Context based learning and results application via project based learning in real situation of physics classroom at high school in Vietnam

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ABSTRACT

A new trend in the field of teaching nowadays is context-based learning which is embedded with real life of learners; our education system is not an exception. This method will stimulate learners’ inspiration towards school subjects, especially natural sciences domains because today’s students tend to less interested into these fields. In this tendency, learning via project plays a crucial role when an in-class learning activity is connected with real diversification of life to help learners to find themselves the meaningfulness of their study. Lessons taught should not in its preset and bound sequence of curriculum instead they are linked with real-life situations in which learners will be able to discover their capabilities and express their own life experiences rather than just staying in class and working out scholastic exercises. This article presents some results obtained by applying the context based learning via project learning in high schools in Vietnam.

Keywords: Context based learning, project-based learning, high school, energy, real-life situation of learners.

INTRODUCTION

In reality, the teaching of individual subjects in school disrupts the connection of knowledge of one object (Lowe, 2002). One phenomenon, one object has not been researched in a unified, synchronous and comprehensive manner at the same time of study rather they are being studied in separate facets under different aspects in each isolate subject at the specific period. Therefore, the knowledge obtained by students lacks of the unification, generality, when they solve real-life matters, learners find a great deal of difficulty, especially applying what they studied because they cannot link by themselves into their life (Maingain et al., 2002).

Moreover, knowledge acquired by learners in schools cannot cover all aspects of problems needed to be solved in real life, as these problems are complicated and diversified, involving features of science, society, environment and even politics. On the other hand, real-life problems always arise and no-stop develop whereas innovations of school education are lagging behind the development of such real-life problems. This results in “discrepancy” between formal learning and virtual reality when students have more chances to experience real life than what they have learned in schools. In order to rectify these matters, some suggestions are given as follows:

a) Create strict connections between in-school curriculums with students’ real life by relating what studied at school with real condition where they live.

b) Introduce problems around their life into school so that learners can study and find solutions convenient with their context.

These two approaches guarantee that learning method will bring instant benefits for learners and communities where they live. This idea poses a number of questions that need to be answered such as what relate to methodologies to make sure that it can be applied with each local situation, with each age group when the
matters of real life are quite different with pure natural phenomenon which has been taught for long in school. Questions can be raised such as:

i) Among numerous real-life problems that arises day by day, which ones of those should be entered into the scholastic curricula?

ii) How to teach students such problems effectively when the curriculum has been designed and formatted well in advance. Furthermore, it has been programmed from low level to high one and must be fixed in accordance with the frame of time.

iii) How to access learners’ performance when it requires much time to solve such problems. Meanwhile, this assessment has been well-preset periodically with each subject of each age group.

**ROLES OF MASS MEDIA IN CONTEXT-BASED LEARNING**

In context-based learning, mass media plays leading roles because of its popularity and impacts on all people, of whom students are most easily-impacted ones (Drot-Delange, 2011). Mass media, offers multi-aspect information as well as global issues to the local inhabitants, inverse, it can spread the local issues to global and other local areas, of which, Televisions and Internet are the most powerful ones (Su, 2008).

Information diffused by television channels is universal, instantaneous and multi-dimensional and impacts viewers of all ages and is considered as the most official information source. While information provided by television channels is always of agenda and high-lighted issues and easily ignites viewers’ curiosity and interests, information provided by Internet can be stored and helps Internet users to search conveniently and fill gaps of the information (Annetta and Minogue, 2004; Dhingra, 2003). At the same time, information on Internet is also frequently and quickly updated and added; hence the combination of television channels and Internet that can formulate a latest, complete and useful source of information on current issues of life (Brandt-Pomares, 2008; Sorensen et al., 2007).

The learners can perceive and are easily emotional by information and issues of life when they access these mass media.

For educators, among complex and diversified ranges transmitted by television channels and on Internet, they should pick out and determine what should be introduced to their learners. The issues selected must assure these following criteria:

a) They must be agenda and broadcasted and diffused many times within a specific period of time.

b) Caught by a large number of learners with knowledge related to those issues systematically.

c) Related to a particular subject at school, so that a teacher is the main person who can be in charge of teaching such issues.

d) Beneficial to local communities of the learners, and learners can experience all or a portion of the issue.

e) Suitable with capabilities of learners, or in other words learners can solve such issues by using knowledge acquired in schools.

