ENERGY 4 FARMING

TEACHERS' DOSSIER: PROJECT-BASED LEARNING

MODULE 1

INTELLECTUAL OUTPUT 2

2020-1-ES01-KA202-082440

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Introduction

This teachers' dossier is part of the Intellectual Outputs covered in the Energy4Farming project (Innovative learning experience for VET studies in energy for farming), with project number 2020-1-ES01-KA202-082440. This project is part of the Erasmus+ programme, funded by the European Commission. Within this project, the partners pretend to promote the improvement and modernisation of VET agricultural studies through the professional development of VET teachers; to include innovative entrepreneurship practices in VET based on the new opportunities offered by the renewable energy sector in order to diversify the rural economy activities; and to facilitate the introduction of innovative project, based learning experiences o mee societal needs in agricultural VET studies by the educational approach of based-project learning. Consequently, this Intellectual Output directly contributes to the third objective named.

In the following lines of this document called "Teachers' dossier: introduction to project-based learning" the reader will find three different modules, including a theoretical framework of the project-based learning (PBL) methodology, with the real planning done by the two VET agricultural centres that participate in the E4F and the prototypes with renewable energies for farming created for implementing the project-based learning in the classroom and teach the academic knowledge and skill by engaging students with real-world practices with meaningful projects.

Theoretical framework

Background

When talking about "project-based learning" (PBL), the name of John Dewey usually comes up. He was the author of "My Pedagogical Creed" (1897) which explained the concept of learning by doing. But, according to some scholars (Burlbaw, Ortwein, & Williams, 2013) the long history of the project method start can be located in Italy, during the architectural and engineering education movement during the late 16th century (Knoll, 1997). Knoll also states five different phases of the methodology, pointing out that the beginnings are from 1590 to 1765.

According to the research of Burlbaw et al. (2013), there are other authors such as Noyes (1909) who push the origins back to the Sloyd education that took root in Finland in 1865. Sloyd is the English adaptation to the Swedish word slöjd, in which children learnt through "technical skills in woodworking […] by making useful objects by hand" (Borg, 2006). This was later transformed and mixed into other contexts among different countries (Borg, 2006) like France, Russia and United States.

In fact, the PBL methodology was not widely recognized in other educational fields until the philosopher William Heard Kildpatrick published "The Project Method" in 1918, where he redefined the concept of project based on Dewey's theory. He argued that students gained experience and knowledge by solving practical problems in social situations. Kilpatrick concluded that the psychology of the learner was a crucial element in the learning process. Learners were free to decide what they wanted to do, increasing their motivation and learning success as they pursued their own goals. Unlike his predecessors, Kilpatrick did not relate the project to specific subjects or areas of knowledge and this perspective opened up a world of possibilities for education (Pujol Conill, 2017).

However, Dewey and other authors criticized the revolutionary concept. His main objection was the unilateral orientation of the learner. In his view, students were incapable of planning projects on their own, and required the help of a teacher to supervise the continuous learning process. This controversial situation and the socio-political context of the time caused the progress and popularity of project-based learning to decline until the 1960s, when in Western Europe and after Hitler's dictatorship, projects emerged as an alternative to traditional lessons.

They were seen as a form of teaching through research and were promoted for their practical relevance, their interdisciplinarity, and their social relationship. The project idea spread quickly from universities to schools, and from Western Europe to the rest of the world. However, the euphoria for projects gradually waned and from 1980 onwards there was an attempt to harmonize project learning with more conventional teaching methods (Pujol Conill, 2017).

Definition of PBL

In order to define what really is the Project-based learning, it is usually mentioned the definition of the authors Bransford and Stein (1993), who understood this methodology as a comprehensive instructional approach to engage students in sustained, cooperative investigation.

Within its framework students collaborate, working together to make sense of what is going on. Project-based instruction differs from inquiry-based activity — most of us have experienced it during our own schooling — by its emphasis on cooperative learning. Inquiry is traditionally thought of as an individual, somewhat isolated, activity. Additionally, project-based instruction differs from traditional inquiry by its emphasis on students' own artifact construction to represent what is being learned (Bransfor and Stein, 1993). Students pursue solutions to nontrivial problems by asking and refining questions, debating ideas, making predictions, designing plans, drawing conclusions, communicating their ideas and findings to the others, asking new questions, etc. (Blumenfeld et al, 1991).

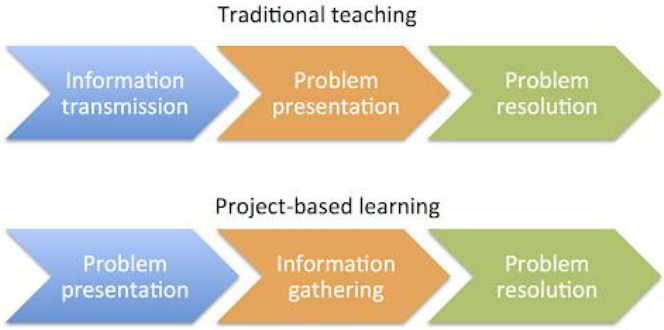


Figure 1. PBL vs traditional teaching. (Universidad de Alicante)

The idea is to teach students to learn how to learn. By having to solve problems, students practice learning rather than merely memorizing. Amazingly enough, the students are not only introduced to facts while solving the problem, but they remember them because the facts are no longer a collection of random information-rather they are meaningful and relevant to solving actual problems. Students learn to apply new information to solve problems.

