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Project Teaching Through Blended Learning Model in Teaching Chemistry in High School

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Abstract

Project-based teaching is an active teaching method. It is student-centered and has advantages in developing self-study capacity for students. The project-based teaching process has teaching activities that teachers can organize in the classroom or online. Therefore, the combination of

Blended learning in project-based teaching is essential and has special meaning for teaching process in the digital age. This article proposes a project teaching process according to Blended learning model and presents an illustrated teaching plan in chemistry in high school.

Keywords: Project-Based Teaching, Blended Learning, Self-Learning Capacity

1. Introduction

Project-based teaching is a teaching method that combines theory and practice with many possibilities for application in teaching chemistry. Project-based teaching is student-centered, from passive to active. Project tasks with a high degree of self-reliance in the entire learning process (planning, implementation, evaluation) project-based teaching promotes positivity, self-reliance, and responsibility, contributing to the development of students' self-study, cooperation and problem-solving abilities [1]. In teaching chemistry. In Vietnam, project-based teaching is researched by: Trinh Van Bieu, Phan Dong Chau Thuy, Trinh Le Hong Phuong [2]; Pham Hong Bac [3]; Pham Thi Bích Dao - Doan Thi Lan Huong [4]; Nguyen Thi Phuong Thuy [5]. It is mainly organized according to the basic steps of students choosing a topic/planning in class, going home to implement the project requested by the teacher and reporting on the output. Products in the classroom without incorporating online teaching activities into the teaching process. Meanwhile, the internet and electronic devices for internet access are becoming more and more popular, and online teaching, if well combined, can help students prepare more carefully when choosing and planning a course. Current project; help teachers monitor and better control the progress and provide timely instructions and support for students' project implementation. Since then, improving the effectiveness of the project-based teaching method in teaching in general and teaching chemistry in particular. Blended learning is a modern learning model that is gradually becoming an inevitable learning trend of the world. Blended learning is a teaching model that combines online teaching and face-to-face teaching with an appropriate ratio to ensure the highest educational effectiveness [6]. Blended learning does not deny the key role of traditional face-to-face teaching, but helps to combine the strengths of both teaching methods to create the best conditions for students' learning activities.

This article presents the process of project-based teaching through the Blended learning model in developing the self-study ability of high school students. Applying this process in teaching chemistry is our research goal.

2. Content

2.1 Project Teaching

In Intel's curriculum: the process of project-based teaching is a student-centered teaching model. This learning style develops students' knowledge and skills through an extended task, which requires students to research and demonstrate their learning through both products and practices [7].

According to Bernd Meier and Nguyen Van Cuong: teaching project - project based learning is understood as a teaching method to implement teaching perspectives: action-oriented, problem-solving teaching integrated teaching topics and perspectives [1].

In Vietnam: "the process of project-based teaching is a form of teaching in which students, under the control and help of a teacher, independently solve a complex learning task, not only theoretically. But especially in terms of practice through which to create products of practice that can be introduced and published". The project orients students to active

learning activities to develop talent. Students will work in groups and collaborate with experts to discover and solve problems on their own, investigate or write their own reports and make their own decisions. From there, students understand more deeply the content and meaning of the lesson [4].

Within the scope of this article, the author considers: the process of project-based teaching is a complex teaching, in which, under the guidance and organization of the teacher, students self-reliantly carry out a learning task with a connection between theory and practice, practice, create specific products that can be introduced. Students identify goals, plan, implement, adjust, evaluate the process and performance results with high self-reliance in the entire learning process. Group work and self-study are the basic forms of learning of the process of project-based teaching. The process of project-based teaching has the characteristics defined and depicted by the following diagram:

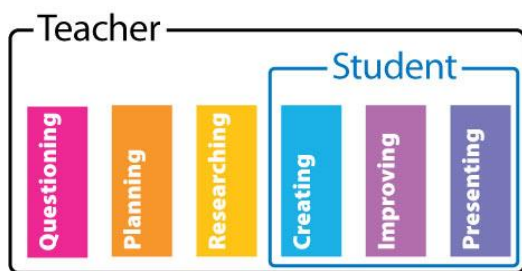


Fig 1: Project-based learning model

In the process of project-based teaching, there are many different views in the world about the division of stages in the implementation process. In this article, the approach when building the process of project-based teaching is the teaching process, so it must be based on the basis of teaching theory; At the same time, it is a form of learning, so it should be based on the structure of the implementation process in general, including 4 stages:

