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Applying Contract Teaching Method in Combination with Mind-map Technique in Teaching Nomenclature and Chemical Terminology for High School Students in the Northern Mountainous Provinces of Vietnam

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ABSTRACT

Contract teaching is an aspect of differentiated teaching methods in which students play the major role in the teaching process. Contract teaching and learning is a way of organizing the learning environment in which each student is assigned a package of different tasks to complete within a certain time period. Mind map is a technique considered as a means of utilizing the image recording capability of the brain. By using diagram, the overview of an issue is shown as an image in which objects are connected together by seams. In this way, the data is remembered and recognized more easily and quickly, providing high efficiency in teaching and learning. In fact, students in the Northern mountainous provinces of Vietnam have restrictions on language, especially English. It is, therefore, very difficult for teachers to convey the knowledge of nomenclature and Chemical terminology. By using research materials, the researcher in this study has shown the basis of dialectical materialism Philosophy, Psychology, Pedagogy of cognitive processes in the teaching Chemistry at secondary schools.The researcher studied documents related to teaching theories, teaching methodology of Chemistry, programs, Chemistry teaching materials at high schools to indicate the relationship between the content of teaching Chemistry, skills of using Chemical terminology and the components of teaching Chemistry at high school. By using survey research method including questionnaires and interviews, the researcher worked with 1195 students at 10 high schools in the mountainous provinces of northern Vietnam. The findings were synthesized and analyzed using mathematical statistical methods to determine the status of using Chemistry nomenclature and terminology by high-school students. Thereby, we would propose the application of contract teaching methods combined with mind map techniques in order to practice the lessons of Chemistry nomenclature and terminology for high school students in the mountainous provinces of northern Vietnam.

Keywords: Contract Teaching, Mind-map, Nomenclature, Chemical Terminology.

Introduction

In some European countries, especially Belgium, contract teaching is a positive method that has been studied and applied effectively. In Vietnam, this teaching method was initially implemented under Vietnam-Belgium project in some subjects at a number of primary and secondary schools.

Mind map is teaching technique developed in the late 1960s by Tony Buzan, who was dubbed "universal tool for the brain" bringing really astonishing efficiency, especially in the fields of education and business. "*Mind map is a form of recording the use of colors and images to expand and sharpen the idea. The central idea or image will be developed by the supporting ones and be connected to the center*".

Mind map fully utilizes the capability of recording images of the brain. This is one way to

memorize details, then to synthesize, analyze, string, and compare a problem in form of branched diagram. In this article, the author will discuss the contract teaching method in combination with mind map technique in order to train the nomenclature and chemical terminology for high school students in northern mountainous areas of Vietnam.

Aims of the study

The purposes of this research were: a) to investigate the current situation of using contract teaching method to teach Chemistry to high school students; b) to find out whether or not there are difficulties in the use of teaching method to teach Chemistry to high school students, c) to offer implications in strategies for using contract teaching method. Particularly, this research aimed at answering the following questions:

1. What is the current situation of using contract teaching method to teach Chemistry to high school students?
2. What difficulties do the students of Chemistry have in using contract teaching?
3. What might be done to improve contract-teaching methods in teaching Chemistry to students?

Literature Review

Contract Learning

The term "Contract learning" is, actually, a contract work, which emphasizes the central role of learners in the process of teaching and learning.

Learning contract is a form of organizing learning activities in which learners are given a set of tasks described in detail in a formal written contract. Learners may decide to spend more or less time on each activity, which goes first and which comes next. According to the Vietnamese ministry of Education and training, it can be understood that *"contract learning is one way of organizing learning activities in which learners deal with a package of tasks in a certain period of time".*

The contract is a feasible agreement between two parties, teacher and students, in which students will have the commitment to complete the task selected after a predetermined time period. In contract teaching and learning, teacher is responsible for designing tasks and assignments, guiding students to select suitable tasks with their capacity. After the liquidation of the contract, teacher gives comments on the degree of contract completion, marks the outcomes and summarizes the lesson content. Students are responsible studying, signing and conducting the contract in order to achieve specific learning content. The implementation of the contract may be done by one or a group of students.

Teacher should make sure that every student who signs the contract is aware of their responsibility and complete their tasks in a predetermined time period.

The Advantages of The Contract Teaching Method

It is a modern teaching method, which can be easily applied in the context of high school education in Viet Nam.

It helps differentiate students from their pace and level of learning: students are allowed to decide the order to perform their tasks, select the tasks and the time to finish by themselves.

