Developing the Capability to Apply Chemical Knowledge to Practice through Study Nitrogen and Nitrogen Fertilizer Topics

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Abstract Currently, learning topics are considered as effective models for innovative methods of teaching learning - oriented capacity development for students. In this article, the author preferred the concept of teaching the subject, the process of developing teaching topics include five steps, investigate the status of capacity development use knowledge of chemistry to practical for students under learn theme in some high schools, building assessment tool capacity to apply knowledge, the structure of the capacity to manipulate knowledge, from which we designed the topic illustrating nitrogen and nitrogen fertilizer. Conduct pedagogical experiments and evaluate the effectiveness of applying the knowledge of Nitrogen and nitrogen fertilizer topics to develop students' capacity.

Keywords: capacity to apply knowledge, develop the capacity to apply knowledge, teaching topics, nitrogen and nitrogen fertilizer


1. Introduction

Chemistry is both a theory and an experiment. Students must not only study theory but also know how to apply the knowledge they have learned to solve practical situations. Therefore, in the course of teaching, it is necessary to build teaching topics to develop the capacity to apply chemical knowledge (knowledge and energy) into practice, which will make the lecture closer, give students the interest, enthusiasm in learning and see the practicality of learning.

In the world, there have been some related research works such as Victoria, FF, & Paul, A. E, Enhancing Students' Achievement, Interest and Retention in Chemistry through an Integrated Teaching / Learning Approach, studying the effects of the method, integrated teaching method in the direction of mapping concepts to learning styles and achievements of chemistry students [1]. Stohllmann, M., Moore, TJ, & Roehrig, G. H, Considerations for Teaching Integrated STEM Education, researching a supportive model, teaching, effectiveness, and (original) documentation of teaching considerations Integrated STEM education teaching has been developed through a long-term partnership with a middle school [2]. On the issue of capacity development for the students, the Lu Z., Z. Zou, Zhang Y, Application of Mind Maps and Mind Manager to Improve Students' Competence in Solving Chemistry Problems threads cents Land use mind maps and software Mind Manage to improve students' ability to solve chemical problems during the transition period of chemistry instruction in China [3]. Everwijn, SEM, Bomers, GBJ & Knubben, JA Ability- or competence-based education: Bridging the gap between knowledge acquisition and ability to apply for students to learn how to apply guesswork in the field of general skills and total skills suitable (reflexive and learning to learn) interact with learning content according to different majors [4]. Taber KS, Adho K, Developing Chemical Understanding in the Explanatory Vacuum: Swedish High School Students' Use of an Anthropomorphic Conceptual Framework to Make Sense of Chemical Phenomena, common use of anthropological language in descriptions and explanations of students In addition to the basic chemistry phenomena - changes in state, chemical bonds and reactions [5]. Basu M, Das P, G Chowdhury "Introducing integrated and Comparison with traditional teaching in undergraduate medical teaching curriculum " with the objective of evaluating the feasibility of Information Technology (IT); to compare IT with traditional teaching and to analyze student feedback and instructor feedback on IT awareness [6].

In Vietnam, many research projects on teaching subjects authors such as: Vuong Cam Huong "Designing self-study activities under the subject of chemistry to develop self-study capacity for high school students." [7], Tran Thi Ngoc Linh 'Train students' self-study capacity
2. Content

2.1. Research Methods

Use a combination of analysis, synthesis and systematization methods in the study of relevant documents. Investigate the reality of development the capability to apply chemical knowledge into practice for students students in chemistry teaching by themes at some high schools; Pedagogical experiment to test the practical value of research results. Using mathematical statistical methods to process data make valid comments and assessments.

2.2. Research Facilities

Questionnaire, assessment test, tabulation and mathematical statistical formulas.

2.3. Research Subjects

- Developing chemical engineering energy training for students through teaching topics.
- Develop topics of teaching nitrogen and nitrogen fertilizers.

