome standard	Weight	Description			
Criteria			Level 1	Level 2	Level 3	Total
			(1	(2	(3	point
			point)	points)	points)	
Criteria						
no.1						
	Overall point ($\mathcal{D}_{gv(Lecturer 's point)}$)					

b. Form for self-assessment by students and assessment of team members FORM FOR SELF-ASSESSMENT OR ASSESSMENT OF TEAM MEMBERS

Task:....

1. Section for personal/group member information

2. Rubric section for assessment of the Outcome Standards of skills and attitudes

Note: The assessment point $(\mathcal{D}_{N(group's point)}/\mathcal{D}_{tdg(personal's point)}$ is based on the maximum scale achieved by the criteria.

Step 7: Analyze information, comment and improve the tool

+ Analysis and assessment of students' academic result according to Rubric of the assessment forms built in step 6 are weighted as follows:

Rubric for assessment of the assessment criteria according to the quality standards (for lecturers): 70%

Rubric for assessment of Outcome Standards for skills and attitudes assessed by students: 30%. In which group assessment is 20%, and student's self-assessment is 10%.

$$\begin{split} & \underbrace{B_{SV(student 's \ point)} = B_{gv(Lecturer 's \ point) \ (} *70\%) + B_{N(group's \ point)} (*20\%)}_{+ \ D_{tdg(personal's \ point)} (*10\%)} \end{split}$$

Section for classification by the letter scale (used for evaluating the results of the course summary by credit)

3.3. Using authentic assessment tool in teaching General Physics according to the outcome standards at the University of Agriculture and Forestry

3.4. Design some authentic assessment tools according to the outcome standards in the process of teaching General Physics

TOPIC 1: DESIGN A MODEL OF A DRIP IRRIGATION SYSTEM TOPIC 2: AGRICULTURE IN THE CONTEXT OF THE INDUSTRIAL REVOLUTION 4.0

TOPIC 3: NANOTECHNOLOGY AND ITS APPLICATION IN AGRICULTURE

TOPIC 4: CLEAN ENERGY AND RENEWABLE ENERGY

Chapter 4. PEDAGOGICAL EXPERIENCE

4.1. Experimental purpose

The pedagogical experience's goal is to determine the correctness of the scientific hypothesis that the topic has set. The

following questions are specifically addressed by pedagogical experience:

- Does the system of authentic assessment tool designed in chapter 3 enable feasibility and conformity with the purpose of student assessment in the course of teaching General Physics at the University of Agriculture and Forestry?

- Can lecturers evaluate students' academic results in accordance with the criteria when they use the authentic assessment tool? Is it possible to enhance the standard of student academic result?

4.2. Time, location and subject of pedagogical experience

Because the General Physics curriculum framework and content at universities in the agro-forestry sector differ, the thesis does not approach pedagogical experience on a large scale. Instead, it organizes pedagogical experience using the case study method (2-round pedagogical experience at University of Agriculture and Forestry - Thai Nguyen University).

- The first round of pedagogical experience will be given to first-year students enrolled in Course 50 at the University of Agriculture and Forestry - Thai Nguyen University during the first semester of the academic year 2018–2019.

- The second round of pedagogical experience will be held for first-year students in Course 51 at the University of Agriculture and Forestry of Thai Nguyen University in the academic year 2019–2020.

4.3. Pedagogical experimental method

4.3.1. Investigation method

University lecturers and students were given questionnaires as part of a pedagogical experience to gather data on the viability of using a authentic assessment tool to teach General Physics to students.

4.3.2. Observation method

- Observe students in the process of implementing pedagogical experience (evaluating planning and implementing student assessment process at university).

- Observe the activities of performing assigned tasks of students through videos, photos, chat groups Zalo, Facebook, ...

Focus on gathering information on the students' behavior, attitude, and sense of teamwork during the observation process.

4.3.3. Mathematical statistical methods

Using authentic assessment tools including 3 assessment questions for the pedagogical experience of student groups. Assessment results are scored and processed using mathematical statistical methods. Compare the results between 3 times of performing the assessment for experimental groups to draw conclusions about the assessment of student's academic result according to the outcome standards.

4.4. Pedagogical experience content

4.4.1. Documents and guidelines for pedagogical experience

+ We prepare the following documents to implement pedagogical experience:

- Guidelines for the implementation of authentic assessment in teaching General Physics.