It develops students' ability to work independently: Students can independently perform the task with or without the support of the teacher or other students.

It enables students to get support for each individual, not for the whole group or class at a time. This, thus, helps promote the creativeness and activeness of the good students and facilitate the weaker ones in their work.

It offers more diverse activities for learners

It creates favorable conditions for learners in accordance with their capacity: learners can choose optional tasks and aid levels in accordance with their capacity.

It helps students feel responsible for their assigned tasks: After signing the contract with teacher, students will become more responsible for performing their duties.

It strengthens the interaction between students and teachers: as teachers do not give lectures, they will have time to support students' requests, which increases the interaction between teachers and students.

It promotes students' ability of presenting problems: this enables students to practice presenting problems and keeping their confidence in front of the crowd.

It helps increase students' capacity of team work: As students have signed the contract with their teacher, they will unite with other students in the group to complete the contract. Increasing the ability of team work is suitable with the specific characteristics of high schools in northern mountainous areas of Vietnam where there are many students of minor ethnic groups.

Methodology

The implementation of contract teaching

Step 1: Selecting contents and setting deadlines.

Assignments in the contract. a review or practice lesson is the most appropriate; or a new lesson in which the tasks can be performed in a random order.

Time requirements. Teacher has to decide the deadline for the contract. This is best based on the number of periods in class in order that students can manage their time. The minimum time limit for a contract should be 2 periods (about 90 minutes) instead of period as previously. One reason is that students need more time to study the contract. Secondly, teacher and students have more time to finalize the contract. Teacher can also arrange students to conduct the contract outside the official periods, or at home depending on each particular task.

Step 2: Designing the lesson schedule

Identifying the objectives of the lessons

Determining the teaching methods, organization patterns, and teaching technique. The basic method is the contract teaching and learning method in combination with other methods/techniques. For instance, using visual aids, problem-solving approach, cooperative learning in groups, in combination with mind map or other modern teaching techniques.

Teacher's preparation. Preparing contract on the basis of the real context of classroom (quantity, students' background and psychology, school facilities), documents, workbooks, reference books, necessary tools and equipment for the effective performance of teachers and students. The contract includes the required and elective task. Besides, there are personal cards suitable to each task.

Students' preparation. Students fulfill the requirements of the teacher before class such as homework, school supplies, pictures, tables and figures, etc.

Step 3: Designing teaching activities

Activity 1: Delivering the contract. Teacher introduces the contract to students and gets agreement on the contract provisions with the whole class. Students read and register the time and order to do exercises and tasks specified in the contract, and make commitment to teacher. Teacher then sets time, orients and supplies students with necessary materials to perform the contract.

Activity 2: Implementing the contract. Students work individually or in groups to complete the tasks in the contract. Teacher also encourages students to develop such social

skills as the ability to present an issue, the ability to learn in groups, etc.

Activity 3: Finalizing the contract. Teacher asks students to stop to self-evaluate their work, then present the assigned contents in the contract in class. Other students will comment and give their feedbacks.

Students stop working individually and in groups, then present their work. Other students give feedbacks (if any).

Teacher gives comments on students' tasks, summarizes the knowledge, withdraws conclusion and gives marks.

While finalizing the contract, teacher may organize some activities that help students evaluate each other, and self-evaluate their mandatory and optional tasks.

Activity 4: Consolidation. In some circumstances, it is necessary to consolidate the knowledge or some specific skills for students. To do this, teacher can give assign students more exercises or tasks to finish in a short time period.

Applying the contract teaching method in combination with mind map technique

The following is an example of a lesson applying the contract teaching method in combination with mind map technique entitled "CLASSIFICATION AND NAMES OF ORGANIC COMPOUNDS" – Advanced Chemistry Grade 11 – Upper secondary education program in Vietnam.

Classification and names of organic compounds

Objectives:

Knowledge:

- Students understand the classification of organic compounds, the names assigned to simple continuous-chain alkanes from C-1 to C-10.
- Students learn about the origin of the name of some organic compounds, the naming system according to IUPAC nomenclature of organic compounds.
- From the naming rules studied, students can apply to name other organic compounds.

Skills:

- Students have skill of naming organic compounds according to their molecular formula and writing the formula from the name.

Attitude:

- Well prepare the contract
- Well cooperate with teacher and other students in class.

Preparation:

Teaching aids. Handouts, projectors, support cards with different levels (less or more support), quizzes, games, mind map to summarize the lesson. Students prepare the contract, notebooks, pens, textbooks.