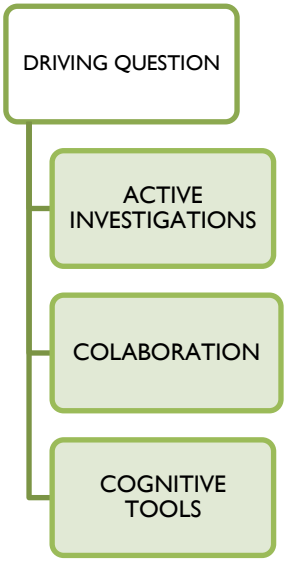
In this sense, there are two essential components of projects:

1. A driving question or problem that serves to organize and drive activities, which taken as a whole amount to a meaningful project.
2. Culminating product(s) or multiple representations as a series of artifacts, personal communication (Krajcik), or consequential task that meaningfully addresses the driving question (Brown & Campione, 1994).

PBL in the classroom

PBL differentiates itself from traditional methods of teaching as the teacher takes on the role of facilitator while making learning more collaborative, hands-on process driven by real-world connection. It uses authentic projects as vehicles to encourage a deeper learning through collaboration and extended inquiry, and culminates in a final product or event.

Here are four features that facilitate use of project-based instruction in classrooms (Houghton Mifflin's):



- A "driving question" anchored in a real-word problem and ideally uses multiple content areas;
- Opportunities for students to make active investigations that enable them to learn concepts, apply information, and represent their knowledge in a variety of ways;
- Collaboration among students, teachers, and others in the community so that knowledge can be shared and distributed between the members of the learning community
- The use of cognitive tools in learning environments that support students in the representation of their ideas: cognitive tools such as computer-based laboratories, hypermedia, graphing, applications, and telecommunications (Blumenfeld et al., 1991).

It is also essential to mention the inter-disciplinary characteristic of this methodology. Real-word challenges are rarely solved using information or skills from a single subject area. In PBL, projects require students to use content knowledge and skills from multiple academic domains to engage in inquiry, solution building, and product construction.

In this context, and despite the criticism, the PBL is a rigorous methodology. Challenges set out in PBL often require the application of knowledge and skills, not just recall or recognition. Typically, students' first steps will be to engage in a process of inquiry. This leads to deeper learning, not just of the academic content, but also the use of the content in real world applications. This then leads to the development of solutions that address the problem/challenge of the project, and the creation of products to communicate solutions to an audience.

To conclude this section, and as mentioned above, student-centered is one of the main features which makes the difference in comparison to other types of methodologies. In PBL, the role of the teacher shifts from content-deliverer to facilitator, coach or project manager. Students work more independently, with the teacher providing support only when needed.

The student in project-Based learning

Students can be responsible for the creation of both the question and the activities, as well as the nature of the artifacts. Additionally, teachers or curriculum developers can create questions and activities.

Regardless of who generates it, the question cannot be so constrained that outcomes are predetermined, leaving students with little opportunity to develop their own approaches to investigating and answering the initial question.

Students' freedom to generate artifacts is critical; it is through this process of generation that students construct their own knowledge. Because artifacts are concrete and explicit (e.g., a model, report, consequential task, videotape, or film), those can be shared and critiqued. This allows others to provide feedback, making the activity authentic and realistic, while allowing learners to reflect on the different proposals, but also to extend their knowledge during the revision.

Projects are decidedly different from conventional activities that are designed to help students learn information in the absence of a driving question. Such conventional activities might relate to each other and help students learn curricular content, but without the presence of a driving question, they do not hold the same promise that learning will occur as do activities orchestrated in the service of an important intellectual purpose (Sizer, 1984). Supporters of project-based learning claim that as students investigate and seek resolutions to problems, they acquire an understanding of key principles and concepts (Blumenfeld et al.,1991). Project-based learning also places students in realistic, contextualized problem-solving environments (CTGV, 1992).

Thus, projects can serve as bridges between phenomena in the classroom and real-life experiences. Questions and answers that arise in different contexts are given value and are proven open to systematic inquiry.

Project-based education requires active engagement of students' effort over an extended period.

Project-based learning also promotes links among subject matter disciplines and presents an expanded, rather than narrow, view of subject matter.

Projects are adaptable to different types of learners and learning situations (Blumenfeld et al., 1991).

Teachers' role in Project based learning

With technology transforming the professional landscape at a more rapid pace than ever before, equipping students to deal with a shifting workplace is fundamental to a teacher's calling. Not just individual jobs, but entire sectors are at risk of becoming obsolete. Casual work is on the rise and it is predicted that when our students enter the workforce it will be common to have at least five different careers in their lifetime (FYA, 2017).

Teachers who make Project Based Learning a regular part of their teaching enjoy their new role, although for some it might take time to adjust from traditional practice. It is fun to get creative when designing a project, instead of just using "off the shelf" curriculum materials. Most teachers like working collaboratively with their colleagues when planning and implementing projects, interacting with other adults from the community or the wider world. PBL teachers usually find it rewarding to work closely alongside students, tackling a real-world challenge or exploring a meaningful question.

When transitioning to PBL, one of the biggest hurdles for many teachers is the need to give up some degree of control over the classroom, and trust in their students. But even though they are more often the "guide on the side" than the "sage on the stage," this most certainly does not mean that teachers do not "teach" in a PBL classroom. Many traditional practices remain, but are reframed in the context of a project. According to the Buck Institute for Education, there are some main duties and goals that teachers should perform:

- Design & Plan: Teachers create or adapt a project for their context and students, and plan its implementation from launch to culmination while allowing for some degree of student voice and choice.
- Align to Standards: Teachers use standards to plan the project and make sure it addresses key knowledge and understanding from subject areas to be included.
- Build the Culture: Teachers explicitly and implicitly promote student independence and growth, open-ended inquiry, team spirit, and attention to quality.
- Manage Activities: Teachers work with students to organize tasks and schedules, set checkpoints and deadlines, find and use resources, create products and make them public.