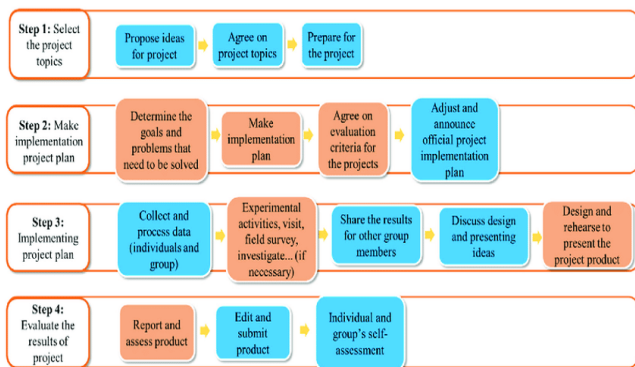


Fig 2: The process of organizing the process of project-based teaching

2.2 Blended Learning

Blended learning is a term used a lot in the field of education in developed countries such as the United States, Australia, Japan, etc. In Vietnam, blended learning is still a new concept. Blended learning comes from the meaning of the word “Blended learning”, which means “blended” or “combined”. There are different views when defining blended learning. Anthony g. Picciano, Charles d. Dziuban,

Charles R. Graham [8] has summarized 3 groups of views about the combination commonly used in the definition of Blended learning:

1. Combination of teaching methods (or teaching media)
2. Combination of teaching methods
3. Combination of online teaching and face-to-face instruction

The views (1) and (2) are too broad, not clarifying the specific nature of Blended learning because any learning system must involve and combine a variety of teaching methods and different teaching media. Viewpoint (3) reflects more accurately the characteristics and foundations of the combination, creating the basis for distinguishing this teaching model from other teaching models.

We believe that: Blended learning is a unified and complementary combination of online teaching via the Internet and teaching directly in the classroom to create the best conditions for students to achieve their learning goals when occupying the same learning content/topic. The combination of the above two teaching methods in different sequences and ratios will create different blended learning models



Fig 3: Blended learning model

According to Staker, the Blended learning model includes: 1) rotation model; 2) flex model; 3) self-blend model; 4) Enriched virtual model [3].

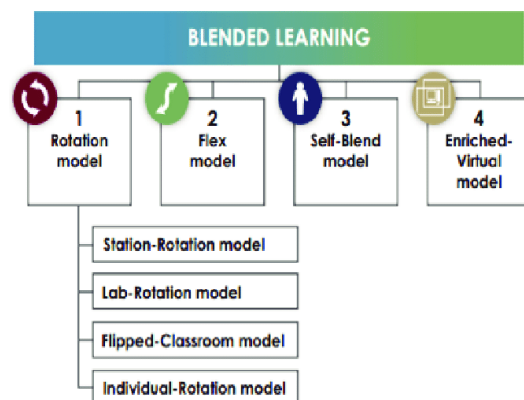


Fig 4: Blended learning models

In these teaching models, the teaching process consists of 5 important components: (1) synchronous activities; (2) asynchronous operation; (3) cooperation; (4) evaluation; (5) supporting documents. The Internet is an environment that provides learners with rich content, connects and exchanges at any time, anywhere that students can access the internet. With each content, learners learn by the best method, the best medium, the most suitable form and the ability to achieve the highest efficiency.

2.3 Project Teaching Process According to the Blended Learning Model in Teaching Chemistry in High Schools

Based on the process of organizing the process of project-based teaching, the characteristics of Blended learning and

students' intellectual framework in teaching according to the Blended learning model; after testing; Editing and perfecting, we propose the process of project-based teaching through the Blended learning model, including:

Table 1: The process of project-based teaching through the Blended learning model