2.4. Research Results and Discussion

2.4.1. Teaching by Subject

a. Picking concept

“The topic is a unit of knowledge content that when organizing student research and discovery, it will solve a theoretical or practical problem, so that it can not only acquire scientific knowledge but also practice, forming basic competencies such as problem solving, using language, calculation, creativity, critical thinking and self-study” [(16); p 37]

The subject is the core issue, the main aspect of the movement orientation of the object and its multidimensional relationship with other objects in nature. It can be said that teaching on the subject has an integrated teaching nature, bringing human awareness to an objective reality. In teaching, the topic is a relatively complete knowledge unit, and at the end of a topic, learners acquire knowledge and skills to solve practical problems related to or solve problems. Topic in new context” [(17); p 48].

b. Process of topic building

Step 1: Define the subject name [(18)]

Based on the program content, applications, phenomena, processes in practice, identify the related content presented in some current articles / lessons, thereby building up a common problem, to form a subject in the subject or / and related subjects to build an interdisciplinary integrated topic.

Step 2: Define standards of knowledge, skills, attitudes and competencies [(18)].

Identify standard knowledge, skills, and attitudes according to the general education curriculum in chemistry subjects. Use teaching methods actively organizing the activities of learning, thereby determining the competencies and qualities can be formed for students.

Step 3: Described four-level requirements and compiling questions / exercises for checking assessment [(18)]

Identify and describe the level of requirements including (identify, understand, manipulate, high manipulate) of each type of question / exercise that can be used to test and assess competency and quality of students in teaching.

Compile specific questions / exercises according to the levels and requirements described for use in teaching activities, testing, evaluation, practice based on the theme.

Step 4: Design teaching process [(18)].

Process of teaching topics are organized into learning activities of students to be able to perform in the classroom and at home, each lesson in the classroom can only perform a number of activities in the process of pedagogical methods and teaching techniques used. In a subject with many lessons, it is possible to integrate with each other, not separated by each period, without having to repeat the common parts (such as the general goals of the topic, the required standard of knowledge and skills, attitude, ... these contents are designed (recorded) only once but fully reflected for the whole topic).

Step 5: Building an assessment tool to apply knowledge into the topic [(13)]

Assessment tool for applying knowledge including tests (15 minutes, 45 minutes, check in the course of the topic, test after the topic, the product evaluation sheets student learning (journals, clips, presentations, ...)), group activity evaluation sheets, coupons student competency assessment for teachers, student self-assessment questionnaire, communication questionnaire of Student information before and after the topic.

2.4.2. Capacity to Apply Knowledge

a. Concept of capacity to apply knowledge

“Students’ ability to apply knowledge is the ability of students to mobilize themselves, use the knowledge and skills they have learned in class or learn through real-life experience to solve problems, out of diverse and complex situations of life effectively and with the potential to transform it. Manipulate knowledge capacity illustrates the quality and personality of people in the process of operation to satisfy the need to dominate knowledge” [(9)].
b. Structure of capacity to apply knowledge [19]

Students’ capacity of applying knowledge ordinary chemistry through a 5 capacities following major components:
- Capacity of systematizing knowledge.
- Analytical capacity to synthesize applied chemical knowledge into real life.
- The ability to detect the contents of chemical knowledge is applied in issues to different fields.
- Capacity to detect problems in practice and use chemical knowledge to explain.
- Innovative independent competence in handling practical issues.

2.4.3. Situation of Developing the Capacity to Apply Chemical Knowledge into Practice for Students in Teaching Thematic Chemistry at Some High Schools in Dak Lak Province

Through surveys and surveys of opinions of 18 teachers and 156 students at Buon Ho High School, Hai Ba Trung High School, Huynh Thuc Thang High School in Dak Lak Province. Comments: Most teachers and students think that developing technical competence through teaching Chemistry is very necessary (58.24% of teachers; 41.76% of students). Referring to the current energy efficiency of students, there are 39.21% of teachers rated at fairly and 7.8% of teachers rated well. Regarding conducting teaching by topic, students are quite interested (72%). Through the results of the above survey, I realize that the use of positive teaching methods to teach topics is necessary, in order to develop the capacity of technical energy training for students.

2.4.4. Design Nitrogen and Nitrogen Fertilizer Topics

- Content 1: Nitrogen
- Content 2: Ammonia and some ammonium compounds
- Content 3: Nitrogen fertilizer
- Duration: 3 periods in class and 2 weeks at home

I. Objectives
1. Knowledge
Know: The natural state, the application of nitrogen, ammonia, the nutrition of nitrogen fertilizer.
Understand: The chemical properties of nitrogen, ammonia, ammonium salts, nitrogen fertilizer classification, effects of nitrogen fertilizer on plants.
Application: Knowledge of chemical equilibrium, reaction rate, enthalpy for ammonia fusion. Experimental identification of ammonium ions in nitrogen fertilizer containing ammonium ions was performed. How to use nitrogen fertilizer for plants.
Analysis: Contact process of creating and supplying nitrate to soil from rain water.
Assessment: Effects of nitrogen fertilizer on crops, the environment and human health.