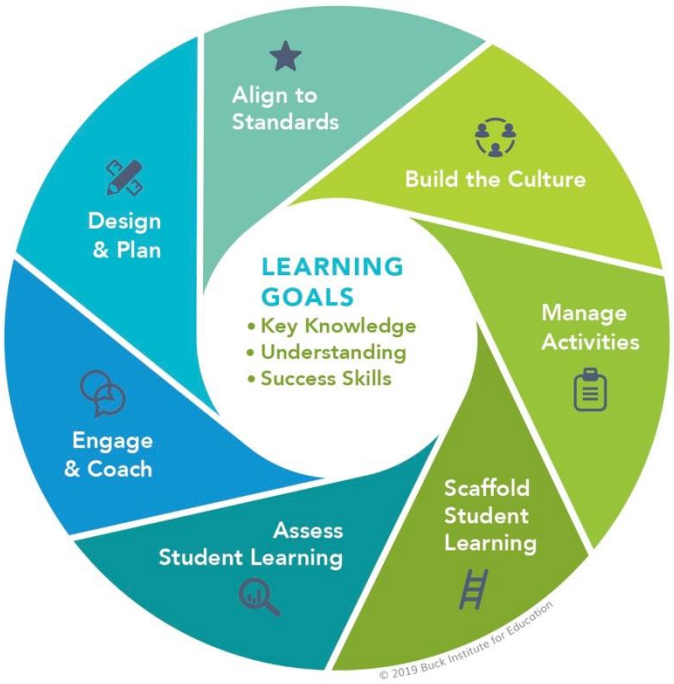


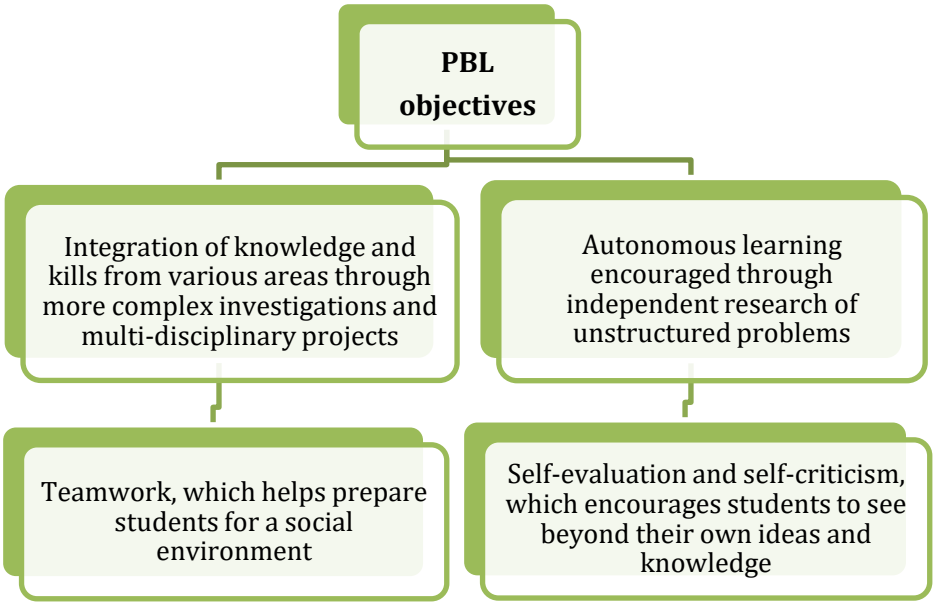
Figure 1. Source: Buck Institute for Education (2019)

- Scaffold Student Learning: Teachers employ a variety of lessons, tools, and instructional strategies to support all students in reaching project goals.
- Assess Student Learning: Teachers use formative and summative assessments of knowledge, understanding, and success skills, and include self and peer assessment of team and individual work.
- Engage & Coach: Teachers engage in learning and creating alongside students, and identify when they need skill-building, redirection, encouragement, and celebration.

To sum up, the teacher's role is not as dominant as it approaches the model of project-based learning is student-centered. Teachers act more as a guide, adviser, motivator, facilitator (if in the lab or workshop teacher collaboration with laboratory assistant) and evaluator. Project based learning focuses on a real-world problem, learner must assume responsibility for their own learning, the teacher's role becomes that of a guide or facilitator, and the deliverable must relate the learner's life and/or career. The main point of the PBL model is how teacher or instructor facilitate student to work individual or in group to find out our solved the real problem of the project being studied.

Project-based learning objectives

The desired outcomes of project-based learning stretch far and wide and can vary by school, teacher and institution. However, project-based learning objectives aren't all that different to the characteristics outlined above, and its purported benefits. Still, here are some of the common objectives of project-based learning based on the Buck Institute for Education (BIE):



Why PBL?

PBL is an effective method to deepen learning and grow a range of skills allowing students to question, research and learn from both their successes and failures. Benefits include positive student attitudes, greater connection of concepts to the real world and higher student and teacher motivation (Boaler, 1998; Kaldi, Filippatou & Govaris, 2011; Lam, Wing-yi Cheng & Ma, 2009). In a study of 246 high school students, Mergendoller, Maxwell & Bellisimo (2006), found that standardized test results were higher when students were taught through PBL, as opposed to more traditional methods.

According to the Buck Institute for Education (BIE), there are some of the widely cited benefits of implementing project-based learning in the classroom:

- Presents opportunities for deeper learning in context and for the development of important skills relating to college and career readiness.
- Boosts students' engagement and achievement and helps students develop the 21st-century skills they need to succeed in their future careers. These include critical thinking, communication, collaboration, and creativity, among others.
- Makes room for student choice, allowing students to feel like architects of their own learning journey.
- Improves student attitudes toward education, thanks to its ability to keep students engaged
- Provides plenty of opportunities for feedback and revision of the plan and the Project.
- Encourages students to make meaningful connections across content areas, rather than thinking about each subject area in isolation (multi-disciplinary pedagogical approach).
- Engages students in real-world learning, giving them a deeper understanding of concepts through relevant and authentic experiences. This prepares students to accept and meet challenges in the real world, mirroring what professionals do every day.
- Engages students deeply with the target content, helping to increase long-term retention.
- Promotes lifelong learning. Technology is present, it is use enable students, teachers, and administrators to reach out beyond the school building. PBL also teaches students to take control of their learning, the first step as a lifelong learner.
- Lends itself to formative and authentic assessment. Formative assessment allows us to systematically document a student's progress and development and focuses on deep learning, asking through questions.

