

Applying Some Modern Methods and Techniques in Teaching Chemistry to Develop Students' Competence in Vietnam

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Abstract Developing qualities and capacities for students is the goal of Vietnamese education in 21st Century in accordance with the "4.0 technology era". This article introduces some modern methods and techniques that have been studied and used effectively in the teaching for develop students' capacities of chemistry in high schools in Buon Ho town, Dak Lak province, Vietnam, such as project teaching, contract teaching, experiential teaching, hands-on teaching, integrated teaching, teaching with mind map, teaching in team collaboration. This has raised interest among for students and has resulted in higher academic achievement than those not used the above-mentioned teaching methods. In particular, they have developed individual, professional and social competence those are language ability, creative thinking capacity, problem solving ability, computational competence; cooperation capacity, capacity to apply chemical knowledge into real-world.

Keywords: *competence /capacity/ ability, teaching methods, teaching techniques, chemistry competencies*

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1. Introduction

After 2015, Vietnam's education will change drastically in the direction of synchronous reform, especially in general education. The innovation of general education is inevitable in order to adapt to the great development of the knowledge society of mankind and the rushing development of science and technology. The teaching is not following in the form of "one-way transmission" but must be "learner-centered", divided, developed capacities for learners, ... The learning space is not only in the classroom but also outside the school, such as: study at home, at the factory, in the field, on the internet, ... Students do not just listen to lectures, note or do their homework in the classroom, then they have to explore themselves, gain knowledge, explore online, implement learning projects, experience, practice, solve situations, solve problems... The innovation of teaching methods not only to develop general qualities and capacities, but also to develop specific capacities for learners. [1,2]

2. Research Content

2.1. Definition of Competency and Competencies Development for Students

Competency concept has a Latin origin "competentia".

Today, the concept of competency is often understood in different ways, depending on the approach and perception. [1,3,4]

According to the Program of general education - the Overall program introduces the concept: "Competency is an individual attribute formed, developed by virtue of availability and learning process, training, allowing people to mobilize total of knowledge, skills and other personal attributes such as excitement, confidence, will, etc to successfully realize activities, achieving desired results in specific conditions." [1]

From the above understandings, we see Competency is the ability of individuals to work on the basis of mobilizing the total of knowledge, skills, attitudes, ... to effectively accomplish a task. In this topic, we use the concept: "Ability is the ability to carry out responsible and effective actions, solve tasks, problems in changing situations in occupational fields, social, or personal, on the basis of knowledge, skills, experiences and readiness to act".

2.1.1. Rules of Competencies Developing for Students

According to [3,4,5]: To form and develop for students' competencies, when choosing the content and teaching methods must to ensure the following rules:

-Rule 1: Ensure the goal of education, form and develop the necessary competencies for learners, especially the ability to apply knowledge into practice of students.

-Rule 2: Ensure scientific, accuracy and practicality.

-Rule 3: Ensure consistency between theory and practice.

-Rule 4: Ensure the unification of fit and development requirement.

-Rule 5: Ensure consistency between the teacher's main role and the positive, self-awareness, active of the learners.

-Rule 6: Use active teaching methods to actively activate students' awareness and enhance their effective participation in solving practical problems.

2.1.2. Measures to Develop The Students' Competencies in Teaching Chemistry

To develop the competencies for students in teaching chemistry, the following measures can be used: [3,4,5]

- Form a strong basic knowledge system. It is the formation of concepts, laws, properties, rules, ...

- Training for students with the ability to think logically, precisely through the observation, analysis, synthesis and to rely on the nature of the problem to find a short solution creative.

- Design and organize integrated teaching topics related to the practice of the local residence. Build realistic situations (directly or indirectly) through a system of questions and train students to use the knowledge to solve real-world problems.

- Use question / problem situations to apply knowledge into practice.

- Use visual aids, practical experiments, ... to practice the use of knowledge in practice.

- Use active teaching methods and techniques, appropriate teaching aids.

- Organizing the examination using the interdisciplinary knowledge to solve practical problems and technical science exam for high school students.

2.2. The Real State of the Application of Modern Teaching Methods and Techniques in Order to Develop the Competence for Students in the High Schools in Buon Ho town, Dak Lak Province

Of the 20 teachers teaching Chemistry in Buon Ho town, they are mainly qualified as Pedagogical University, only 2/20 have master degree, no PhD or college degree. Their seniority of teaching chemistry in high school: No new graduates; From 3 to 5 years: there are 3 teachers; from 6 to 10 years: there are 9 teachers; from 6 to 15 years: there are 6 teachers; Over 15 years : there are 2 teachers. 85% of respondents said that the innovation of teaching methods in the current period is very necessary. The frequency of use of modern teaching methods is low. Such as : The teaching by project(15%), teaching by contract work (10%), teaching by corners (10%), teaching by webquest (5%). The almost of them have not focused on the development of general competencies and specific competencies for students yet.