Creativity: Making bread using baking powder, growing vegetables using fertilizer.

2. Skills
Predict properties, check predictions and conclusions about properties of nitrogen, ammonia, and ammonium salts. Write chemical equations illustrate. Identify substances, solve related exercises. Communication skills, cooperation skills, presentation skills.

3. Attitude
Actively explore and create creativity in learning, have the will to overcome difficulties to achieve good results in learning. Proactively and actively participate in and mobilize others to participate in activities of propagation, care and protection of nature.

4. Capacity needs to be formed and developed
Capacity of applying Chemistry knowledge in life, problem solving and creativity, Energy of communication and cooperation.

II. Teaching methods
Project teaching method (Main method), using to stem for teaching.

III. Prepare
1. Teacher prepares: Documents, orientation questionnaires, evaluation sheets, tasks to be assigned to student groups, knowledge test after the project.
2. Students prepare: Learn the lesson content, complete the report in groups.

IV. Determining and describing the level of requirements, compiling questions / exercises
1. Describe the levels of awareness and capacity to form
2. Questions / exercises corresponding to each type / level of request
a. Level know (development capacity thinking)

Question 1: Which of the following fertilizers is nitrogen fertilizer?
A. KCl B. Ca3(PO4)2 C. K2SO4 D. (NH4)2CO.
b. The level of understanding (developing thinking capacity)

Question 2: In the following fertilizers: NH4Cl, (NH3)2CO, (NH3)2SO4, NH4NO3, the type with the highest protein content is
A. NH4Cl B. NH4NO3 C. (NH3)2CO D. (NH4)2SO4.
c. Low level of manipulation (developing thinking energy, creative energy)

Question 3: Give the following statements:
1. The nutrition of fertilizer nitrogen was rated prices under section hundred weight material element nitrogen.
2. Ammonia is used to produce nitric acid, fertilizer nitrogen.
3. Ammonium fertilizer should be applied to acid soil.
4. The main component of fertilizer urea is (NH2)2CO.
5. It is not fertilized urea with lime.

<table>
<thead>
<tr>
<th>Know</th>
<th>Understanding</th>
<th>Manipulate</th>
<th>High manipulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>nature states, the application of the element nitrogen, ammonia. Nutrition of nitrogen fertilizer</td>
<td>Understand the chemical properties of nitrogen, ammonia and ammonium salts. Classification of nitrogenous fertilizer</td>
<td>Applying knowledge of chemical equilibrium, reaction rate, enthalpy for ammonia fusion. Experimental identification of ammonium ions in nitrogen fertilizer containing ammonium ions was performed. How to use fertilizer for plants.</td>
<td>Contact process of creating and supplying nitrate to soil from rain water. Making bread using baking powder, growing vegetables using fertilizer,...</td>
</tr>
</tbody>
</table>
Question 4. On the market today, in addition to chemical fertilizers, there are organic fertilizers being used by many farmers. In your opinion, what kind of fertilizer should be used for plants? Please state your opinion on the above issue.

V. The process of organizing teaching topics

Illustrative content 3. Nitrogen fertilizer

A. Stable class

B. Experimental activities, connections

1. Operation objectives
   - Mobilize students’ already learned knowledge and create the need to continue learning new students’ knowledge.
   - Developing cooperative capacity, energy efficiency for students.

b. Mode of organization and operation:

Teacher screening a video about the misuse of fertilizer urea a vegetable request students observations:
https://www.youtube.com/watch?v=SDZfAKRL3U.
- Activities individuals: students watch the video and answer questions: The abuse of nitrogen can affect crops, the environment and human health or not?
- Group activities: Teachers give students group activities to share and complement each other in the results of individual activities.
- General class activity: Teachers invite representatives of some groups to present the results, others comment and supplement.

C. Products, performance evaluation:

- Product: The use of nitrogen fertilizers reduces soil fertility, pollutes water sources, pollutes the air, affects plants and harms human health.
- Evaluation criteria: Present content clearly and completely.
- Evaluate operational results.