- Encourages imagination and creativity. When you have to solve a problem, you have to be inventive and creative. PBL often ask to solve world class problems, so thinking out of the box is necessary. Because there are no real guidelines, visual design, drawing, and creating are essential elements within project-based learning.

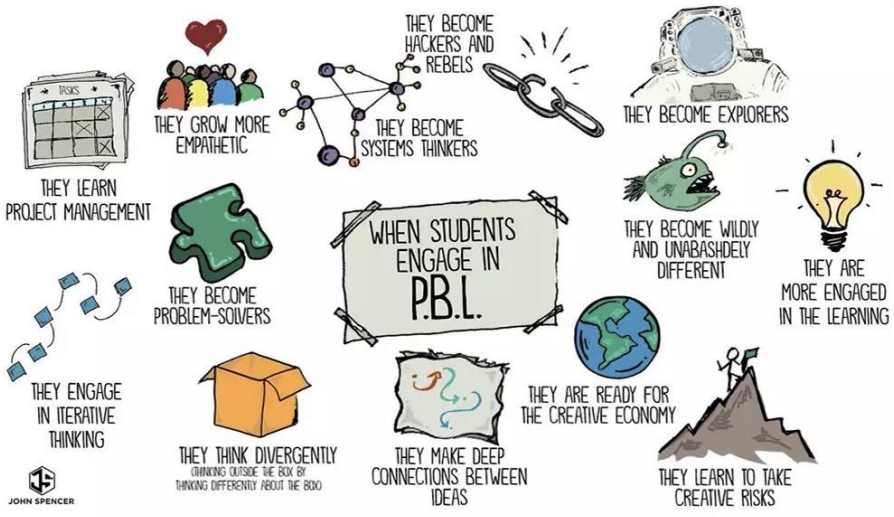


Figure 2: Source: John Spencer, retrieved from https://www.blendeducation.org/p/pblcourse

Limitations and challenges

According to the *Instituto Tecnológico de Investigación y Desarrollo Educativo de Monterrey* (TEC) (2001), Project Based Learning requires the use of a large amount of time, reducing the opportunities to use other methodologies. In addition, it can be difficult to obtain evidence that students have achieved project.

The greater degree of autonomy granted to the students can be a difficulty for them, since they can develop the project without the adequate model of thinking, approach to the situation or feedback (TEC, 2001).

Although PBL deepens the knowledge within which the project works, other knowledge is not treated or is treated in a much more superficial way, so they only cover a small amount of the program content, according to Valero (2012). But, in addition, if we take into account that in a team each student must have a certain level of specialization, not all components of the group will learn the same thing (Valero, 2012).

Following the same author, the fact that students delve deeply into a particular aspect of the syllabus may cause them to ask questions that the teacher does not know how to answer. This fact can produce emotional instability in the teacher, which does not happen with the master class, where the teacher controls the entire content being worked on, and can even foresee in advance the doubts that will arise among his students and how to resolve them.

On the other hand, the change in the teacher's role, from transmitter of knowledge to facilitator and guide of learning is not trivial, and requires technique and learning, as pointed out by Alcover, Ruiz and Valero (2003).

In this sense, Instructor Carmel Schettino identifies communication as a key challenge to PBL. In a blog post for the National Council of Teachers of Mathematics, she identifies two key pieces of the assessment process for PBL:

- Instructors must consistently engage students to help them understand how their PBL work links back to their overall learning outcomes or course objectives.
- Students need opportunities to revise in their work so they can reflect on how PBL relates to their classroom assessments.

It is also important to be educated on PBL. While it is becoming increasingly popular, not every district has a wealth of professional development resources to ensure that teachers are deeply educated in PBL. In addition to collecting your own resources, consider alternative methods of professional development like Twitter chats, message boards, or online communities dedicated to PBL.

Implications for school leaders, teachers and students

The survey data suggest there are several things school leaders and teachers can do to make it easier to adopt PBL in the classroom.

Prioritize time for teacher collaboration. Time to collaborate with other teachers was identified in both challenges and enabling factors, highlighting the importance of building connections between colleagues. Look at how staff meetings are used – can the content be flipped so that announcements are given through technology and meetings are used for meaningful work? How can technology support collaboration? Are there opportunities to team teach, or observe other teachers?

Build PBL into school plans and discuss at faculty meetings. Show support from the top down.

Consider how teacher efficacy can be developed through mastery of PBL. Strategies might include providing room to collaborate, creating a safe space for mistakes and feedback, and planning how the school might slowly transition to using this approach, giving teachers time to dabble and learn.

Keep in mind that PBL can be a new way of learning and thinking for students. Teachers should consider ways to prepare and scaffold learners' experience, such as making responsibilities explicit and building in student time management.

Trust in your teachers. Give them the room to create and you will see more motivation and innovative teaching.

If access to technology is an issue at your school, *consider using mobile phones as a source of technology* or assign roles within groups who are responsible for researching or using technology rather than requiring all students to access the technology.

Look into quality professional development. There are several providers who will support individual teachers to develop quality programs or support a whole school approach.

Think outside the box for resources. How can the local community, parents and families engage with and support learning? Approach both local and larger organisations for mentorship, resources and content ideas. You may be surprised how many people want to help.

Think about what motivates students at your school and tap into that. The motivation of students can be an enabler. You could interview students or even co-design assessments or curricula.

Have fun with designing real world-based learning. It's an opportunity for you as an educator to get creative. Showcase what you and your students have produced and learned – this will get others on board too.