I have observed 20 lessons in classrooms: 7 in Buon Ho High School; 5 in Hai Ba Trung high school; 5 in Huynh Thuc Khang High School and 3 at the Buon Ho Continuing Education Centers. Assessment Results: Excellent 4/20;

Pretty 13/20; Average 3/20. Throughout the lessons, teachers focus on how to communicate the contents of knowledge in the textbook for students but less attention to how the knowledge is applied in real-practice. The teacher's questions are mainly for students to reflect the knowledge what they have learned or ask students to answer on the basis of reading knowledge in the textbook. Therefore, in the process of studying, students do not have the ability to promote individual, social and professional skills.

2.3. Study Some Positive Teaching Methods and Techniques to Develop Students' Abilities

In teaching, many teaching methods and teaching techniques can be used to develop the capacity of students. [3,4]

2.3.1. Teaching by Project

"Teaching a project is a form or teaching method in which the learner performs a complex learning task, which combines theories and real- practice, practice and their products can be introduced. This task is carried out by the learner with high self-reliance in the whole learning process, from goal setting, planning, to project implementation, testing, adjustment, evaluation of process and result" .

2.3.2. Contract Teaching

Contract teaching is a form of teaching organization in which each student is assigned a package contract that includes various mandatory and elective tasks / assignments for a certain period of time. They are active and independent to decide the time for each assignment / task and the order of realization in which they are performed." [4,6]

2.3.3. Teaching Webquest

"Webquest is a teaching method in which learners perform in a group of tasks with self-reliant on a complex topic/ a topic linked to a real-world situation. The basic information about the topics is accessed from the links selected by the teacher before. Research-oriented learning and exploration, learning outcomes are presented and evaluated by students" [3,4].

2.3.4. Teaching by Practice, Experiential- learning Method

Experiential learning is the process of learning through experience, and is more specifically defined as "learning through reflection on doing". Hands-on learning is a form of experiential learning but does not necessarily involve students reflecting on their product.

It is related to, but not synonymous with, other forms of active-learning, such as action-learning, adventure-learning, free-choice learning, cooperative-learning, service-learning and situated-learning. [5,7]

2.3.5. Interdisciplinary Integrated Teaching.

Interdisciplinary integrated teaching is the teaching of knowledge relating to two or more subjects. "Integrative" refers to the method and goal of teaching activities while "interdisciplinary" refers to the content of teaching.

Teaching "integration" is sure to teach knowledge "interdisciplinary" and vice versa, to ensure the effectiveness of interdisciplinary teaching must be by and towards the goal of integration.

This is a form of teaching that helps develop students' capacities and qualities effectively. [2,5]

2.3.6. Some Modern Teaching Techniques

Teaching techniques are measures, methods of action of teachers and students in situations small actions to fulfill and control the teaching process.

Some modern teaching techniques, such as: Aquarium; KWL; 5W1H; Mind map; Brain power; Pieces of puzzle; Tablecloths... [4]

2.4. Examination, Assessment in Teaching-Oriented Capacity

The assessment methods used in teaching the development of student competencies are as follows: [3,4] Observing the classroom; Review student records (See Figure 2); Students self-assessment; Peer evaluation; Assess the test (See Figure 1); Evaluation of contract products, projects ; Evaluate the questionnaire; Evaluate through the checklist.

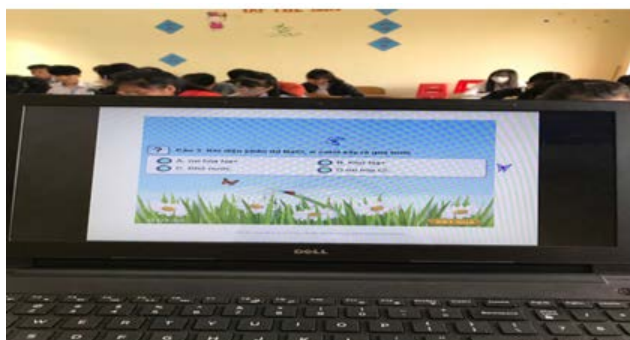


Figure 1. Check the old- knowledge on the computer



Figure 2. Assess students' products

2.5. Applying a Number of Methods and Techniques of Active Teaching in Teaching in Order to Develop the Capacity of Students

2.5.1. Project-Based Learning

Example: Discover the Role of Chemical Fertilizers (Lesson Chemical fertilizers-Chemistry 11)

-Task 1: Discover the role of chemical fertilizers in plants. Demonstrated by experiment.