Through the results of questions of the teachers (developing detect the contents of chemical knowledge capacity which are applied in problems of different fields).

C. Knowledge creation activities

a. Operation objectives
   - Know the nutrition of nitrogen fertilizer.
   - Understand the classification of nitrogen fertilizer, the effect of nitrogen fertilizer on crops.
   - Explain the effect of nitrogen fertilizer on plants and human health.
   - Cooperative capacity, energy efficiency and energy efficiency in life.

2. Mode of organization and operation:

Activity 1: Assigning tasks

Teachers assign tasks to 3 groups, ask students to discuss in groups to identify the specific contents and tasks to be performed in each group’s project.

Group I: As a marketer, please show me what nitrogen is? How to classify nitrogen fertilizer, effects of nitrogen fertilizer?

Group II: As a fertilizer manufacturer, introduce everyone about the process of producing nitrogen fertilizers through a video, picture,...

Group III: As famous actors, you play a part about the situation of using nitrogen fertilizer in the locality and suggest some solutions to increase fertilizer use efficiency and reduce environmental pollution.

Teacher synthesizes students’ opinions, unifying the contents and tasks to be presented.

Activity 2: Plan the project, identify the project goals, and provide questionnaires that guide the topic

- Teacher provides guidance votes students project implementation, project tracking window,... popular way of presenting books to monitor the project, criteria and assessment scale plus m project,...
- Group activities: Students discuss to plan the project implementation.
- Teachers track, comment, advise groups of students to build a plan appropriately.

Activity 3: Guide students to implement the project plan

- Students search for information about nitrogen fertilizers from textbooks, reference books, from the internet or go to the field, then assign specific tasks to each member of the group.
- Students formulate a presentation outline and then design the product to highlight the main ideas, illustrate by visual means (diagrams, images, videos,...).
- Teachers monitor the process of project implementation groups and answer questions when students need it.

Activity 4: Product Report

- Teacher: Invite groups I, II, III to report in turn. Each group presented the report within 5 minutes of what was delivered and answered the other group questions. During the group process you report, the remaining groups listen and ask questions and evaluate according to the evaluation form.
- Teacher: After the presentation of each group and the review of other groups, teachers comment, supplement and finalize knowledge.

Activity 5: Students record

Students summarize the content that teachers have commented, edited and commented.

c. Products, performance evaluation:

- Products
  - Diagram of Thinking kinds of fertilizer root a group I. PowerPoint on the production process of nitrogenous fertilizers of group II. Scenarios, pictures of Group III.
  - Project monitoring book, evaluation sheets.
  - Students evaluate products and the presentation of groups according to the product evaluation criteria.
- Team members complete individual self-assessment, peer group evaluation through evaluation form, classroom assessment.

- Criteria for evaluation: Display content fully and strictly.
• **Evaluate operational results**
- Through the activities of learning about nitrogen fertilizer, the effects of nitrogen fertilizer, nitrogen fertilizer production process (developing energy to discover the contents of chemical knowledge that are applied in issues of different fields).
- Through the activities of understanding the actual situation of using nitrogen fertilizer in the locality and offering some solutions to increase the efficiency of fertilizer use and minimize environmental pollution. (creative independent energy development in dealing with practical issues).
- Through project implementation planning, project plan implementation, drafting of presentation then designing, product reporting (developing capacity to systematize knowledge, synthesize analysis) Applied Chemistry knowledge in real life.

**D. Activities: Training, applying extensive exploration**

**a. Operation objectives**
Consolidate and inculcate the knowledge learned in the energy engineering solar energy into practice.

Applying chemical knowledge which through the topic of nitrogen and nitrogen fertilizer to develop the applying knowledge of nitrogen fertilizer into practices capacity

Knowledge stem in the topic

<table>
<thead>
<tr>
<th>Product's name</th>
<th>Science (S)</th>
<th>Technology (T)</th>
<th>Engineering (E)</th>
<th>Mathematics (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables reform</td>
<td>Composition and properties of fertilizer</td>
<td>Process of growing vegetables</td>
<td>How to use fertilizer</td>
<td>Calculating the amount of fertilizer to fertilize the tree</td>
</tr>
</tbody>
</table>

### 1. Mode of organization and operation:

**Activity 1:** Teachers distribute learning cards and ask students to complete:

**STUDY COUPON**

**Question 1:** The nutrition of nitrogen fertilizer is assessed according to
A. The percentage of NO in the nitrogen fertilizer.
B. mass fraction of HNO3 in nitrogenous fertilizer.
C. Percentage of elemental mass N in nitrogenous fertilizer.
D. Percentage of mass of NH3 in nitrogenous fertilizer.