Step	face to face		online	
	Teacher	Student	Teacher	Student
Step 1: Create a project implementation plan	<ul style="list-style-type: none"> - Ask Ss to decide on the theme of the skin. - Divide into groups to perform skin according to the student's choice. - Organize a group of students to propose solutions, identify relevant known facts, make an implementation plan and develop criteria for evaluating leather products. - Answer, support group of students. 	<ul style="list-style-type: none"> - groups agree on skin theme selection. - Group discussion to agree on the project's issues, identify what is known and relevant. - project execution planning (defining means and methods of performing tasks, assigning people to perform them, determining when, where, and expected product to be obtained). - Develop and unify criteria for evaluating leather products. 	<ul style="list-style-type: none"> - pose problems and organize students to develop ideas and propose skin topics. - survey students' needs on skin topics. - Ask Ss to propose a problem to be solved (problem) and determine what they know related to the selected topic.- Support them via the internet. - publish the criteria for evaluating leather products. 	<ul style="list-style-type: none"> - do survey. - identify known and proposed problems. - exchange in the group and with the teacher to adjust the project implementation plan. - publish the official project implementation plan.
Step 2: execute the project	<ul style="list-style-type: none"> - support students (if needed) 	<ul style="list-style-type: none"> - conduct experiments, practice laboratory at school, visit, field survey... (if any). - product design and presentation of skin results. 	<ul style="list-style-type: none"> - Monitor, support and control the project implementation progress of the group of students. - encourage, encourage students. 	<ul style="list-style-type: none"> - collect/process skin information. - personally report results, propose problems, difficulties encountered after each implementation phase. - Group discussion, comments on results, requests for support from teachers. - Synthesize results, prepare designs and presentation scripts for leather products.
Step 3: report and evaluate project results	<ul style="list-style-type: none"> - Organize students to report project products and peer-review leather products according to established criteria. - reward good products and positive group of students. 	<ul style="list-style-type: none"> - group presents leather products and discuss. - cross-review of leather products. - edit products according to suggestions. 	<ul style="list-style-type: none"> - announce the results of skin product evaluation and reward students. - Ask Ss to take the test (if any). - Ask students to self-assess and learn from experience. 	<ul style="list-style-type: none"> - take a test. - self-assessment and experience and remedial thinking.

2.4 Illustrated Lesson Plan

Based on the project teaching process according to the Blended learning model presented above, we have designed an illustrated teaching plan in teaching chemistry. The lesson plan is described as follows:

Project: Ethyl alcohol in life-benefits and harms

A. Goals

1. Common goal

Developing students' talents through project teaching activities according to the Blended learning model.

2. Specific goals

- Demonstrate the applications of ethyl alcohol and explain the applications based on its properties.
- Name the types of alcoholic beverages used in life and explain the meaning of alcohol content on the above beverage products.

- presents the process of ethyl alcohol absorption in the human body, the harmful effects of alcohol abuse on health and social problems.
- Surveying the actual situation of students' alcohol use in schools or residential areas where they live. Recommend recommendations to the community on how to use alcohol safely and sensibly.
- presentation of materials, processes and development of local traditional winemaking.
- Present the ingredients and process of making wine from fruit. Explain the metabolism and benefits of fruit-based alcohol.
- Show the ingredients and how to make the disinfectant solution. Explain the role of ingredients in disinfectant solutions.