Notwithstanding these, the question is how to guarantee that the introduction of such issues into education activities is effective and suitable with the predetermined curricula?

The introduction of such issues into education activities of school makes sure not creating another subject. Otherwise, it is necessary to re-design the curricular format and edit its own pedagogic. Therefore, it is necessary to corporate and integrates such issues into existing school subjects. In addition, context-based learning is not to focus on equippings learners with new knowledge rather it is aimed at educating learners on behaviors and application of knowledge on reality, stimulating interest in learning, enhancing learners teach themselves, creating links knowledge of subjects together so as to develop skills of learners comprehensively.

Hence, context-based learning means that learners can participate in collective activities and become getting used to dealing with actual problems life and learning the way to persuade local communities to make common decisions to guarantee of their collective benefits.

There may be a number of teaching methods to ensure these benefits, but in the course of teaching physics in high schools for students from 16 to 18 years old in Vietnam, we found that by-project learning will generate a great deal of advantages in combining knowledge acquired in school with real-life situations, in which mass media will offer learners much advantage when they implement projects.

**IMPLEMENTATION OF CONTEXT-BASED LEARNING VIA PROJECT-BASED LEARNING**

**Selection of project themes**

Rooting from the orientation of curriculum in the high school, especially in physics, we pick out themes from which both students and teachers are interested and then we research local issues commensuration with these themes. From the real investigation of 451 students from 2 high schools and 47 teachers of physics who come from various high schools at the 2010 Conference of Complementing Physics Teacher of the Vietnamese Ministry of Education and Training, we obtained a list of themes relating to renewable energies interested by themselves and the themes are presented in Table 1 in order of priority.
Themes related to solar thermal and sunlight energies attracted great attentions of many pupils and teachers from various high schools and classes, the selection is due to exploit and use renewable energies widely discussed by mass media due to concerns on climatic changes and sustainable development. Especially, Viet Nam lies near the Equator, has a system of tangled rivers and a long-stretched coastline from the North to South, the issues of exploiting solar energy, water pollution and hydropower attracts more and more attentions of students. Such selections of teachers and students can be explained as followings:

i) Concerns on future exhaustion of fossil fuel resources;
ii) Conflicts on occupying of oil resources among larger countries and smaller countries, a typical example of this is the sea-territory dispute in East Sea;
iii) Construction of the first wind energy generating plant in the South of Viet Nam and the usage of solar electricity systems on islands in East Sea and mountainous areas of Northern Vietnam;
iv) Wide advertisements of solar water heaters to be installed on roofs of urban households and hospitals.
v) Implementation of Research and manufacture of solar energy cookers to be distributed free of charge to people in mountainous and Central regions of Viet Nam;

Therefore, all project ideas selected by teachers and students are related to these themes, such as solar energy cooker projects, refining seawater into drinkable water by using solar energy, manufacturing solar cells, small hydropower station projects, projects of installing lights on buses, so on. These projects have been carried out by us at 7 high schools in 5 provinces Dong Thap, Vinh Phuc, Buon Ma Tho, provinces and Hanoi and Haiphong City in the recent years.

Implementation of the projects

In the spectrum of a densely-arranged curriculum for high school students in Vietnam, it is hard to implement the project inside the intra-curriculum. Therefore, the organization of implementing the project should be flexible such as it is better to do it at the beginning of the semester as well as at the end of the school year or during the Summer vacation (Tra, 2009). By that way, project implementation should be done uniformly between timetables of intra and extra activities of the school in order not to affect learning of students and teaching of schools ensuring that the projects are brought under control of teachers (Hérold and Ginestie, 2009).

Time for discussing project ideas and presenting project results is allocated in intra- or extra-curricular period, and the time for students to execute the projects is set up outside the school but still under indirect and periodical supervision of teachers (Hai et al., 2013).

