

# Planning And Organizing Experiential Teaching With The Topic Of Climate Change To Contribute To Environmental Protection Education For High School Students

Nguyen Dieu Linh<sup>1</sup>

<sup>1</sup>Hong Quang high school, Viet Nam

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**Abstract:** *Experiential learning is a method that plays an important role in the general education curriculum in Vietnam. Well-organized experiential activities will help educators and learners to achieve long-term goals such as: broadening students' knowledge, developing morals, competencies, awareness, and having responsibilities of citizenship in both local and national context. This article illustrates and analyzes results obtained in the experiential teaching on the topic of Climate Change in Physics at Hong Quang High School (Vietnam).*

**Key Word:** *Experiential learning, Climate change, Environmental protection, Teaching Physics.*

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## I. Introduction

The underlying principle to develop current physics curriculum in Vietnam is to focus on the nature and physical meaning of objects, and to emphasize practicality; avoid mathematical inclination; facilitate scientific thinking in terms of physics, provoke students' love and passion for learning, and enhance the ability to apply knowledge in practice [1]. A student's schoolwork must go hand in hand with the student's life [4].

Under the influence of this trend, the organization of experiential learning plays a particularly important role when placing students' learning activities "outside" the classroom. Philosophical views on the role of experience in education can be traced to Confucius (551-479 BC), who said: "Educational methods must attach importance to practice and application"; "The point of view of teaching must ensure a connection with life. Education through games, activities outside of class time, in nature" by J.A. Komensky. And J. Dewey is the one who makes the point of "Learning through doing, learning from doing", according to him, teaching must assign work to students, not assign problems to students to learn [3]. David Kolb studies the experiential learning cycle. According to him, the steps of experiential learning include concrete experience, reflective observation, conceptualization, and active experimentation.

Experiential teaching is not stereotyped according to books, but is associated with social practice, is a way of linking theory with reality of social life, creating a unity between perception and action in the learning environment. practice. Therefore, experiential learning helps learners to apply knowledge to solve social and community problems. Thereby, stimulating interest, changing attitudes and behaviors towards social, local and global issues such as environmental pollution, climate change, energy security, etc. experience meeting the goals of general education in Vietnam in the current period.

The article applies the process of organizing experiential teaching of Kolb (1984) to teaching Physics the content of knowledge about "Climate change" to contribute to environmental protection education, thereby forming the quality and capacity for students.

## Studies on experiential teaching

Experiential teaching has been studied by many authors. We can mention many educators such as Willingham, Conrad and Hedin, Druism, Owens and Owens, Karen Warren, etc.

In 1984, on the basis of the work of Dewey, Lewin, Piaget, Lev Vygotsky and other researchers on experience and experiential learning, David Kolb, an American educational theorist, studied and for publishing a work on experiential learning: Learning experience: Experience is the source of Learning and Development. David Kolb formally introduced the experiential learning theory, identifying the stages in experiential learning. For Kolb, "Learning is the process in which knowledge is created through the transformation of experience".[2]

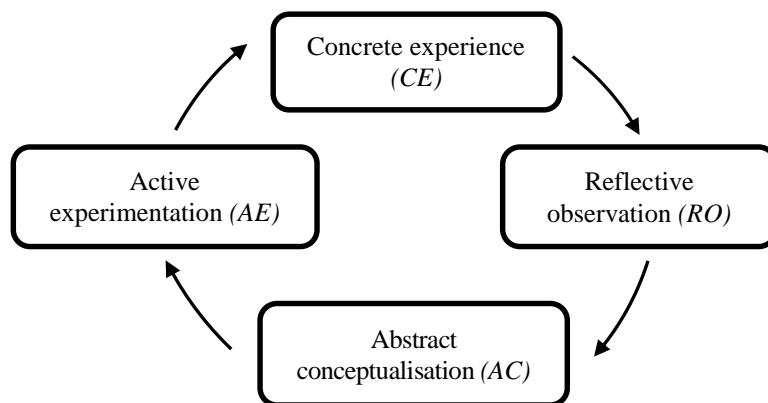


Figure 1. Kolb Learning Cycle (Kolb, 1984)