-Task 2: Build website or poster to propagate the harmful effects of chemical fertilizers (See Figure 3: "Do not over fertilize chemical fertilizer!". Because it pollutes the soil, pollutes the water, causes disease to plants and wastes money.)

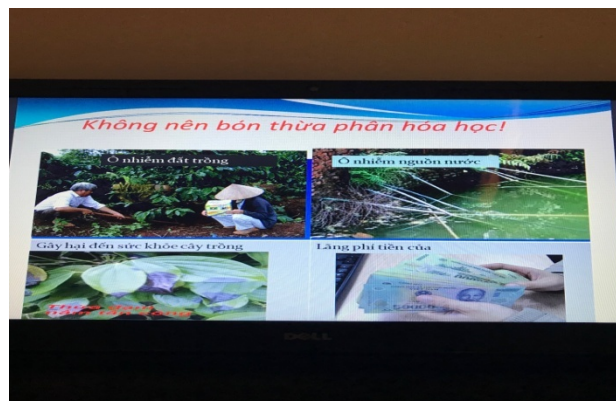


Figure 3. A poster to propagate the harmful effects of chemical fertilizers in Vietnamese

2.5.2. Contract-Based Learning

Example: A Study of the "Structural and physical properties of Metals", Chemistry 12. (See Figure 4 and Figure 5).

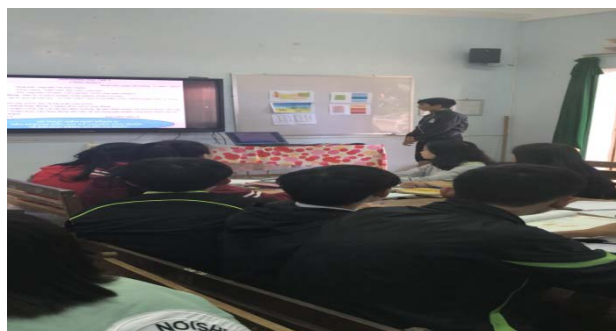


Figure 4. Students present the product of the study contract

LEARNING AGREEMENT

..., day/ month/ Year

Mrs: Nguyen Thi Kim Hanh (Part A)
 Title: Teacher of Chemistry
 Name of student:
 Title: Team leader 1 of class... (Part B)
 Part B is responsible for completing a powerpoint presentation and some clips on ...
 - Part A is responsible for providing orientation materials, reference materials, support when requested.
 - Part B has the responsibility to comply with requirements on product content, form of presentation and time of completion.
 -Contract completion deadline: 1 week from the date of signing the contract

REPRESENTED BY A REPRESENTATIVE BY B
 (Name and full name) (Name and full name)

Figure 5. A Sample learning contract

2.5.3. Interdisciplinary Integrated Teaching

Example:

-The theme 1: “The Role of Nitrogen and Phosphorus Compounds in Plants” related to subjects Chemistry, Biology, Geography, and Agricultural Engineering. (See Figure 6)

-The theme 2: Teaching module “Ionization of substances” with English - Chemistry 11.



Figure 6. Students are studying to complete the project in the theme

2.5.4. Teaching Base on Experience, Praticce

Students learn from what they do. (See Figure 7 and Figure 8).



Figure 7. Experience: take care of the garden of medicinal plants at school



Figure 8. Studying a new lesson of chemistry in the lab

2.5.5. Teaching through Webquest, e-book

Some teachers and students create pages to learn, discuss and exchange knowledge with each other. Such as the facebook “Cô Hạnh hóa-H2” (Mrs Hanh teacher

chemistry-H2)-A facebook page to introduce, exchange Chemistry knowledge with students, mainly about the application of chemistry in life. (See Figure 9)



Figure 9. A facebook page “Mrs Hanh teacher chemistry-H2”

<https://www.facebook.com/C%C3%B4-H%E1%BA%A1nh-ho%C3%A1-H2-292118327932981/>
They can also use the following web address to study, research. Such as:

https://sites.google.com/s/0B_CxT995j_nsMHJqRIR4MUN6MIU/edit?usp=drive_open&authuser=0;
<http://truonghocketnoi.edu.vn;> <https://tuyensinh247.com>
<https://hocmai.vn;> ...

They can also use e-book to study, research. (See Figure 10).