> *In PBL, a teacher is engaged in the process right from the beginning to the end. Teachers should incessantly monitor student work and progress. The role of the teacher in PBL is that of a facilitator who strives to make the learning experiences worthwhile for the students.*

Methodology

In this module, the different steps to create a complete development of an experience based in service-learning will be explained; a new way of teaching and learning, while giving back to the community.

Figure 3. Katz, L.G. and Chard, S.C. (2000) Engaging Children's Minds: The Project Approach, 3rd Edition. Stamford, CT: Ablex.

When a systematisation of a methodology is made, it can happen that the methodology gets too simplified or it cannot be applied to different contexts because it ignores some peculiarities of different experiences. Therefore, in order to give a tool, and guide educators in order to apply the PBL to know what to do in each part of the project, the following pages, based on mainly ideas for developing the PBL, will state basic steps in order to create a successful project based on this pedagogy. Hence, how to choose the correct methodology? This will depend on the number of participants, the context, the autonomy of the students… it will be a decision of the teacher/professor to decide which method to apply in a specific classroom.

As previously explained, PBL is a teaching method that allows students to propel their own learning. Students are able to choose topics to study based on their passions and connect their findings to surrounding world. They work collaboratively and share their learning with a relevant audience. PBL is not just another education trend.; this style of teaching and learning has transformed student engagement and gives students the opportunity to take risks and grow as individuals.

That is why it is essential to have a good planning to carry out a PBL project. It can seem messy, unorganized, and chaotic from the outside since there are so many different elements required but when planned correctly, PBL can be even more effective for student engagement and comprehension than other teaching methods.

Performing a PBL task is not significantly different from elaborating any other type of project. In order to create a quality project-based learning there are some steps to be followed. In this

case, those steps can be identified in three blocks (Batlle, n.d.): preparation, implementation and evaluation. From the educator point of view, these three blocks can be briefly defined as:

- Preparation: prior process to the implementation in which the idea is designed, having into account the resources and the planning of the project.
- Implementation: group preparation (based on the preparation phase), implementation of the project and closure of the project within the classroom.
- Evaluation: posterior analysis of the implemented project and its educational and social results.

In addition, these three blocks can be divided in three stages:

Nevertheless, according to Kaye (2004: 10), it should be divided into four blocks, being those: preparation, action, reflection and demonstration.

- Preparation: this block includes identifying the need, for later investigating and analysing it, as well as creating a plan for action. It already includes the students, guided by the teacher. The students are who identify the community need and do research about it, involving active learning and critical thinking to understand the problem. All of this leads to a plan of action in which the skills and interests are analysed. At the end of this stage, students try to find partnerships.
- Action: occurs as a direct result of the previous block. During this block the students perform the service and while doing so, they come to recognise how lessons can be applied to daily life, taking the meaning to outside of the classroom. Moreover, during this part students are able to observe their strengths.
- Reflection: it is an ongoing process that can happen in different stages of the PBL project (even though there are specific times for its discussion). It is a time to explore what they are learning and its effect, using cognitive, social and emotional aspects for the reflection.
- Demonstration: it provides evidence of what students have achieved during their service, exhibiting their expertise in public. This will be useful to recognise their work and celebrate their achievement.

Preparation

1. Driving question and topic

This is the leading step in project-based learning. Teachers or students identify a problem or an opportunity from their surroundings that requires meticulous work and demands a resolution. The essential question is the problem or challenge you pose to your students to solve. This should be an open-ended question to which there is no one right answer. Every student or group should be able to come up with an answer or solution that is unique. The essential question should, of course, be geared to students' age and language level. It can also be related to the curriculum and may be affecting the school, city, or country. It could be as simple as "What does an ideal house look like?" or as complex as "Think of a serious problem in your community. How can it be solved?" or "What is a new invention the world needs?" Essential questions should engage students and be relevant and authentic. You can also ask your students to create essential questions as this gets them more involved and thinking more deeply. There is no limit to the types of essential questions you can ask. This is an inquiry-based step that requires great attention to detail and group work because the learning goals of students will be based on the precise mapping of the driving problem statement. Brainstorming and bloom's taxonomy will assist you in this step to formulate the driving question.

2. Working teams

Students are divided into groups. In each group, students discuss what products to be offered in order to solve a problem in the area (real-world) or to produce an innovative product.

The organization of teams depends on the characteristics of the students, their ages, and backgrounds. It is interesting to divide the groups by common interests and profiles, always asking and betting on the students' freedom. The number of people in each group depends on the number of students in the class and the type of project to be carried out. For deeper learning, it is desirable that each student has a role in each group, and if possible, that the roles can be rotated.

The early stage of designing theme is the teacher and students discuss and identify real-world problems or challenges that arise in areas where the school or college is located. The primary reason for PBL is a need to adapt to a changing world. The argument is that students should strive in an environment centered on learning instead of on teaching. Identifying potential areas can be done through surveys, interviews with certain society and student about problems or challenges that developed in each area. Students identify real problems to pursue, and they investigate them through real-world sources of information (e.g., interview, internet sites, magazine articles, primary sources). From some of the problems or challenges that arise in areas that have been identified, a teacher with students selects and define what the real-world issues that will be serves as the theme of the project tasks.

At the end of this stage, the following three questions should be answered:

- What are the socials needs or opportunities surrounding learners?
- How can these opportunities be related to the curriculum?
- What could be the learnings experiences in this project?

How can I get started?

- Think about the curriculum and your student's needs and interests.
- Create a project that will effectively tie all these together while keeping in mind the amount of time and resources you have.
- If you or your students are new to PBL, starts small and simple.
- Reflect on what went well and what you need to change for the future.
- Keep track of how effective the project was for learning and how engaging it was for your students.
- Find ways to get as much student input as possible. The more they are involved, the more they will care!