### Organizing experiential teaching in high schools in Vietnam

To organize effective experiential learning, teachers need to: [5], [7]

- Take into account the interests of learners, which generates active learning motivation to solve the problem posed. Teachers need to choose issues that are closely related to students' daily lives. From there, teachers will be able to express the problem vividly, practically and urgently.
- Build situations to guide students to detect and solve topical problems. Encourage students to ask questions and discuss questions. Good questions lead them to seek information about the problem, exchange information, evaluate information to select valuable information and discard irrelevant information.
- Encourage students to come up with ideas, discuss critically to choose good ideas. Students are given time to think before deciding to act.

Organization of experiential learning can be done through the following stages:

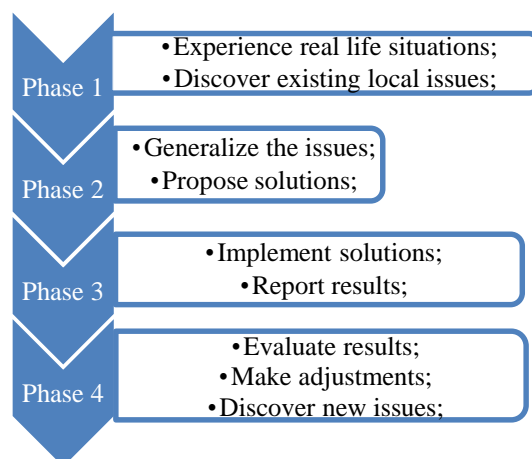


Figure 2. The process of organizing experiential learning

**Stage 1. Experiencing and discovering problems:** Starting from the practical context of life, leading to the discovery of problems to be solved in association with the locality associated with the subject program.

**Stage 2. Proposing solutions:** Through generalization questions, students generalize into problems to be solved and propose solutions. Teachers direct students to build sub-themes. Each sub-topic leads to a task (with a corresponding product).

**Stage 3. Implementation of solutions:** Students collect information, process information and synthesize information. Collecting information from diverse sources requires students to evaluate and select valuable information; implement solutions and report results. The student product can be displayed, it can be a presentation, a model, an experiment or a poster, etc. The product is creative to solve a real-world problem.

**Stage 4. Evaluation and adjustment of the solution:** Evaluate and propose to adjust the solution for better results. From there, new problems arise that need to be solved.

Learners' experiences, feedback gained from learning activities are the basis for adjustment and behavior change and the basis for students' new interest [6]. The relationship between the stages of organization of experiential learning associated with the above practical context can be represented through the diagram below:

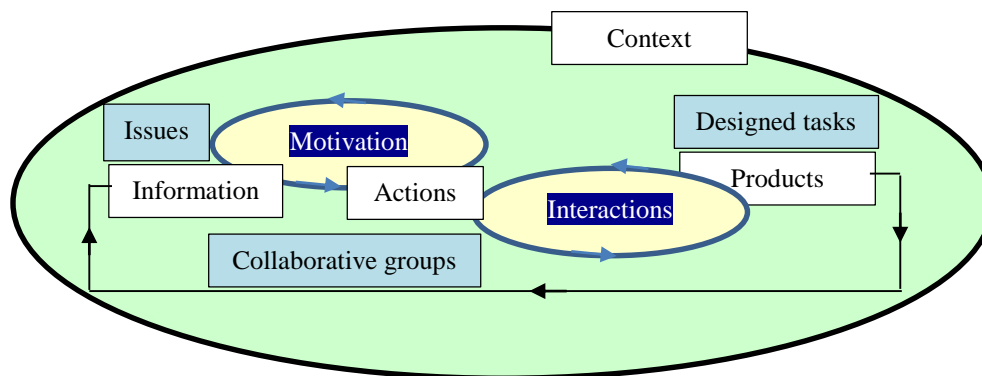


Figure 3. Relationship between stages in experiential teaching

## II. Research Methods

The article uses the theoretical research method on experiential teaching along with the analysis of the content to be taught about environmental protection education and topic of climate change. Thus, it establishes a diagram of the scientific process as a basis for designing specific and detailed teaching stages of the topic. The proposed process is experimentally organized for high school students (Vietnam) and analyzed some of the obtained products.