- Polls for collect information from lecturers and students...

+ Organize a discussion with lecturers teaching the General Physics module about how to complete the authentic assessment exercise using the method given by the author in Chapter 3 to assess the students' academic result according to the outcome standards.

+ Discuss the content of assessment according to the criteria with lecturers who directly teach and evaluate experimental groups in order to assess students' academic result according to the outcome standards.

+ Provide instructions to experimental group students on how to conduct activities in the authentic assessment tool; create assessment criteria.

4.4.2. How to conduct pedagogical experience

The experiment was divided into two rounds with the implementation and purpose of each round as follows:

+ In the first round of pedagogical experience, the tool created in Chapter 3 will be used for 20 first-year students (02 groups of experience) in the course of teaching General Physics to test the efficacy and practicality of the authentic assessment tool. On that basis, adjustments are made to a number of criteria and indicators in order to standardize the authentic assessment tool and make it more thorough and practical for the second round of pedagogical experience.

+ The second round of pedagogical experience will use the adjusted tool from the previous round for 43 first-year students (05

groups of experience) to evaluate students' Academic Result according to the Outcome Standards using standardized authentic assessment tool.

4.5. Results of pedagogical experience

4.5.1. The process and results of the first round pedagogical experience

4.5.1.1. The first round pedagogical experience

The first round pedagogical experience was undertaken with two groups of students from Thai Nguyen University of Agriculture and Forestry's Course 50 (academic year 2018 - 2019).

The first round of pedagogical experience occurs in semester 1, with Topic 1 being included in the assessment for students in the first stage of the General Physics module (specifically after the end of Chapter 2 content), Topic 2 being used in the midterm (specifically after the end of Chapter 3 content), and Topic 3 being used at the end of the semester (after the end of Chapter 5). We provided questionnaires to 02 groups of students who completed the first round of pedagogical experience and 03 lecturers who participated in teaching General Physics after completing the assessment across three topics (See Appendix 3).

4.5.1.2. Results of the first round pedagogical experience

After distributing questionnaires, we collected 23 answer forms. the data was coded, cleaned and entered into SPSS 20 software.

* Descriptive statistics results:

Urgency: the authentic assessment tool that are built and used to assess the academic result according to the outcome standards for students are very meaningful and necessary.

Feasibility: the authentic assessment tool built and used to assess the academic result according to the outcome standards for students are feasible and effective.

Reliability: the students' comments about the tool after being tested in the first round pedagogical experience are completely reliable, the results are statistically significant.

* Results of some comments on the content, standards, and assessment criteria for the 3 authentic assessment topics

According to the analysis results, the majority of respondents (over 50%) chose to answer "agree" or "very agree" to a number of descriptive observations about the appropriateness of the assessment

of quality levels in terms of knowledge, skills, and attitudes according to the criteria (KT3), the suitability of the authentic assessment task (KT4), how to determine criteria (KT5), criteria (KT6), and levels of expression in each criterion (KT7). However, the amount of votes submitted for the undecided level was still relatively high (48 percent for KT4, 39 percent for KT6, KT7), with votes for disagreeing notably strong in KT5, KT6, and KT7. This demonstrates that some lecturers are still concerned about the propriety of defining standards and evaluation criteria in a authentic assessment tool. Based on a synthesis of some particular remarks regarding the survey tool, we have adjusted, lowered the complexity level in expressing the criteria, and redefined the weights. Scoring for criteria that play a core role.

4.5.2. The process and results of the second round pedagogical experience

In the second round of pedagogical experience, we expanded the scope of using tool for 02 classes with 5 groups of students (total of 43 students) of Course 51, academic year 2019 - 2020 at University of Agriculture and Forestry - Thai Nguyen University, in order to assess the students' academic result according to the outcome standards in the General Physics module teaching process.