B. Project Subtopics and Suggested Research Questions

<p align="center">Topic 1: application of ethyl alcohol in practice</p> <p>Objective: clarify the applications of ethyl alcohol in different fields (food, cosmetic, pharmaceutical - medical,...). Explain the application based on its properties.</p> <ol style="list-style-type: none"> 1. What are the practical applications of ethyl alcohol? Take illustrative examples in different fields (food, cosmetics, medical...). 2. Why is ethyl alcohol used to produce alcoholic beverages? 2. What do you know about e5 biofuel, dry alcohol? What are they used for? Based on what property is ethyl alcohol used as fuel? 3. Why is non-toxic ethyl alcohol used for medical disinfection? What is the most effective concentration of ethyl alcohol as an antiseptic? Explain. 4. What is the role of ethyl alcohol in products such as mouthwash, nasal spray, and hand sanitizer? 5. Why do people use heavy alcohol to soak traditional Chinese medicine, soak high? 6. Why does alcohol remove the fishy smell of fish? 7. How to make vinegar from ethyl alcohol like? 8. In ptn, how do people destroy excess sodium in small amounts? Why? 9. Why is ethanol used as a solvent in paints and cosmetics? <p>Product suggestions: powerpoint presentations, mobile phones, comics showing applications of ethyl alcohol...</p>	<p align="center">Topic 2: actual use - harmful effects of alcohol abuse on health and society</p> <p>Objective: to investigate the status of alcohol use and the consequences of alcohol abuse. Propose solutions to prevent and overcome.</p> <ol style="list-style-type: none"> 1. Name some alcoholic beverages on the market? Compare their alcohol content 2. What is the status of students' use of alcohol and alcoholic beverages in the school and in the residential area? 3. How does the absorption of ethanol in the human body take place? How does drinking alcohol often and heavily affect health? (affects the nervous system and organs such as: heart, liver, kidney,...). 4. How does alcohol abuse affect social issues (traffic safety, social order, domestic violence...)? What is the blood alcohol concentration to drive? 5. How to cure drunkenness? 6. What recommendations should be made for people to use alcohol safely and effectively? <p>Product suggestions: survey forms, powerpoint presentations, propaganda posters...</p>
<p align="center">Theme 3: traditional winemaking process and economic benefits of local winemaking</p> <p>Objective: learn the process and experience of traditional winemaking. Clarifying the value and proposing solutions to improve the economic efficiency of local winemaking.</p> <ol style="list-style-type: none"> 1. What are the ingredients, process and tools for making wine according to local traditional methods? 2. Factors affecting wine quality and winemaking performance? How does yeast work in the process of brewing rice? How is the fermentation time determined? Why does the fermentation process of agricultural products contain a lot of starch and sugar (rice, corn, cassava, ripe fruit,...) If left for a long time, the wine will taste sour when distilled? 3. How to judge the quality of wine? What ingredients are mixed in alcohol when distilling causes headaches when drinking? Want to get good wine, not mixed with many impurities need to pay attention to the problem? Why is it easier to drink wine the older it is? 4. What are the economic benefits of local winemaking? In order to increase the economic value of the traditional winemaking process on a family scale, what other economic activities need to be coordinated? 5. How is fake wine made? What ingredients in fake alcohol cause poisoning when drinking alcohol? <p>Product suggestion: powerpoint presentation with photos/videos of the winemaking process, handbook...</p>	<p align="center">Topic 4: making fruit wine</p> <p>Objective: learn the making process and benefits of fruit wine. Create and advertise products, instructions for safe and effective use.</p> <ol style="list-style-type: none"> 1. What kind of fruit can be used to make wine? What is the difference between fruit wine and rice wine? Benefits of fruit wine? 2. What is the process of making fruit wine? How does the transformation happen? Which ingredients in fruit ferment to form alcohol? Is fermentation anaerobic or aerobic? 3. How do fruits ferment fast? Should we use granulated sugar in the fermentation process? Why? 4. How to present and introduce fruit wine products? Indicates the ability to scale production. 5. Teach people how to use fruit wine safely and effectively? 6. Proceed to make fruit wine. <p>Product suggestions: videos, photos describing the process of making fruit wine, actual products with an introduction about the benefits of fruit wine...</p>
<p align="center">Topic 5: Making an antiseptic solution</p> <p>Objective: To learn the ingredients and how to prepare an antiseptic solution. Conduct product preparation and guide effective and safe use of products.</p> <ol style="list-style-type: none"> 1. What are the main ingredients of the antiseptic solution and what are the roles of those ingredients? 2. Steps to take and note when preparing disinfectant solution? 3. How to present and introduce disinfectant solution? 4. Prepare disinfectant solution. 5. What should be paid attention to when using disinfectant solution to ensure safety and effectiveness? <p>Product suggestions: videos, pictures describing the process of preparing antiseptic solutions, actual products and instructions for use...</p>	

C. Designing learning activities

Method	Teacher's activities	Student's activities
+ Objectives: Ss propose leather ideas, make a decision to choose a leather theme according to their needs and join the group that implements a leather theme.	Activity 1: Generate ideas and decide on topics + Product: contents of column k, w of KWL diagram. + Assessment: component competencies determine learning objectives through the KWL diagram. + Organize	
Online learning on microsoft teams	- The teacher raised the problem on the microsoft teams online learning management system. Teacher gives pictures and introduction: ethyl alcohol has many applications in practical life and production. This is also the chemical composition of alcohol and other familiar alcoholic beverages on the market today. However, alcohol abuse also causes serious effects on human health and	- suggest other skins (if any). Choose the skin theme suggested by the teacher and the student.

	<p>social problems (such as traffic safety, social order, domestic violence, etc.). Essential question: how to make life better? Lesson question: What are the practical applications of ethyl alcohol? If alcohol abuse and alcoholic beverages can cause what harm? How to enhance the benefits and minimize the harm of ethyl alcohol use in life? After the lesson on alcohol, we will conduct a learning session to learn about “ethyl alcohol in life - benefits and harms”. Here are some recommended skin themes. Please choose a skin topic that you are interested in (according to your needs and preferences). In particular, encourage them to suggest other new topics. Suggested skin subtopics include: 1. Application of ethyl alcohol in practice. 2. Actual use - harmful effects of alcohol abuse on health and society. 3. Traditional winemaking process and economic benefits of local winemaking. 4. Make fruit wine. 5. Prepare disinfectant solution. - Ask students to propose problems to be solved (research questions) and identify what they already know (knowledge/skills) related to the chosen topic. Fill in the kwl diagram in your notebook</p>	<p>- propose problems to be solved, identify what is known and record it in notebooks.</p>
Learning in class (3 - 5 minutes)	<p>- The teacher uses the last 15-20 minutes of class time of period 2, lesson 40: alcohol to organize students' groups and make a plan for implementation (in step 2). - Organize groups of students (corresponding to the topic that students decide to choose).</p>	<p>- Form the group, nominate the team leader, secretary.</p>