## III. Result

### Some experiential teaching topics in Physics

Physics is a subject with many opportunities to organize teaching for students through global issues or local issues such as: environmental protection; economical and efficient use of energy; traffic Safety; climate change prevention; renewable energy, greenhouse effect, etc. With the issue of climate change and economical and efficient use of energy, students can conduct research such as:

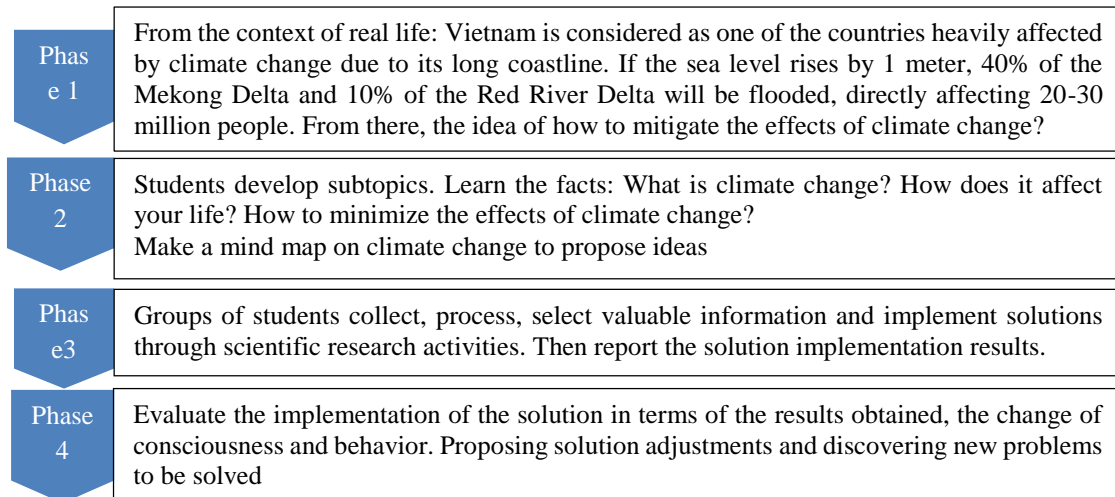
- Magnetic storms: Harm and measures to prevent magnetic storms;
- Measures to rationally use electrical/electronic devices in the household: microwave ovens, mobile phones, televisions, electric motors, etc.
- Saving energy in electricity use;
- Harms caused by hydroelectric and thermal power plants to the environment;
- Measures to reduce waste in power transmission;
- Measures to avoid the influence of the system;
- Power transmission with landscape and human health;
- Harms of the artificial greenhouse effect;
- Climate Change;
- Exploiting clean energy sources.

From above topics, students can learn the applications of physics in engineering and in life; Design, manufacture and use of physics laboratory instruments; Making models, etc. To promote appropriate problem solving, teachers need to pay attention to the emotional aspects, motivations and social determination of learners.

Thus, teachers can create situations, motivate students and propose new ideas on local daily life, or the problems students find on the mass media.

### Organizing experiential teaching on the topic of climate change in the high school physics program

The teaching objectives are: Through experience, students can identify what climate change is; Point out the activities and means of daily use that contribute to climate change; State the effects of climate change on the environment and propose specific solutions to minimize the consequences caused by climate change. It is through the process of implementing and exchanging products that learners' responsibilities will be formed to prevent the acceleration of climate change, thereby having practical ways and actions to preserve and protect the environment. environmental protection.