Four strategies to work with the group

1. Motivate them: it is necessary to sensitize the group to the social need of the project with the objective of predisposing them to commitment and action.
2. Diagnose the social need: give the students the opportunity to investigate the problem, extract data, draw conclusions…
3. Define the project: in order to make the project their own, the adolescents must be able to understand what action they are going to develop, what use it is going to have and in what environment, and what they are going to learn from it.
4. Organise the work: spend time planning the service with them, organizing and defining work groups, giving and distributing responsibilities, specifying the work schedule we are going to follow...

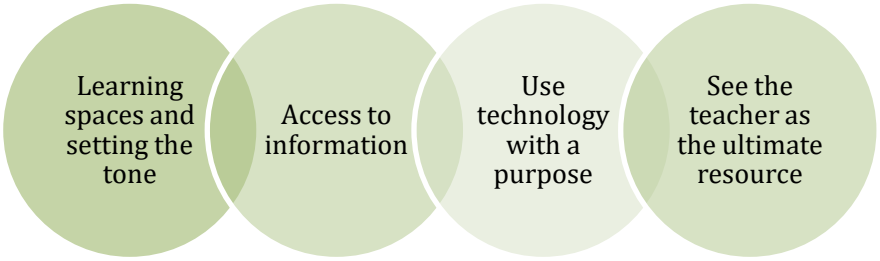
For implementing these first phases, it is suggested to carry out the following dynamic "Project Hands": To reflect on personal strengths and weaknesses and set a learning goal, we can ask students, once they are clear that they are going to undertake the project based learning, to draw on a paper the silhouette of one of their hands.

On the fingers they will write capacities or abilities that they recognize in themselves and that they believe will be useful to develop the project.

Separately (outside the hand, for example) they will write down a "weak point". They will also write down a personal learning that they wish to achieve with the project.

3. Project planning

The next step is to design a learning plan for the project which means that the teachers assess how the problem or opportunity connects with the standards he/she is intending to teach. The best approach is to involve the students in this process so that they can feel included.



Select the project path which corresponds to the syllabus or curriculum. It is better to integrate multiple subjects for enhanced student engagement and dynamic learning. Make sure that the learning resources and content are at the students' disposal while they are working on the project. A teacher should be prepared to provide deep content knowledge to the students because the project can move in any direction and students may require a deeper understanding of the concepts to reach a viable conclusion.

As mentioned above, students are divided into groups. In each group, students discuss what products to be offered in order to solve a problem in the area (real-world) or to produce an

innovative product that can be worth economically, and take decision about the products that will be their project. After deciding the products, the students submit a draft proposal to the teacher who then gives suggestions, feedback, consideration and approval toward the proposal.

Think about what linguistic and content skills you want students to learn as they work on the project and find ways to make sure students must practice and develop these skills during the project. Think about how they will gather the information they need – online, from classmates, from books, from community members, etc. Set clear objectives for the project and think about what the *outcome* will be. The outcome for a project is never a test. It is a student-created product or performance (poster, presentation, paper, role-play, story, script, video, digital story, brochure, book, etc.). While technology can be very useful in PBL, it is not a requirement; the only requirement is your imagination.

In this step it is also necessary to set a timeline and schedule for the project activities. Students should be given a set date or time frame in which they had to present their final project work. However, to realize the benefits of the whole process, be prepared to be flexible in your schedule and set the schedule by working collaboratively with students.

Think about how long the project will last and set a deadline. Will it all be done in class? Outside of class? A combination? Provide a timeline and checklist for students to follow. If you have designed a longer project, make sure to create mini-deadlines so that you can check in on student progress and provide feedback and guidance. Sometimes students can get stuck or off-track. The teacher's job during a project is to help students stay focused. Of course, if you design a shorter project that is all done in class, a timeline and mini-deadlines will not be necessary. Projects can be large or small; think about what is appropriate for your students and teaching context.

At the end of this stage, the following three questions should be answered:

- What is the question / opportunity / challenge attended to?
- What is the outcome that the students have to carry out?
- What are the learnings objectives of this project?

Implementation

Project preparation with students is a key part of PBL. Throughout this stage students will discover the meaning of the action to develop, the commitment to acquire and the responsibility to obtain good results.

4. Research and analysis

Once the project planning is done, it is time for the students to start researching and collecting the necessary information to carry out their aim, according to the steps planned in the previous phase. Students have to pool the information gathered, share their ideas, discuss, elaborate possible hypotheses, structure the information and look for the best way to continue with the execution of the project.

The idea is to go as deep as possible into specific content, to see how far students can go without setting a limit. Teacher should help to filter which information is more appropriate or reliable, but the students should gradually acquire the ability to obtain information by themselves and after analyzing it, convert it into knowledge.