The teaching methods. Contract teaching, learning in groups in combination with mind map technique

Teaching activities (90 mins)

Activity 1: Controlling the class (2 mins)

Activity 2: Classifying organic compounds (13 mins)

Activity 3: Studying and signing the contract on nomenclature of organic compounds (10 mins)

- Teacher introduces the contract which includes 5 tasks.

- Teacher divides the class into 5 groups based on the learning capacity of each individual and number in every group. When making groups, teacher should pay special attention to the ethnic composition of each group as high schools in the Northern mountainous areas of Vietnam include different ethnic groups whose identities, lifestyles, and beliefs differ from each other.
- Teacher delivers the contracts and handouts to students
- Teacher explains the task requirements in the contracts
- Signing contract with students
- Students listen to, observe, think, and review the contents in the contracts
- Students make questions (if any) about the contract, then sign it.
- Students sign the contract (this is done in the first period of the lesson so that students have time to be well-prepared)

Activity 4: Implementing the contract (55 mins)

Teacher writes the topic "THE NOMENCLATURE OF ORGANIC COMPOUNDS" on the board.

Task 1 (10 mins)

- Teacher asks the group studying the regular name of organic compounds to send a representative to present in front of class.
- Students do the tasks assigned in the contract, paste the prepared products on the first branch of the mind map and make a presentation.
- Teacher asks other groups to give their feedbacks
- Teacher comments, add further ideas, then finalize the major knowledge of the lesson.
- Teacher asks students to evaluate themselves in the contract.

Task 2 (10 mins)

- Teacher introduces the IUPAC nomenclature system, then asks the group responsible for studying the original names to present their task.
- Students do their task, then paste the prepared products on the second branch of the mind map and make a presentation.
- Teacher asks other groups to give their feedbacks
- Teacher comments, add further ideas, then finalize the major knowledge.
- Teacher asks students to evaluate themselves in the contract.

Task 3 (10 mins)

- Teacher asks the group studying the alternative names to present their task
- Students do their task, then paste the prepared products on the second branch of the mind map and make a presentation.
- Teacher asks other groups to give their feedbacks
- Teacher comments, add further ideas, then finalize the major knowledge.
- Teacher asks students to evaluate themselves in the contract.

Task 4 (10 mins) - Teacher asks the group responsible for studying the semi-system name (acid + (α, β, γ, δ, ε, ω) + amino + regular name of the corresponding carboxylic acids) to present their task.

- Students do their task, then paste the prepared products on the second branch of the mind map and make a presentation.
- Teacher asks other groups to give their feedbacks
- Teacher comments, add further ideas, then finalize the major knowledge.
- Teacher asks students to evaluate themselves in the contract.

Task 5 (10 mins)

- Teacher asks students to work in pairs to do the following exercises, then observe students to do their tasks (Teacher may help students if necessary):

Exercise 1: Name the following compounds using the original nomenclature:

$CH_3CH_2CH_2$-Cl; CH_2=CH-Cl; $CH_3COOC_2H_5$; CH_3-O-CH_3.

Exercise 2: Indicate the alternative name (if any), the name of the main carbon bond, and functional name in the names of the following organic compounds:

CH_3-CH_2-CH_2-CH_3; CH_3-CH=CH-CH_3; CH_2=C(CH_3)-CH=CH_2;

Butane 2-Butene 2-Methyl-1,3-butadiene

CH_3-CH_2-CHCl-CH_3; CH_3-CH_2-OH; CH_3-CH_2-CHO.

2-Chlorobutane Ethanol Propanal

Exercise 3: Indicate the regular names in the names of the following organic compounds:

2-Methylpropane; Ethylene; Acetylene; Benzene; Propane-1,2-điol; Acetic acid.

Activity 5: Contract liquidation (15 mins)

- Teacher asks three students at a time to do exercises 1, 2, and 3 given above on the board. Other students observe to give feedbacks.
- Teacher then checks students' tasks and emphasizes the notable points. Give marks to encourage students.
- Teacher shows the mind map to finalize the lesson.
- Teacher asks students to self-evaluate in the contract.
- Teacher lets students finish their contracts and collect all.

Activity 6: Consolidating and assigning homework (10 mins)

- Teacher reminds students to prepare for the next lesson and do all the rest of exercises in textbook.
- Teacher lets students play a word puzzle game

**** Game rule: Find out the word in the vertical line by resolving the horizontal lines. Students may decide the vertical line without resolving all the horizontal lines.***

1.The regular name of a type of organic acids which is named after an ant?