**Question 2:** Which of the following fertilizers is nitrogen fertilizer?
A. KCl, B. Ca3(PO4)2, C. K2SO4, D. (NH4)2CO

**Question 3:** Which of the following fertilizers increases soil acidity?
A. KCl, B. NH4NO3, C. NaNO3, D. K2CO3

**Question 4:** Fertilizer supply nitrogen combined plant as ions:
A. NO3− and NH4+, B. NH4+ and PO43−

**Question 5:** In the following fertilizers: NH4Cl, (NH4)2CO, (NH4)2SO4, NH4NO3. The type with the highest protein content is
A. NH4Cl. B. NH4NO3. C. (NH4)2CO. D. (NH4)2SO4.

**Question 6:** Do not fertilize with lime because it is in water
A. Nitrogen fertilizers precipitate lime.
B. Nitrogen fertilizer reacts with lime to form NH3 gas that neutralizes nitrogen.
C. Nitrogen fertilizers react with lime and exothermically cause the plants to die from heat.
D. Crops cannot absorb nitrogen in the presence of lime.

- Personal activities: Thinking and answering questions in the study sheet.
- Group activities: Teachers give students group activities to share and complement each other in the results of individual activities.
- General class activity: Teachers invite representatives of some groups to present the results, others comment and supplement.

**Activity 2:**
Teacher tasked students: Learn about the process of growing vegetables reform and how to fertilize vegetables, compare whether the use of fertilizer chemical, organic fertilizer and no fertilizer use affects how come the development of vegetable reform. Complete the following table:

<table>
<thead>
<tr>
<th>Chemical fertilizers</th>
<th>Organic fertilizer</th>
<th>Do not use fertilizer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Students perform tasks in groups: Studying textbooks, reference materials, searching information on the Internet. Proposal and discussion of initial ideas, unified the planting procedures and fertilizing stages for plants. Develop specific plans and implementation plans.
- Teachers observe and support students when needed. Ask students to submit products and reports after 5 weeks.
- Teacher general comments on the results of the learning project.
- Collect individual and group evaluation forms.
- Announcing and evaluating groups of teachers.

**c. Products, performance evaluation**

- **Product**
  - Results of answering questions / exercises in the learning card.

- **Vegetables and analysis, comparison of groups.**

  How to fertilize plants:
- Right amount: Determine the right amount of fertilizer to fully supply the needs of the tree, reducing the excess of soil.
- Correct soil: Choose fertilizer that is suitable for the basic soil properties.
- Timely: Fertilize at the time when plants need the most nutrients to grow and develop.

- Teachers guide students to synthesize and adjust knowledge to complete lesson content.

VII. Check and evaluate

**Question 1:** (Levels of awareness) In the following types of chemical fertilizer, which fertilizer type is:
A. KCl. B. Ca(HPO₄)₂. C. K₂SO₄. D. (NH₄)₂CO.

**Question 2:** (Levels of Understanding) In the following types of chemical fertilizer, which fertilizer type is:
A. NO₃⁻ and NH₄⁺. B. NH₄⁺ and PO₄³⁻. C. PO₄³⁻ and K⁺. D. K⁺ and NH₄⁺.

**Question 3:** (Levels of manipulate) For the following statements:
1. The nutrition of fertilizer nitrogen was evaluated according to the percentage volume of material elements nitrogen.
2. Ammonia is used to produce nitric acid, nitrogenous fertilizer.
3. Ammonium fertilizer should be applied to acid soil.
4. The main component of urea fertilizer is (NH₂)₂CO.
5. People do not fertilize urea with lime.

The correct statement is:

**Question 4:** (Levels of advanced manipulate) On the market today, in addition to chemical fertilizers, there are organic fertilizers being used by many farmers. In your opinion, what kind of fertilizer should be used for plants? Please state your opinion on the issue.