**Figure 4.** Relationship between stages in experiential teaching on the topic of climate change Concretize the proposed stages through specific teaching activities and results.

Activity 1: Experience in practice, answer the questions:

- What is climate change and how does it affect human life? List some solutions to respond to climate change.
- Why use energy economically and efficiently? What is “clean energy”? Name some “clean energy” sources that you know.

The tour takes place at 2 locations:

- Panasonic Risupia - Vietnam clean energy introduction center at Sunrise D11 building, Tran Thai Tong street, Cau Giay district - Hanoi.
- Pha Lai Thermal Power Plant (Hai Duong, Viet Nam).



**Figure 5.** Students visit at Panasonic Risupia - Hanoi and Pha Lai Thermal Power Plant, Hai Duong, Viet Nam

Activity 2: Proposing solutions: Groups make mind maps and propose plans to reduce the harmful effects of climate change

Students apply the synthesis of knowledge from the subjects and use information on the mass media, the Internet, etc. to learn the concepts of climate change, point out the causes and effects globally and in Vietnam in particular, and make a mind map.



Figure 6. Groups of students draw mind maps

From the practical experiences and knowledge in the lessons, groups of students gave their ideas and participated in the contests "Science and technology for high school students" and "Applying interdisciplinary knowledge to solve problems". Students practice with 2 typical topics then won the ministerial prize, which are:

- Handling and making use of rice straw after harvest. In this topic, students proposed a solution to take advantage of post-harvest rice straw to contribute to climate change response.
- Treatment of surface water pollution with aquatic plants in Bach Dang river - Hai Duong city. On the basis of analyzing how contaminated water samples affects the living environment, and contributes to climate change, students have come up with a plan to treat pollution by physical, chemical and aquatic plants.

Activity 3: Product report

Collaborative groups report products, with two groups report on contest topics, two groups report on propaganda solutions and activities to participate in the program "Earth Hour".

<p>Groups of students report and present their products, give ideas on using clean energy sources and respond to the "Earth Hour" event launched by the Provincial Youth Union.</p>	<p>"Giờ Trái Đất là chiến dịch toàn cầu do Quỹ quốc tế và bảo vệ thiên nhiên (WWF) khởi xướng và được thực hiện lần đầu tiên tại thành phố Sydney với sự tham gia của 2,2 triệu người."</p> <ul style="list-style-type: none"> <li>➤ Năm 2009, lần đầu tiên Việt Nam tham gia vào chiến dịch Giờ Trái Đất, tiết kiệm được 140 000 kWh</li> <li>➤ Năm 2015, tiết kiệm được 520 000 kWh "Tiết kiệm năng lượng - Ứng phó với biến đổi khí hậu"</li> <li>➤ Năm 2016, tiết kiệm được 457 000 kWh "Hành động nhỏ, ý nghĩa lớn"</li> <li>➤ Năm 2017, tiết kiệm được 471 000 kWh "Tắt đèn - Bật tương lai"</li> <li>➤ Năm 2018, tiết kiệm được 485 000 kWh ~ 834 triệu đồng "Sống xanh hơn"</li> <li>➤ Năm 2019, tiết kiệm được 492 000 kWh ~ 917 triệu đồng "Tiết kiệm năng lượng - Bảo vệ trái đất"</li> <li>➤ Năm 2020, tiết kiệm được 436 000 kWh ~ 813 triệu đồng "Hãy hành động để trái đất luôn xanh"</li> <li>➤ Năm 2021, tiết kiệm được 353 000 kWh ~ 658 triệu đồng "Lên tiếng vì thiên nhiên"</li> <li>➤ Năm 2022, tiết kiệm được 309 000 kWh ~ 576 triệu đồng "Kiến tạo tương lai. Bây giờ và không bao giờ"</li> <li>➤ Năm 2023, tiết kiệm được... ??? "Tiết kiệm điện thành thói quen"</li> </ul> <p>Hôm nay TÔI SỐNG XANH HI CÙNG MỌI NGƯỜI</p>
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Figure 7. Propaganda flyer design in response to "Earth Hour"

Activity 4: Evaluate solutions, propose new problems to be solved

The groups evaluated the results obtained, proposed new problems to be solved, and solutions to use energy economically and efficiently to save energy, and conclude how to deal with climate change.