2. The other name of 2-Methylpropane?

3. The name of a hydrocarbon widely used as fuel and the main component of liquefied gas?

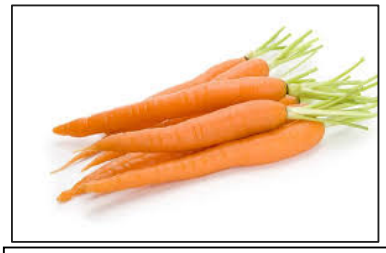
4. The name of the organic compound containing only C and H in the molecular elements?

5. The components of the vinegar contain about 3-5% of this kind of acid?

1.			**F**	**O**	**R**	**M**	**I**	**C**				
2.			**I**	**S**	**O**	**B**	**U**	**T**	**A**	**N**	**E**	
3.							**P**	**R**	**O**	**P**	**A**	**N**	**E**
4.	**H**	**Y**	**D**	**R**	**O**	**C**	**A**	**R**	**B**	**O**	**N**	
5.		**A**	**C**	**E**	**T**	**I**	**C**					

LESSON MIND MAP

Acid formic is named after the fire ants - formicinae



The name of Carotenes derives from the Latin word *carota* which means carrot.

Not carrying any systematic features. Named based on the origin of existence, appearance (color, taste, smell…)

Exam ples:

Belonging to a type of nomenclature in which all components have systematical

Regular Names

Nomenclature of organic compounds

Systematic names

Be in the middle of regular nomenclature and systematical nomenclature

Semi-systematic names

E.g:styrene (C_6H_5-CH=CH_2) is derived from stirax (name of a tree resin generating stirene) and only the suffix -en (to show the presence of the C = C double bond) is the system element

E.g: the name hexane (C_6H_{14}) is composed of 2 parts, hexa (the prefix derived from Greek language means six) and -ane (the suffix to show a saturated hydrocarbon).We, therefore, have the name: hex (a) + ane-> Hexane (dropping 1 of the 2 consecutive letters "a")

Findings & Discussion

After surveying the actual use of chemical nomenclature and terminology at twelve high schools in six provinces of Thai Nguyen, Bac Kan, Cao Bang, Tuyen Quang, Hoa Binh, Yen Bai, with 56 teachers and 1195 students, there are initial remarks as follows:

The results of the survey showed that the majority of students (85%) have not mastered chemical nomenclature and terminology. They often memorize those terms in a mechanical way, or rote, and often mistake one chemical term for others.

Many students (65%) cannot distinguish between types of nomenclature or use them to name organic compounds.

Students' skill of expressing chemical nomenclature and terminology is still very weak.

With the preliminary results of the survey, I conducted a pilot application of the contract teaching method in association with mind map technique to train chemical nomenclature and terminology for high school students in some Northern mountainous provinces of Vietnam.

The following is the analysis of pedagogical practice results of four Grade 11 classes at Luong Ngoc Quyen high school, Thai Nguyen City, Thai Nguyen Province. The selected content is Chapter 5 - Saturated Hydrocarbon in the second semester of the academic year 2014 – 2015. In the control classes (11A4, 11A5), teacher used regular lesson plans, presentation, conversation, visual aids when teaching the chemical nomenclature and terminology. In the experimental class (11A1, 11A2), teacher used the contract teaching method in combination with mind map technique when teaching chemical nomenclature and terminology. All the four classes are learning the Advanced Chemistry grade 11 with the same teacher. 50 students from two experimental classes and 50 students from two control classes who had similar survey results were chosen to conduct the pedagogical practice.

When the Ankane finished, 15 minute test (multiple choice) (see appendix 1) was conducted and at the end of chapter 5, a 45 minute test (multiple choice and written test) was given (see appendix 2). The tests were the same for all classes.

The Results of the 15-Minute Test

Table 1 below shows summary of the 15-minute test results of the students.