2.5. Experimental Results Pedagogy

Pedagogical experiments are conducted in the school year 2019 - 2020, at Buon Ho High School and Huynh Thuc Khang High School in Dak Lak province. Design nitrogen teaching topics with the use of polar teaching methods to develop and develop technical energy for students. Assessing experimental results through observation checklist by students' self-assessment and teachers' evaluation along with the results of the energy efficiency assessment tests are processed by mathematical statistical methods (see Table 1).

Table 1. Checklist to observe the development of technical energy training into practice of students in experimental class before impact and after impact

<table>
<thead>
<tr>
<th>Criteria</th>
<th>BEFORE IMPACT</th>
<th>AFTER IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weak (0-4 points)</td>
<td>Average (5-6 points)</td>
</tr>
<tr>
<td>1. Recognize the practical problems of nitrogen fertilizer</td>
<td>14</td>
<td>21.21%</td>
</tr>
<tr>
<td>2. Identify the knowledge about nitrogen fertilizers related to practice</td>
<td>16</td>
<td>24</td>
</tr>
<tr>
<td>3. Discover, explore knowledge about nitrogen fertilizers related to practical issues (if any)</td>
<td>18</td>
<td>24</td>
</tr>
<tr>
<td>4. Explain, analyze, evaluate practical issues of using nitrogen fertilizer</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>5. Recommend measures, implementation of the problem using nitrogen and propose a new issue</td>
<td>25</td>
<td>24</td>
</tr>
</tbody>
</table>
Table 2. Summary of typical parameters

<table>
<thead>
<tr>
<th>Class</th>
<th>students’ number</th>
<th>$\bar{x}$</th>
<th>$S$</th>
<th>$S^2$</th>
<th>$V$ (%)</th>
<th>Student test value</th>
<th>Influence level ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>32</td>
<td>7.41</td>
<td>1.66</td>
<td>2.77</td>
<td>22.40</td>
<td>$t = 2.65$</td>
<td>0.63</td>
</tr>
<tr>
<td>Control</td>
<td>33</td>
<td>6.33</td>
<td>1.71</td>
<td>2.93</td>
<td>27.14</td>
<td>$t = 2.00$</td>
<td></td>
</tr>
</tbody>
</table>

Analysis of observation checklist: Wind energy of students after impact is better than before impact. The percentage of students who achieved a good and good level in each indicator criterion of students after the impact was always higher than before the impact and at a weak level, lower average. As follows:

Realizing the practical problems of nitrogen fertilizer: % of students who got the good level after the impact were 36.36%, the % of students at weak level was only 7.58%, but before the impact percent of students who got good level had only 6.06% of which are at a weak level of 21.21%.

Determine the knowledge about nitrogen fertilizer related to practice: % of students achieved a good level after the impact of 31.82%, a percentage of students at weak level was only 10.61%, but before the impact of % students reached a level good at only 7.58% of which weak level is 24.24%. Proposing measures, implementing solving the problem of using nitrogen fertilizer and proposing new problems: % of students achieved good level after impact of 28.79%, % of weak students were only 12.12%, but before when the impact percent of students reach the good level, only 6.06% of which the weak level is 37.88%.

Considering the other criteria of energy efficiency from the data obtained, the results are similar (see Table 2).

The average value of the experimental class is higher than the control class (7.41>6.33) showing that the apply knowledge class result of experimental class is higher than that of control class. V values in the range of 10% to 30% demonstrate reliable results. The $S$ value of the experimental class is smaller than the control class so the dispersion of the experimental layer is lower than that of control layer. The impact level ES (0.63), in the range 0.5 to 0.79 should be able to confirm the difference of the two mean values are significant, 99% reliability ($>t_{n}$). From the above, it shows that the measures we use have a positive impact in developing the apply knowledge capacity for students. Thus, developing energy efficiency for students through thematic teaching has achieved success in contributing to improving the quality of teaching effectiveness.

3. Conclusion

From the research the theoretical basis of teaching topics and capacity of applying knowledge. We have designed the topic of nitrogen and nitrogen fertilizer. Conducting experimental teaching under the teaching method of the Project and STEM learning to develop energy efficiency for students through applying knowledge to use nitrogen fertilizer to fertilize vegetables properly will bring high efficiency.

Experimental results on chemical engineering into practice before impact and after impact have clear and feasible changes through the use of teaching topics in developing energy efficiency for students, which has helped the lesson. Teachers’ lectures become closer, will attract more students, contribute to arousing interest in learning, meet the current educational trend and are necessary luggage for students to enter life in the future.

References