Figure 10. Students are studing new lesson by e-book

2.5.6. Use of Mindmap in Teaching

Mind mapping is a powerful tool used to systematize old knowledge (See Figure 11), as well as new knowledge. (See Figure 12).



Figure 11. Use of mindmap to review knowledge chemistry 11

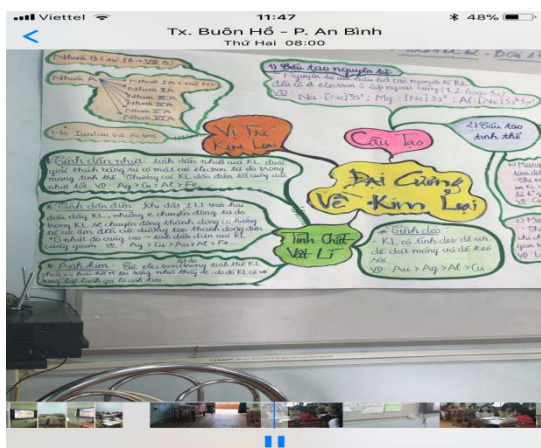


Figure 12. A mindmap "Outline about metals"- chemistry 12

2.5.7. Group Teaching in the Corners

To develop collaborative capacity and in accordance with the learning style of the students, while teaching should be taught in groups, in the corners. (See Figure 13)



Figure 13. Study new lesson in groups, in corners

2.4. Discussion about Results Experimental Pedagogy

The experimental pedagogy is realized at Hai Ba Trung High School with 2 experimental classes: class 11A2 (42 students) and class 11A5 (40 students) and 2 control classes: class 11A6 (36 students) and class 11A9 (39 students) with total enrollment of 82 students (experimental Group (1) and (2)) an 75 students of 2 control classes (Group I and II). Class 11A2 (G1) and 11A6 (GI) taught by the author, while classes 11A5 (G2) and 11A9 (GII) taught by Pham Thi Ket. Results of students in chemistry are as follows: (See Table 1 and Figure 14, Source: smas.edu- Hai Ba Trung high school - Buon Ho town - Dak Lak province)

Table 1. Results of students in research groups (Note: G = group; NS= number of students)

G	NS	8.0-10	6.5-7.9	5.0-6.4	3.5-4.9	0-3.4	≥ 5.0
		NS(%)	NS(%)	NS(%)	NS(%)	NS(%)	NS(%)
1	42	10	24	6	2	0	40
		23.81%	57.14%	14.29%	4.76%	0%	95.24%
2	40	7	17	14	2	0	38
		17.5%	42.5%	35%	5%	0%	95%
I	36	2	7	18	9	0	27
		5.56%	19.44%	50%	25%	0%	75%
II	39	0	8	22	9	0	30
		0%	20.51%	56.41%	23.08%	0%	76.92%

Based on the learning outcomes and pedagogical data, the quality of learning in the experimental class is higher than that of the control classes. From the observation, I find that after teaching these methods, students developed not only in professional capacity but also the abilities in method and social capacities language ability, creative thinking capacity, problem solving ability, computational competence; cooperation capacity, capacity to apply chemical knowledge into real-world... Specifically, they learnt not only the knowledge of chemistry but also the knowledge of other subjects, practical knowledge.... These methods also help students to plan and solve problems, work in groups, solve problems together; Especially students can self-assert, find their own creativity and express themselves through the products of the group or their own. As a result, over 96% of students felt satisfied after participating in this research, of which > 50% were very satisfied.

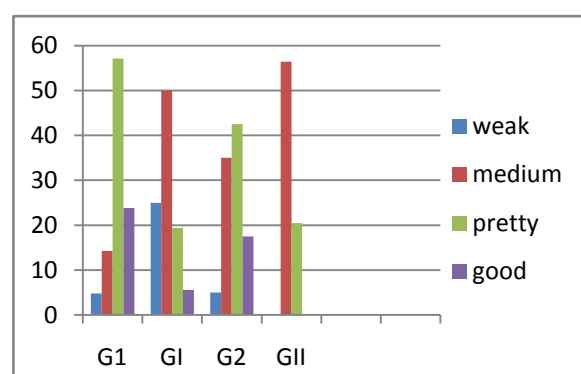


Figure 14. The chart of students' results in groups research

3. Conclusion

The subject has researched the reality of the innovation of teaching methods of chemistry in high schools in the area of Buon Ho town, Daklak province; study the concept of competence, some methods and techniques of modern teaching; Successfully applied these methods in teaching chemistry in Hai Ba Trung high school, Buon Ho town, Dak Lak province. In particular, learners have developed individual, professional and social competence.

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