Table1. Summary of the 15 minute test results

SUBJECTS	TOTAL No.	BAD (0–2)		WEAK (3–4)		AVERAGE (5–6)		FAIRLY GOOD (7–8)		GOOD (9–10)	
		No.	%	No.	%	No.	%	No.	%	No.	%
Control	50	5	10	9	18	24	48	9	18	3	6
Experiment	50	3	6	6	12	27	54	10	18	4	8

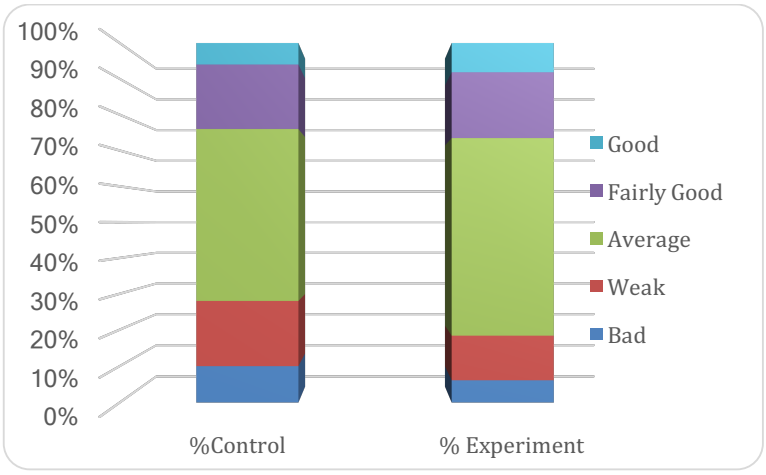


Figure 1. The statistics of the 15 minute test quality

The results of the 45 minute Test for chapter 5 - Saturated Hydrocarbon

Table 2 below indicates the summary of the 45 minute test results

Table 2.
Summary of the 45 minute Test results

SUBJECTS	TOTAL No.	BAD (0–2)		WEAK (3–4)		AVERAGE (5–6)		FAIRLY GOOD (7–8)		GOOD (9–10đ)	
		No.	%	No.	%	No.	%	No.	%	No.	%
Control	50	3	6	11	22	25	50	9	18	2	4
Experiment	50	1	2	4	8	29	58	12	24	4	8

To understand the quality of 45 minute test of the students, see Figure 2 below.

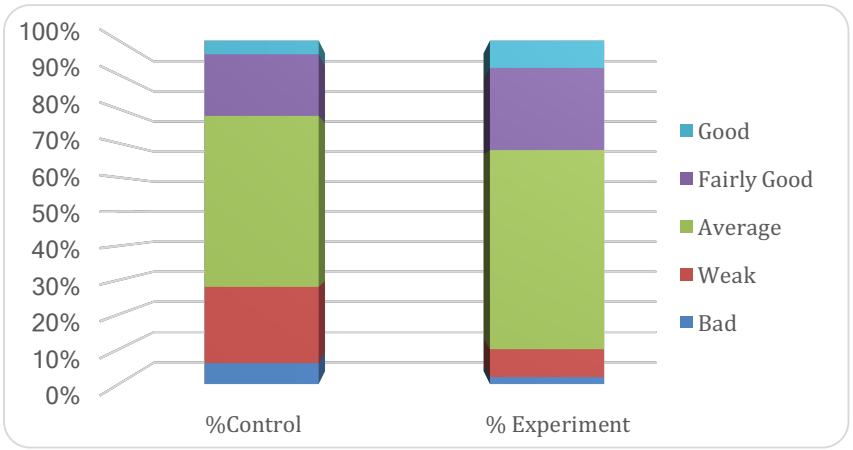


Figure 2: The statistics of the 45 minute test quality

Qualitative analysis of the test results:

In the 15 minute test, the results of the two classes are relatively equal. The percentage

of students getting good points, fair, average, weak, poor in both classes are similar. The level of awareness in chemistrywas mainly at average. For the content related to nomenclature and chemical terminology, students often made mistakes in the following aspects:

Students mistook such terms as differential, crystallization, and extraction for each other, namely, 11 students from the control class and 10 from experiment class.

Students wrongly named the organic compounds, 21 from the control class and 24 from the experiment class. Most of the students did not know how to use the marks "," and "-" correctly.

Students wrote the wrong molecular formula of organic compounds from their given names: 25 from the control class and 22 from the experiment class.

Students mistook among different ways of naming organic compounds: 19 from the control class and 18 from the experiment class.

In the 45 minute test, the results of two classes showed remarkable difference. The rate of weak students in experimental class declined considerably, the "average" and the "fairly good" rate increased. In the contents on nomenclature and terminology, students who made mistakes in the 15 minute test show positive progress as follows:

+ Mistaking among terms: 10 from the control class and 6 from the experiment class

+ Wrongly naming the organic compounds: 21 from the control class and 15 from the experiment class. Students in experiment class were better at using "," and "-"

+ Writing the wrong molecular formula of organic compounds from their given names: 20 from the control class and 17 from the experiment class

+ Mistaking among different ways of naming organic compounds: 12 from the control class and 4 from the experiment class.