<p>Activity 2: make an implementation plan</p> <p>+ Objectives: students can make an implementation plan and agree on product evaluation criteria. + Product: the group's official skin implementation plan. + Evaluation: the ability to make and adjust the learning plan through the group discussion diary, the implementation plan + Organization</p>		
Learning in class (12 – 15 minutes)	<p>- organize a group of students to discuss to identify knowledge/skills related to skin and propose problems to be solved in the project. Make a project implementation plan, assign tasks to members (5WH, Mind Map). - follow, direct and support teams. - organize discussions and develop common evaluation criteria for the project's products</p>	<p>- các nhóm thảo luận dưới sự điều hành của nhóm trưởng và hoàn thành phiếu học tập. - trao đổi với gv về kế hoạch - các nhóm thảo luận, thống nhất tiêu chí đánh giá sản phẩm dự án.</p>
Online learning on microsoft teams	<p>- The teacher created chat groups on teams (corresponding to each group of students), giving admin rights to the group leader. - Support the student group to adjust the project implementation plan accordingly.</p>	<p>- exchange in the space of the team on teams to adjust the project execution plan. - Agree and announce the project implementation plan to the teacher and all members.</p>

<p>Activity 3: project implementation (done in 1-2 weeks)</p> <p>+ Objectives: students collect information, solve project problems, design and practice product presentations. + Students' products: leather products of the group. + Evaluation: the ability to implement the learning plan through the group discussion diary and the group's skin products. + Organization</p>		
Online learning on microsoft teams	<p>- ask the team leader to monitor and report regularly on the performance of the members after each phase. - participate in discussions, online meetings of the group for advice and support. - give feedback to the team on how to present and present project products.</p>	<p>- students perform assigned tasks and report on each stage in the plan. - detect and propose new issues to supplement and adjust the project implementation plan and activities. - After each stage, the team leader actively creates online discussions/meetings on teams to organize for members to report on their results, exchange difficulties, questions and ask for support from teachers. - Group leader organizes student groups to summarize skin research results, demonstrate leather products and develop presentation scenarios.</p>
Trực tiếp (do nhóm tự sắp xếp theo kế hoạch)	<p>- The teacher supports the group of students (if necessary)</p>	<p>- Conduct activities: hand out survey sheets, visit local wine production facilities, practice making fruit wine, antiseptic solution... - Team meeting for product design and presentation of leather products.</p>

<p>Activity 4: report and evaluate the results (1 hour)</p> <p>+ Objectives: students present project products, peer assessment and self-assessment of project implementation results. + Student's products: results of peer assessment of project products; results of self-assessment of the group's project implementation process;</p>		
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kwl table of each student.		
+ Evaluation: the capacity of the component to implement the learning plan and the ability to evaluate the learning results and adjust through the process of reporting on the group's project products, the results of the evaluation of the project's products, the results test, kwl diagram. + Organization		
Learning in class (1 period)	<ul style="list-style-type: none"> - arrange class space and organize a contest to learn about "ethyl alcohol – benefits and harms", each group is a team, the teacher and the other group are judges to mark and ask questions/ discuss. - The teacher evaluates and organizes peer assessment groups according to the established criteria. - Ask the team to edit the project product to submit it back to the teacher and self-assess the skin - summarizing results and rewards 	<ul style="list-style-type: none"> - Student groups take turns reporting skin results, other groups follow up and ask questions. - peer assessment groups of project products according to established criteria. - groups to edit project products according to their comments and self-assess the project implementation process.
Online learning on microsoft teams	<ul style="list-style-type: none"> - announce the results of the project product evaluation and reward the positive students/groups of students. - Ask students to take the test on teams. - ask each student to self-assess and learn from experience. 	<ul style="list-style-type: none"> - take the test. - each student self-assess and record the knowledge/skills gained in column 1 of the kwl table and learn from experience. Announced on teams.