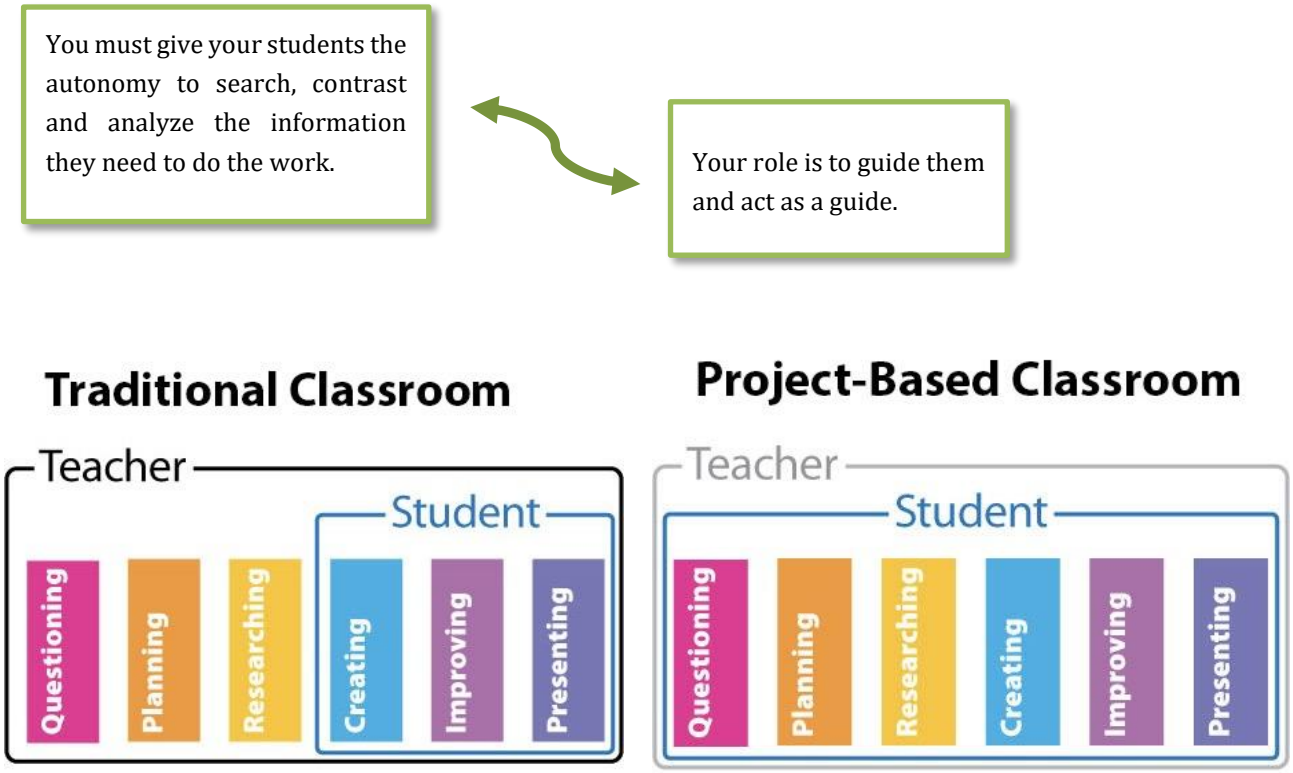


Figure 4. How are projects and project-based learning different? (Thoughtful learning)

5. Project execution

In this phase the students will have to implement what they have learned to develop a product that answers the driving question posed at the beginning. It is important to encourage them to give free rein to their creativity.

The tasks of the project execution are practical activities to students with good teamwork to show performance quality and to solve problems related to the project to realize the project design into a real object. The role of the teacher at this stage is to become a mentor, tutor, supervisor and evaluator to allow students to carry out the learning process through inquiry process and constructing work on project tasks they are doing.

In executing project tasks, students work in accordance with the estimated production activities, safety priority, solid teamwork and consultation to teachers if any problems are found. Successful in a job these days often implies being capable of operating in ill-defined and ever-changing environments, dealing with nonroutine and abstract work processes.

Students will also have to put themselves in the shoes of experts in the field (poets, sculptors, historians, scientists, etc.) and will have to develop products that these experts would make (poems, sculptures, essays, experiments, etc.). Working with tangible products brings the content closer to the students, allowing them to learn through different channels. Most of the intelligences required in the realization of products are usually those that allow students to obtain more stable and lasting learning.

Performing the project provides students with real-life learning and allows them to value and make sense of what they have been studying and preparing for. During the project implementation there are four different phases:

1. Carrying out the product / project. The action requires a good number of commitments: punctuality and assistance, doing things correctly, and striving to achieve the proposed objectives.
2. Relating to people and entities of the area. The development of the project may provide opportunities for communication with people who are not normally part of the circle of relationships of the students, so that they exercise their empathy and respect for diversity.
3. Registering, communicating and disseminating the project. During the execution of the project, it is convenient to register what is being done (with photographs, videos, diagrams...) and to make a communication campaign (inviting the press, using the

school's website...) to disseminate the project and reinforce the commitment of the group.

4. Reflecting on the lessons learned from the implementation. Recognizing and identifying what is learned while performing the service will help learners to become more aware of the value of what they are carrying out.

In order to disseminate, communicate and register the project, it is possible to make a project video, answering the following four key questions:

At the end of this stage, the following four questions should be answered:

- Is the outcome done? How was the process?
- Did you have followed the planned schedule and steps?
- What are the learnings achieved from the development of this process?
- Which is the best way to disseminate the project / outcome?

6. Project presentation and closure

In this phase the presentation of the final outcomes will be performed. It is possible to prepare a close presentation, with all class students, or a public presentation, inviting parents and/or classmates from other classes.

It is highly recommended to find a way of sharing the outcomes with an external audience to increase students' responsibility and motivation. It can be through the public presentation or by sharing the products.

Why is it needed?	Why should it be recorded?	Who will carry it out?
• To disseminate the project • To encourage other groups to repeat it • To search for other types of support • To thank the potential partners for the opportunity	• Social need • PBL tasks • Testimonies • Tangible results reached	• People involved in the project, such as the students • It can be an opportunity to involve families or other volunteers • It could be a PBL project for communication students

During the presentations, students should present the results of the project tasks to their classmates, what they have learned and show them how they have answered to the initial question. It is important that they have a structured presentation script, explain themselves clearly and support the information with a variety of resources. Students should also present their perceptions, and they evaluate each other sharing the improvements to be made and the points that have been well succeeded.

Think about ways students can share their products outside of the class.
Can they post them on a class blog? Share with other students at a school assembly? Put posters in the hall? Invite parents to see their outcomes? Finding a wider audience makes student work more authentic and provides extra value and a sense of pride and achievement.

Once the presentations of all the groups have concluded, it is time to reflect with your students on the experience and invite them to search together for a collective answer to the initial question. In fact, discussions between teachers and students are essential. All together should share opinions and impressions about the learning objectives, goals achieved, deficiencies in the process and the results of projects that have been implemented, and teachers interpret students' mastery of the project tasks have been carried out.