In conclusion, through the analysis of the two test results, it can be seen that applying the contract teaching methods in association with mind map technique to train chemical nomenclature and terminology for high school students in the Northern mountainous provinces of Vietnam Northern initially obtained positive achievements. With two equal classes of control and experiment, the experimental class has showed much progress after the application of the new teaching method of nomenclature and chemical terminology.

Processing the Pedagogical Practice Results

Table 3 below presents cumulative frequency of the tests.

Table 3.
Cumulative frequency of the tests

Scores	15 MINUTE TEST		45 MINUTE TEST	
	CONTROL	EXPERIMENT	CONTROL	EXPERIMENT
1	0,80			
2	1,60		2,40	
3	8,80	4,83	8,00	2,43
4	24,10	11,27	20,00	4,84
5	38,20	26,61	34,30	16,95
6	53,30	46,77	55,30	30,63
7	75,30	69,35	76,00	54,83
8	88,70	82,26	90,40	81,43
9	97,50	95,16	98,50	95,17
10	100,00	100,00	100,00	100,00

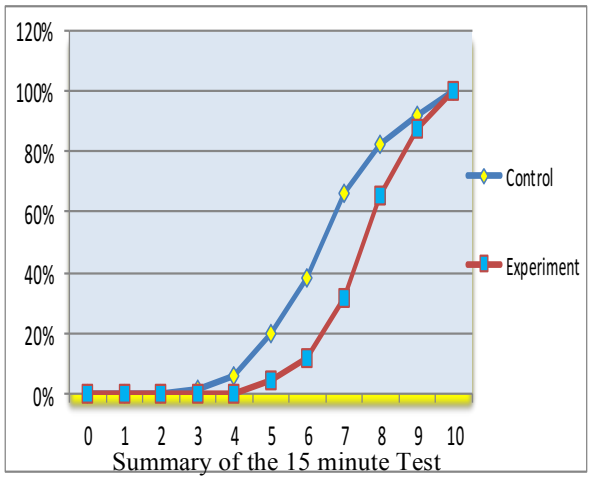


Figure 3. Cumulative percentage of the 15 minute test

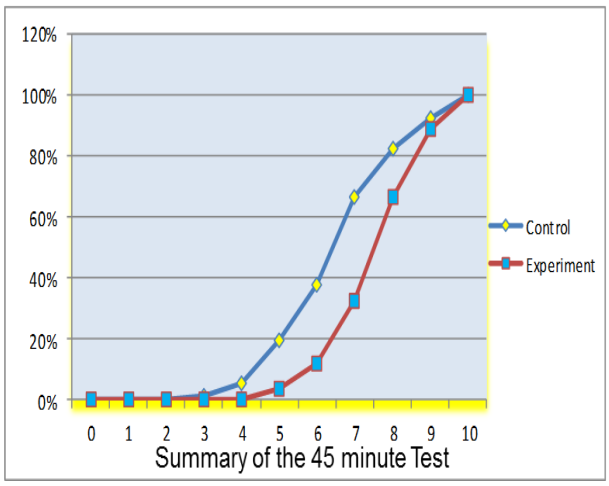


Figure 4. Cumulative percentage of the 45 minute test

The results of the test scores were shown in table 4 below.

Table 4.The statistical analysis results of the test scores

STATISTICS	15 minute test		45 minute test	
	Control	Experiment	Control	Experiment
Quantity	50	50	50	50
Average	5,64 ± 0,16	5,11 ± 0,17	6,14 ± 0,14	5,35 ± 0,16
Standard Deviation	1,56	1,72	1,57	1,84
Coefficient of variation	26,33	32,41	20,78	30,47

Table5.
Compare the pair Experiment-Control with the Student Test

TEST FORMAT	α < 0,05	
	t	f
15 minute test	2,2440	247
45 minute test	4,5814	247

Examining the results of pedagogical practice via Student Test method: check the t_{theory}= 1,96 with α =0,05, and f = 247. We have $t_{qualitative} > t_{theory}$. This implies that the difference between $\bar{x}_{Experiment}$ and $\bar{x}_{Control}$ is meaningful. This can be inferred that the new application of nomenclature and chemical terminology in teaching has proved more effective than other regular teaching methods with the valuable level of 0,05.