Most projects must be able to lead to manufacturing usable products and instantly applied to the life of students, and so the progress of the project must include three main phases (Hai et al., 2012), as follows:

Transfer stage of the project

The students can access the project by real life circumstances in forms of video clips edited by the teacher or documentaries from television channels and Internet. Then, the students will discuss with one another and find solutions. Based on these solutions, teachers will request students to set up projects and execute them.

Project implementation stage

While students are implementing their projects, the teachers will periodically or unexpectedly inspect project progressions and give them some useful advices to help them overcome difficulties, if any. This stage shall be implemented outside schools, and teachers will hand out each group a logbook for them to update their daily progression. This stage may last one week or more, depending on contents of the projects and products to be manufactured.

Project report stage

After completing their projects, the students must report on their project implementation by submitting their
logbooks and presenting via multimedia techniques to introduce and explain their project products. This stage shall be assessed by the teachers and other students of the same classes in the period of project performance and quality of project products.

Results obtained

The projects are implemented in 7 high schools in various places in cities (Trân Phú - Hải Phòng; Yên Hòa – Hà Nội), rural areas (Thánh Oai B và Đại Cước -Hà Nội, Đội Cấn – Vĩnh Phúc) and towns (Đông Tháp and Nguyễn Du - Buôn Ma thuột) (Table 2).

After analyzing project implementation activities of different student groups and respective project products, we find that the student, not only accumulate their acquired knowledge but also aware of their citizen’s responsibility toward social issues.

Completion of the project target will solve social issues

Based on knowledge of related subjects, the teachers have been orientated of students’ ideology toward the society and factuality which human being are facing, from which real situations can be predicted to create study projects commensurations with the teaching and studying simultaneously and the necessity of solving such issues for a better and more sustainable life.

In all the projects, social facts are highly reflected as follows:

i) Severe shortage of energy for development of society;
ii) The use of fossil fuel resources.

These are motivations for the student to apply their knowledge in real life, forming their conscience and positive attitude toward the development of society.

Other projects focus on usage of solar energy, recycled energy such as energy regenerated from garbage, electricity produced from poultry’s recreation, or from waste water of apartment buildings. Apart from such urgent issues, a number of projects, mention on improving the comfort of the community inhabitants, such as “Project on designing signal light system on buses for passengers’ convenience”. As such, the projects on real-life contexts of the learners are aimed at solving social issues. It is the aspiration for learners to discover their learning capabilities, make use of the community resources, consult experts in the fields of research, and exchange information via hi-tech means.

Creative application of inter-disciplinary knowledge on reality

Knowledge absorbed by the learners to solve the diversity and richness in the project is not dependent on a single subject or a field of real life.

In the projects, living experiences of the learners is utilized at maximum while they manufacture components of project products or look for materials. For examples:

i) Rotating function of solar cooker works the same as joints of windows or foldable hammocks;
ii) Pot supporting component of solar cooker is made of grill nets;
iii) Number of components taken from electric fans and 3-phase motor models can be utilized to make mini generator;
iv) Electric energy cell is coated with metal layers on both faces of a glass panel by using electrolysis method, and painted black heat absorption components.

Application of the knowledge of 3-phase electricity, 3-phase generators and motors can help students to solve the problem of electricity shortage (Figures 1 and 2). The learners can manufacture 3-phase electric generators which can make use of wind and water power where national power grids have yet to be installed. The simple structure of the generator ‘stators have three separate and identical rolls on three iron stator cores placed discrepantly 120 degrees on a ring, and the rotor is an electric magnet. In addition, some learners even prepare “Manual of operation and maintenance of electric generators” for customers (Hai and Tra, 2010).

While implementing projects of harnessing solar thermal energy, the learners search the Internet for information, self-study to manufacture usable solar cookers, produce heating ovens, and solar water distillers.

Table 2. Teaching by projects based on in – effect learning.