D. Appendix

Appendix 1: Student's kwl chart

<i>Project Topic:</i>		
K (What do you already know related to the project topic?)	W (What are the problems to be solved of the selected project topic?)	L (What did you learn?)
What did you not do well in the project? How to remedy?		

Appendix 2: Worksheets to guide groups of students to plan the implementation of the project

Group:					
No	Student's full name		No	Student's full name	
Mind map					
<i>Member</i>	<i>Mission</i>	<i>Means</i>	<i>Time</i>	<i>Estimated Product</i>	

Appendix 3: Table of evaluation criteria for project products

Criteria	The level of achievement of the criteria			Điểm
	Good (3.0 points)	Pass (2.0 points)	Failed (1.0 point)	
1. Scientific content				
1.1. The project's goals, issues, and problem-solving methods	Show the project's goals, problems to be solved and the way to solve the problem is reasonable, clear and complete.	Show the project's goals, problems to be solved and the way to solve the problem is reasonable, clear but incomplete.	The project's objectives, problems to be solved, and ways of solving them have not been shown reasonably and clearly.	
1.2. Collect project information	Collecting accurate information, citing clear and diverse sources, relevant to the problem to be solved; complete and up to date.	Collect information that is accurate, diverse, clearly cited, relevant to the problem to be solved, but incomplete and not up to date.	Failing to collect the necessary information to solve the project's problems or collecting inaccurate information, without clear origin.	
1.3. Processing project information	Analyze and process logical and scientific information and data, draw sufficient and reasonable conclusions for the project topic.	Analyze and process information and data, but not very logical and scientific; draw some appropriate conclusions for the project topic.	The information has not been analyzed or processed (data is still in raw form) or processed incorrectly; The appropriate conclusions for the project topic have not been drawn.	
2. Project Presentation				
2.1. Product content structure.	Full and clear presentation with scientific logical structure; main content is clarified, prominent, easy to follow.	The presentation is clear, the structure is reasonable but incomplete and the main content has not been highlighted.	The presentation is not clear and complete, it is messy, the main contents have not been clarified.	
2.2. Product display form.	Beautiful presentation, harmonious use of colors,	The presentation is quite nice, using harmonious colors, appropriate	The presentation is not beautiful, the colors are not harmonized, the language	

	appropriate vivid images, reasonable arrangement, accurate language, no typos.	illustrations, reasonable arrangement, but the language used is not accurate, there are a few typos.	is still confused, inaccurate, there are some spelling errors.
2.3. Product presentation.	Unique, creative report ideas. The content is presented visually, vividly, with illustrations, fluently expressed, attracting listeners.	New report ideas. The content is presented visually, vividly, with illustrations, relatively fluently expressed, attracting listeners.	The idea of reporting the product is familiar, the content is sketchy, the expression is not fluent.
2.4. Collaboration in product presentation.	There is effective coordination among team members.	There is coordination among team members but not effective.	There is no coordination among team members when presenting the product.
2.5. Answer discussion questions.	Answer accurately, clearly and fully all discussion questions posed by the teacher or other group.	Answer correctly and clearly to some discussion questions posed by the teacher or other group, but not fully.	Did not answer correctly and clearly the discussion questions posed by the teacher or other group related to the skin topic.
Total score: /24			Rating levels Failed: from 0 to 15 points; Pass: 16 - 19 points; Good: 20 – 24 points.
Classification:			

Appendix 4: Assessment sheet for the group's project-based learning

	Criteria	Degree evaluation		
		Not reached (1 point)	Obtain (2points)	Good (3points)
1	Propose ideas and issues to be solved for the project: reasonable, clear, complete.			
2	Identify what is known about the project			
3	Determine the means, the way to carry out the project tasks: clear, appropriate.			
4	Schedule performance and expected results of skin tasks: clear, reasonable.			
5	Search/collect information for skin via internet and other sources: accurate, relevant, diverse and complete.			
6	Analyze and process information to solve project problems: accurate, complete.			
7	Cooperation with teachers and classmates during project implementation: proactive, regular, effective.			
8	Express and present project products: logical, clear and creative; Scientific presentation, attractive.			
Causes and remedies for bad jobs?				

3. Conclusion

The process of project-based teaching with the support of information and communication technology, meets the requirements of teaching in the digital age. The article proposes and clearly analyzes the process of project-based teaching through the Blended learning model in the development of students' intelligence in high schools and presents an illustrated teaching plan in chemistry. Initial experiments show the feasibility and positive effect of the proposed teaching process.

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