Conclusion

From the pedagogical practice results, it can be concluded that the application of contract teaching method in combination with mind map technique to train nomenclature and chemical terminology for students in the Northern mountainous provinces of Vietnam have initially obtained positive achievements. The combination between contract teaching and mind map technique has proved effective, consistent with students. This application also helped students actively acquire nomenclature and chemical terminology, easily comprehend, memorize, systematize, utilize the knowledge in the process of learning, and develop their creative thinking.

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Appendix 1

The 15 minute test with answers

Question 1. The phenomenon in which substances have similar composition and chemical properties, and their molecular formula have more or less than one or some Methylene groups is called:

A. isomerism. **B.** isotopy. **C.** coequality. **D.** isobar.

Question 2. From the given ankane mixture: Pentane (boils at 36^0C), turns out that heptane (boils at 98^0C), Octane (boils at 126^0C), Nonane (boils at 151^0C), which of the following method can separate these substances?

A. Crystallization. **B.** Differential distillation

C. Sublimation. **D.** Extraction.

Question 3: How many atoms C and H are there in the molecule 2,2,3,3-Tetramethylbutane?

A.8C,16H. **B.**8C,14H. **C.**6C,12H. **D.**8C,18H.

Question 4: Let Isopentane react with Cl_2 with the mol proportion 1:1, the maximum number of monocloro obtained is:

A.2. **B.**3. **C.**5. **D.**4.

Question 5: When chlorinating alkane X with molecular formula C_5H_{12} with the mol proportion 1: 1, 3 alternative monocloro products are obtained. The name of alkane X is:

A.2,2-Dimethylpropane. **B.**2-Methylbutane.

C. Pentane. **D.** 2,3-Dimethylpropane.

Question 6. A compound X with the percentage of carbon, hydrogen and oxygen, respectively by 54.54%, 9.10% and 36.36%. Mol molecular mass of X is 88.0 g/mol.
Which of the followings is the molecular formula of compound X?

A. $C_4H_{10}O$. **B.** $C_4H_8O_2$. **C.** $C_5H_{12}O$. **D.**$C_4H_{10}O_2$.

Question 7. Which of the following substances only has σ link in its molecule?

A. C_2H_4. **B.** C_2H_5OH. **C.** C_6H_6. **D.** CH_3COOH.

Question 8. How many substances are the isomers of each other with the molecular formula C_5H_{12}?

A.3 isomers. **B.**4 isomers. **C.**5 isomers. **D.** 6 isomers.

Question 9. A given ankane with the formula $(CH_3)_2CHCH_2C(CH_3)_3$, the name of this ankane is:

A.2,2,4-Trimethylpentane. **B.**2,2,4 Trimetylpetan.

C.2,4,4-Trimethylpentane. **D.** 2-Dimethyl-4-methylpentane.

Question 10. Isopentane and 2-Methylbutane respectively are the names of which ankanes with the formula $CH_3CH(CH_3)CH_2CH_3$:

A. Original-official nomenclature and regular nomenclature

B. Regular nomenclature and alternative nomenclature

C. Alternative nomenclature and regular nomenclature

D. International nomenclature and IUPAC nomenclature.

Answers: (1 point for each correct question)

Questions	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Answers	***C***	***B***	***D***	***D***	***A***	***B***	***B***	***A***	***A***	***B***

Appendix 2

The 45 minute test with answers

4.2. The 45 minute Test for chapter 5 - Saturated Hydrocarbon

A. Multiple choice (7 points)

Question 1. The followings are statements about organic compounds:

(1) C and H are the main elements.
(2) may contain other elements such as Cl, N, P, O.
(3) chemical bonds are mainly covalent bond.
(4) chemical bonds are mainly ionic bonds.
(5) volatile, difficult to burn.
(6) chemical reactions happen quickly.

The correct ones are:

A. (4), (5), (6). **B.** (1), (2), (3).
C. (1), (3), (5). **D.** (2), (4), (6).

Question 2. With two compounds acetylene (C_2H_2) and benzene (C_6H_6), which statement is correct?

A. Two substances are similar in molecular formula but different in their most simple formula.

B. Two substances are different from their molecular formulas but similar in the most simple formula.

C. Two substances are different from their molecular formulas and the most simple formula.

D. Two substances are similar in molecular formulas and their most simple formula.

Question 3. The chemical reactions of organic compounds have the following characteristics:

A. usually happen very quickly and generate a single product.
B. usually occur slowly, not completely, not in a certain direction.
C. usually happen very quickly, not completely, not in a certain direction.
D. usually occur very slowly, but thoroughly, not in a certain direction.