<table>
<thead>
<tr>
<th>Names of projects</th>
<th>Places of project implementation</th>
</tr>
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<tbody>
<tr>
<td>Solar cooker</td>
<td>Thánh Oai B, Đội Cấn and Đại Cước (Hà Nội)</td>
</tr>
<tr>
<td>Exploitation of solar thermal energy</td>
<td>Đội Cấn (Vĩnh Phúc)</td>
</tr>
<tr>
<td>Solar energy cells</td>
<td>Nguyễn Du (Buôn Ma thuột)</td>
</tr>
<tr>
<td>Mini hydropower plants</td>
<td>Trần Phú (Hải Phòng)</td>
</tr>
<tr>
<td>Electrical systems on buses</td>
<td>Yên Hòa (Hà Nội)</td>
</tr>
<tr>
<td>Usable electric circuits for households</td>
<td>Đồng Tháp</td>
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</tbody>
</table>
The most creative approach is that the learners decide to use bamboo sticks to form a parabolic frame and find the parabola’s focus by bending pole top. Reflection surface of the parabola is the hardest part because it is hard to manufacture it as flat mirror. The learners have created a bright idea of using inner surface of beer cans and soft drinks to make such reflection surfaces. The students cut out beer cans, flatten them and join cut pieces, and then install the piece on parabolic bamboo frame to make a 'highly creative product'.

About the heat insulation, the learners can make use of abundant local materials such as rice husk, insulating foams, wood chips, and recyclable paper. The learners also find that stiffness of the components is poor, but they have yet to create an automatic swing handle towards the sunlight to absorb at the full exploitation.

In the project “mini hydropower plant”, in addition to harnessing potential energy of waste water discharged from higher areas, the learners also design and install garbage-refilled screen component.

As such, their theoretical knowledge has been converted into more practical knowledge, which is easier to remember than solely learning theoretical formulas and theorems. While applying knowledge on reality, the learner use knowledge of more than one subject, for example physics knowledge for explaining operation principles of solar cooker can be used to understand other knowledge, such as techniques, mathematics, so on, and that of economics, society, environment to persuade each other when talk about advantages, disadvantages and other solutions to create a product.

Consciousness in using recyclable materials found in the locals help aware of consciousness education, behavior to the natural environment and local economic efficiency

During the implementation of the projects, the learners discuss and find numerous important solutions to ensure that the projects can bear good results. That is, the learners can utilize utmost the cheap and abundant materials without damaging the local environment but still be easily fabricated, installed and manufacture. All by project products are made of recyclable materials from daily activities of their local communities. For example, the learners can use rice husk, wasted paper, insulating foam boxes, carton boxes to manufacture insulation components and frames of their solar cookers, as well as use beer cans and aluminum wraps and bamboo frame to manufacture concave mirrors, mirror rotating components and greenhouse effect traps for their solar cookers. This approach leads to feasibility of the projects because of low investment, as follows:

i) Project of signal light system on buses: the learners successfully manufacture and install the light system at the cost of 104,000 VND per bus;

ii) Project of solar cooker: 5 groups of learner, with each of 100,000 VND, successfully manufacture 5 solar cookers used in practice and experimented on boiling eggs and refilling salt water into drinkable water;

iii) The learners also manage to manufacture wind-powered and water-powered 3-phase electric generators to be used in areas not having access to national power grid.

All by-project products made by students are functional and capable of meeting minimum demands of the learners’ communities.

Solar cookers can generate heat of up to 78°C in sunny day; drinkable water-filter systems can absorbed from salt water; mini hydropower system can generate electricity e for 1.5 volt light bulbs. These examples demonstrate the economic efficiency of the project products (Figures 3 and 4).

Mobilization of diverse resources from in and out of schools for learning activities

Teaching by project related to real-life context, the
learners are exited and united, while working in groups because they can be aware of practicality of the project research. The students have managed to mobilize a variety of sources for their learning activities such as:

i) Use mobile phones, internet and diverse sources of information related to their projects;  
ii) Allocate duties and collect members of group and seeking supports from parents and relatives to find materials for manufacturing the products;  
iii) Seek assistance from teachers for advice or helps from relatives and artisans when making products such as cutting glass such as cutting glass, making wood or steel frames.

Promote equality of learners in learning activities and achieve the target of “society” in education

Both male and female learners participate in most projects. After analyzing data of the projects, we find that tasks are assigned equally to all group members, and the learners can discuss and agree with one other on such assignments, each member often take over his or her assigned work based on their best ability, for example female members deal with paper cutting or pasting works, while male ones do other wood cutting works. Therefore, there is no difference between male and female learners during the project implementation (Figures 5 to 7).