4.5.2.1. Academic results of students through the experimental set a. Student's academic result through D1 authentic assessment topic

The academic results of students after implementing the Đ1 authentic assessment topic are relatively poor, with the majority receiving C and D grades. Some subjective and objective causes are as follows: Because this is a new method of assessing students, it is still unclear how to assess using criteria, thus students struggle to determine the requirements for executing activities. Students must spend a significant amount of time collecting documents and frequently working in groups, which is difficult for first-year students because they do not know each other well enough to adapt to group work; students also discover that each person's ability and level of real-world experience varies, which can affect their score results.

b. Student's academic result through D2 authentic assessment topic

The academic results of the students improved dramatically after the implementation of the D2 authentic assessment topics; majority of them received C, B, and few students in Group 4 received A. c. Student's academic result through D3 authentic assessment topic

Following the implementation of the D3 authentic assessment topic, students' academic results improved dramatically, with the majority receiving B, A, and no longer receiving D. This demonstrates that, towards the end of the term, students are familiar with the method of assessment based on the criteria, and teamwork is more effective.

Comment: According to the data, the academic results of the groups tends to improve when the three authentic assessment topics are completed, particularly for groups that get extremely high Level 3 scores (Group 2, Group 4). Figure 4.1 also displays the specific results of each student. Concerning the level of achievement of the criteria in each topic, it can be seen from the fact that students do not know how to perform the task in terms of both theory and practical application (as evidenced by the fact that Đ1's academic results of the majority of criteria reached level 1, none of the criteria reached level 3), then Đ3 the results have significantly improved, many criteria reached level 3, no longer criteria reached level 1. As a result, it was discovered that students accepted the authentic assessment and that there is acquisition and progress in the process of executing the authentic assessment topics.



Figure 4.1. Student's academic result after completing 3 authentic assessment topics

CONCLUSIONS AND RECOMMENDATIONS 1. The results of the thesis

1.1. In terms of theory

- The thesis provided an overview of research on authentic assessment and assessment conducted both at home and abroad, establishing a scientific foundation for conducting theoretical research and developing empirical material for the thesis.

- Theoretical bases on the concept, characteristics and principles of authentic assessment have been concretized; At the same time, it has designed the process of building and using authentic assessment tools for students in the university according to the outcome standards of the training program.

- The thesis developed the content of four authentic assessment tools based on the outcome standards in teaching General Physics at the University of Agriculture and Forestry, including: design a model of a drip irrigation system, agriculture in the context of the industrial revolution 4.0, nanotechnology and its application in agriculture, and clean energy - renewable energy. Each authentic assessment tool contains a set of evaluation criteria and an assessment guidance form based on those criteria. We created an assessment criteria system with three standards (content standards, process standards, and value standards) and eight to ten criteria (depending on the requirements of each topic). Each criterion is weighted differently and assessed at three distinct indicator levels. We also recommend and guide the usage of authentic assessment tools in the General Physics teaching process.

1.2. In terms of practice

- The practice survey results have assisted in identifying the factors influencing first-year students' academic results, including: learning motivation; pedagogical methods; subject knowledge; learning conditions; and subject organization, with learning motivation having the greatest influence on students, followed by the pedagogical method factor. At the same time, the current state of assessment and testing methods in general course teaching at universities is revealed.

- Organizing a two-round pedagogical experience contributes to establishing the requirement and feasibility of the thesis's authentic assessment tool. The pedagogical experience results also show that using the proposed authentic assessment tool helps to assess students' academic results at levels that fulfill the training objectives according to the outcome standards.

Thus, the thesis results reveal that the suggested topic's research purpose is accurate; the pedagogical hypothesis is tested, and the research task is completed. The issue is entirely possible in the innovative use of testing and assessment methods in teaching General Physics to university students majoring in agro-forestry.

2. Suggestions and recommendations

We have a number of suggestions and recommendations to make in order for the testing and assessment activities utilizing authentic assessment of lectures to be truly effective:

- It is required to conduct training for lecturers on how to perform the assessment process using the authentic assessment tool's criteria.

- Lecturers must provide specific instructions to students in order for them to accomplish the authentic assessment task: Encourage various kinds of expression such as role-playing, simulation, discussion, presentation, interpretation, and so on; assist students in group activities, provide opportunities for students to selfassess, peer-review, and self-determine goals in order to achieve standards; ...

- Distribute assessment criteria based on outcome standards to lecturers and students using a authentic assessment tool.

- Implement and apply on a large scale testing and assessment activities using authentic assessment in combination with traditional assessment and testing methods.

- The toolkit can be used as a reference for testing and assessing academic results in accordance with the learner's outcome standards in conjunction with other modules in the University of Agriculture and Forestry's training program.

- Authentic assessment is difficult to perform with a big class of students, thus classrooms must be organized and divided correctly.