Question 4. A compound X has the following formula: $CH_3–CH(CH_3)–CH=CH_2$. What is the systematic name of X?

A.2-Methylbut-1-ene. **B.** 3-Methylbut-1-ene.
C. 2-Methylbut-3-ene. **D.** 2–Metylbut-3-ine.

Question 5. In the molecule of Propyne, the number of σ link is :

A. 7. **B.** 4. **C.** 6. **D.**5.

Question 6. Which of the following hydrocarbon polymerization creates polymers used to manufact buma rubber?

A.But-2-ene. **B.**Penta-1,3-điene.
C. 2-Methylbuta-1,3-điene. **D.**Buta-1,3-điene.

Question 7. The derivatives of monochloro alkane A has 46.53% of volume difference between carbon and chlorine. The name of A is

A.Ethane. **B.**Propane. **C.**Methane. **D.**Butane.

Question 8. The other name of Isopropylbenzene is

A. Toluene. **B.**Stirene. **C.**Cumene. **D.**Xilene.

Question 9.$C_6H_5–CH_2–$ and $C_6H_5–$ radicals are also called:

A. Phenyl và Benzyl. **B.**Vinyl và Anlyl.
C.Anlyl và Vinyl. **D.**Benzyl và Phenyl.

Question 10. Which of the following compounds has geometric isomer?

A.2-Methylbut-2-ene. **B.**2-Chloro-but-1-ene.

C.2,3-Dichlorobut-2-ene. **D.**2,3-Dimethylpent-2-ene.

Question 11. The organic compound with the molecular formula C_2H_2 is called:

A. Methane. **B.**Ethylene. **C.**Acetylene. **D.**Benzene.

Question 12. The gas mixture X consisting ankene M and ankine N have the same number of carbon atoms in the molecule. Mixture X has mass of 12.4 grams and volume of 6.72 liter (in standard condition). The mol, molecular formula of M and N respectively are:

A. 0,1 mol C_2H_4 và 0,2 mol C_2H_2. **B.** 0,2 mol C_2H_4 và 0,1 mol C_2H_2.

C. 0,1 mol C_3H_6 và 0,2 mol C_3H_4. **D.** 0,2 mol C_3H_6 và 0,1 mol C_3H_4.

Question 13. Let hydrocarbone X react with brome (in solution) by mol proportion of 1: 1, obtaining organic compound Y (containing 74.08% Br in mass). When X reacts with HBr, we obtain two different organic products. The name of X is

A. But-1-ene. **B.** Cyclopropane. **C.** But-2-ene. **D.** Propylene.

Question 14. Burn completely 4.64 grams of a hydrocarbone X (gas under normal conditions), then bring the entire combustion products into the solution container of $Ba(OH)_2$. After the reaction, we obtain 39.4 grams of precipitate and the mass of the solution reduces by 19.912 grams. The molecular formula of X is

A. CH_4. **B.** C_3H_4. **C.** C_4H_{10}. **D.** C_2H_4.

B. Written Task (3 points)

Question. Put 1.68 liters of gas mixture X consisting of two hydrocarbone (an ankene A and an ankene B) into the container of brome solution (excess). After the reaction occurs completely, there are 4 grams of brome reacted and 1.12 liters of gas remaining. If completely burning 1.68 liters of the X gas, 2.8 liters of CO_2 would be produced. The gas volumes are measured in the standard condition.

a) Find out the molecular formulas and the names of the two hydrocarbons in X.

b) Write the equations for the reaction, write down product name when letting B react with Br_2solution and HCl.

Answers:

A. Multiple choice (**7 points –** 0.5 point for each correct answer)

Questions	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Answers	**B**	**B**	**B**	**B**	**C**	**D**	**C**	**C**	**D**	**C**	**C**	**D**	**A**	**B**

B. Written Task (3 points)

a) CH_4 (Methane) và C_3H_6 (propylene-propene). (1,5 points)

b) CH_2=CH–CH_3 + Br_2 → CH_2Br–CHBr–CH_3 (1 2-Dibromopropane). (0,5 point)

CH_2=CH–CH_3 + HCl → CH_3–CHCl–CH_3 (2-Chloropropane) main product. (0,5 point)

CH_2=CH–CH_3 + HCl → CH_2Cl–CH_2–CH_3 (1-Chloropropane) by-product. (0,5 point)