IV. Discussion

The process of experimenting with the topic "Climate change" in 2 classes with about 80 students of grade 10 at Hong Quang High School (Hai Duong - Vietnam). The obtained products of the topic include: 10 journals, 10 reports on climate change issues, 2 scientific research papers participating in the contest "Science and technology for high school students" and "Applying science and technology to high school students". interdisciplinary knowledge to solve practical situations" won the ministerial prize; 2 propaganda posters in response to the "Earth Hour" event.

Analysis of learning products shows that students have actively applied subject knowledge to solve real-life problems creatively and have achieved the set goals.

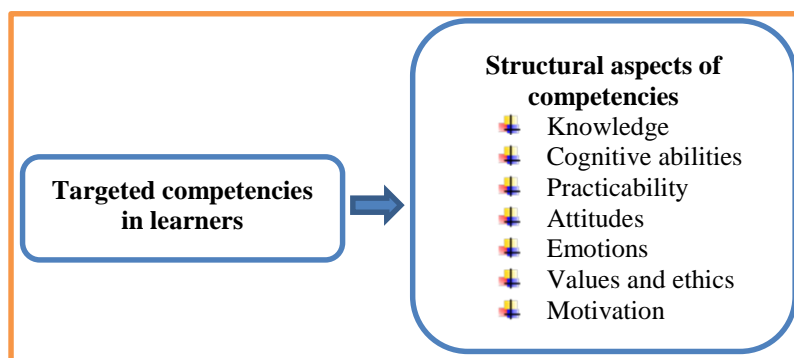
- Knowledge: Students have foundation knowledge about climate change, coping with climate change from subjects and through fact-finding, they also come up with some ideas and solutions to cope with climate change.

- Skills: Students develop skills of information extraction and collection, observation skills, experimental skills, calculation skills, presentation skills and cooperation skills. In particular, the skills of problem-solving capacity are clearly shown through learning activities at different stages. Specifically, students know how to collect information from actual observations about the effects of climate change on the socio-economic, natural resources of Vietnam in general, of Hai Duong province in particular.

- Attitudes: Students were aware of the issues of responding to climate change. They are well aware of the issues and actively participates in activities to decrease climate change. Since then, students have formed a desire and motivation for scientific research to contribute to sustainable development on Earth.

Students experience life through fact-finding and exploiting information on multimedia channels to build publications, journals, and propaganda leaflets, thereby raising their awareness about environmental protection, energy saving and climate change. After performing the outdoor activity, students have a better understanding of how to practice "Earth Hour".

The obtained results show that the organization of experiential teaching associated with the practical context has sufficient opportunities to foster learners' competencies. By learning through experience, learners acquire knowledge, skills, feelings, attitudes and form the value of learning [8].



**Figure 8.** Internal structure of capacity

## V. Conclusion

Research results show the feasibility of organizing experiential teaching in high schools. For the purpose of developing students' capacity, the organization of experiential teaching is associated with practical contexts which pose challenges to learners and stimulate interests and motivation to solve practical problems, and change their behavior, as learners' responsibility of learners to the community is crucial. Experiential teaching contributes to the innovation of teaching content and methods in high schools, and helps to meet the requirements of current fundamental and comprehensive renovation of education and training. However, in order to organize effective experiential learning, schools need to pay attention to the development of teaching plans, professional activities, and topics which are suitable to local contexts and organizational conditions.

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