The boundary among learners with good and poor learning performance is also eliminated (Hai and Tra, 2014). There is discrimination of learners' learning abilities; all of the learners are equal and confident in introducing their project products or talking about their project assignments.

During the process of the projects, the learners perform
in teamwork as minor "society" under the orientation of teachers to reach the education purpose. In these "societies", the learners work as workers under the leadership of team leader, teachers and other learners act as observers. Learning activities connected with practice therefore will create practical products; target the education of behavior and of teamwork, base solutions on discussions corporate among students for the timely final result, forming the "social relationships". In order to reach the target of education by this "society", all "citizens" have to conduct self-assessment, collective-assessment, and each group member-assess frequently to adjust behavior, attitude of their own for the good result made by that "collective". It is this aspect will help students to developed "new citizen conduct" (Unesco, 2009) with forgiveness, law observance, and gender equality so as to establish a link in the society, to solve by themselves all the individual conflicts, democracy, economics, live environment, form life skills, awareness skills, consciousness of stable and unstable development.

Through the process of project implementation, the active citizens - learners - with their creativeness, capabilities can overcome difficulties and solve complicated issues in the society. These "societies" are still under the control and orientation by the teachers so they can intervene and guide to develop into "ones" as preset. The success of the mini "societies" will bear the future citizens to ensure a sustainable development. The teachers have oriented the students to select their team study whether the team members share the same gender or not, come from same village or different, have good or low level of study, they all will look to the common ideology and share assigned work to perform the project successfully. On these by-group assignments, the teachers will achieve the goals of education such as: gender equality education, all life study, social equality, social network, and indigenous cultural development.

The organization for all students to debate, self assess, mutual assess on the basis of preset criteria will help them to adjust their own behaviors and attitude toward communities and surrounding people in order to establish a truly learning society.

In a project of solar cooker, a learner wrote in questionnaire sheet: "I am quite satisfied as I think that this is a perfect result created by the contribution and participation of all members in my group" and concludes: "I like this very much, because it helps us get more and more united", and in a group activity, a student says:" "Excellent, all members devote their own opinions to make the well-rounded product". In a project of solar energy cell, a learner adds more, "He has developed his presentation skills in front of the audience", and in group activity, another has emphasized "group union", "listen more and understand more, together select the best option, rearrange personal timetable to work with group in the ultimate criterion of each-for-all for the final unification". Especially in the project "the useful circuit in the family," when looking back the process of implementation of the project, a student says "Not only do I know how to persuade others, but also listen to other ones and adjust my own ideas ...".

**CONCLUSION AND RECOMMENDATION**

Based on the aforementioned analysis, we can conclude that introducing real-life issues into scholastic environment has inspired students to find truly learning and actively make all their efforts to fulfill their assigned tasks. The themes of the projects related to actual life condition context and issues of the local communities have brought about great success in creating values of learning. However, if such themes are beyond the boundary of real life or capabilities of the learners, it will distract the interests as well as attention from learners and a number of groups, which will discourage the competitions among members in a group and groups with one another. In contrast, if the theme is too easy for learners, they can complete the project too quickly and restrain in-group cooperation and motivations of learners.

Therefore, it is necessary to skillfully select issues to be introduced, simultaneously filing and removing complicated and unreal features which are unsuitable with the learners or beyond their ability and in close with practicality of the issues, as the final products must be practical and capable of dealing with certain issues of the local communities. The result of the product pilot may not be ultimate as commercial products, but ensure feasible effects so as to increase the values of learning activities and students can confirm the usefulness of the products they have produced.

The process of teaching connected with the real life context via project will open an environment for students
to expose with the local communities and environment while conducting learning activities, in addition to help themselves organize their learning timetables, harmonize with the group work, especially self-supervise and assess one another in the implementation of the assigned projects. The project-based learning also removes boundary of genders and learning level of group members and create the equality in learning.

By that way, in the context of motivation for students in schools are decreasing sharply, for science and technology subjects in schools, the application of context-based learning via project is the ultimate solution for education reform in high schools in Vietnam nowadays.

REFERENCES