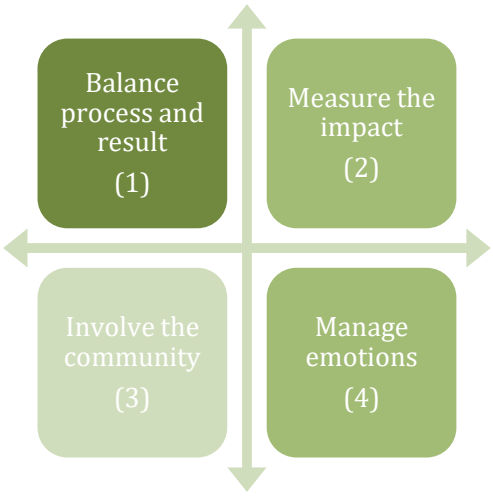
Figure 5. Six tips about how to be a better public speaker. Source: Slidemodel.com

This phase also includes the closing and evaluation stage with the students, which must be based on the reflections incorporated into the planning and execution phases of the project. Moreover, it has to have a double reflexive look: on the one hand, based on the project; and, on the other, on the learning that it has provided.

In this closing and evaluation stage, four phases can be distinguished:

1. Reflecting on and evaluating the results of the service. Accountability for the work done is required by the commitment made to the recipients of the service.
2. Reflecting on and evaluating the learning achieved. The students must be aware of the learning achieved, and they must evaluate it. In this way, they can feel grateful for the experience lived and not only expect gratitude from the recipients.
3. Projecting future perspectives: Will the project have continuity? If so, who will take it over? Or, is it preferred to carry out a different project?
4. Celebrate the experience with everyone. A celebration is the best way to put the finishing touch to the work done. Preparing and holding a party can be a small project within a big project.

Furthermore, a good evaluation of the project improves the autonomy and empowerment of young people, and helps them to face new challenges. In order to evaluate the project with the students, it has to be taken into account four key aspects:



1. It may be that the process of carrying out the project has been fantastic and yet the results are rather poor. It can also happen that the results of the service have been excellent, but at the cost of a conflictive process. Therefore, it will be necessary for the students to exercise their objectivity when evaluating their service action, seeing the double aspect, academic and social, of the project.
2. Many results of the project can be perfectly tangible and that helps to specify the sense: number of beneficiaries, quantity of products produced, hours of activity... With all this we can elaborate graphics, summaries, murals and other elements of synthesis.
3. Since the project has been shared by the educational center and another actor in the community, to objectively evaluate the service the opinion of the people and entities involved is needed. For example, if the service agreed was to help younger children with

their homework, the involved people will be teachers, families and even the children themselves value the work.

4. When the results are not the expected ones or the process of carrying out the project has been conflictive, it is easy for adolescents to fall into discouragement. That is why it is needed to turn frustration into another learning opportunity for future projects, maintaining confidence in their possibilities and the satisfaction of having been able to commit themselves.

REFLECTIONS FOR THE SUSTAINABILITY OF THE PROJECT

a. Once is not enough (as it happens with other types of projects). SL practices must be repeated to achieve the best results. One time will not provide enough information about how much it is possible to get out of this type of project. If the first one is thought of as a pilot, another edition needs to be planned to confirm its suitability.
b. Young people are allies. The students who have participated in the project are the best ambassadors to guide the following repetition of the project to consolidate it. Giving them the opportunity to explain their experience to their peers in other courses will help to spread it among different audiences, in the neighbourhood...
c. Involvement of families. Since the service is carried out in the community, it offers many possibilities to involve families. Parents can collaborate in logistical tasks, recording videos or helping to spread the word about the project; include them in the project.
d. Integration into the school. The Educational Centre can be reinforced by incorporating an emblematic practice of SL that will help the visibility of the centre, as a school opened to the community. To do this, it is necessary to move from a focus on specific activities to a focus on integration into the academic life and the ideology of the centre.

At the end of this stage, the following three questions should be answered:

- How have you planned the presentation?
- What are the main goals achieved?
- What are the learnings achieved with this project?
- Have you found the answer to the initial question?

Evaluation

7. Multifocal evaluation

This is the last step in PBL, which involves reflecting what worked and what didn't during the whole process. Teacher summarized own view and do the evaluation. Reflection helps teachers to improve their instructional strategies in the future. Teachers are also able to incorporate changes in their teaching strategies.

Think about how you will assess student work. What are the skills you want to evaluate? Some people think that projects are just for fun – the "dessert" of the class. However, if they are well designed, they can be very powerful learning tools that require students to go deeper into a topic and use more skills than traditional classroom activities. So, make sure you have clear learning objectives and a good way to assess them.

So, once the project has been completed and evaluated together with the students, it is time for the teachers to reflect on this experience and draw conclusions at various levels. It is necessary to integrate different views and/or focuses in order to have a complete vision about the functioning of the PBL project. At this stage, four phases are identified:

Evaluate the group and its members. In this first phase can make a reflection on these aspects:

- How have their interests, attitudes and values evolved?
- What academic progress in knowledge and skills have we observed?
- What has been the dynamic of the group?

- Evaluate the networking with the school and families. Depending on the characteristics of the project, it is important to have the assessment of the people who have collaborated indirectly. If students have worked at home with their parents, or have carried out a survey outside school, it is recommended to take these factors into account when making the evaluation. What should be changed in the next occasion?
- Self-evaluate the experience as an SL project. It is necessary to be able to evaluate the project itself, as a pedagogical experience that can be of great value for other educators, as well as to consider new challenges.
- To self-evaluate as a person who energizes the project. In this last phase, there are some questions that can be asked to the teachers; for example, the following:
  - Did we lack service training?
  - Did we plan correctly?
  - Were we able to solve the unexpected?
  - Did we have communication difficulties with the entities?

At the end of this stage, the following parts should be obtained:

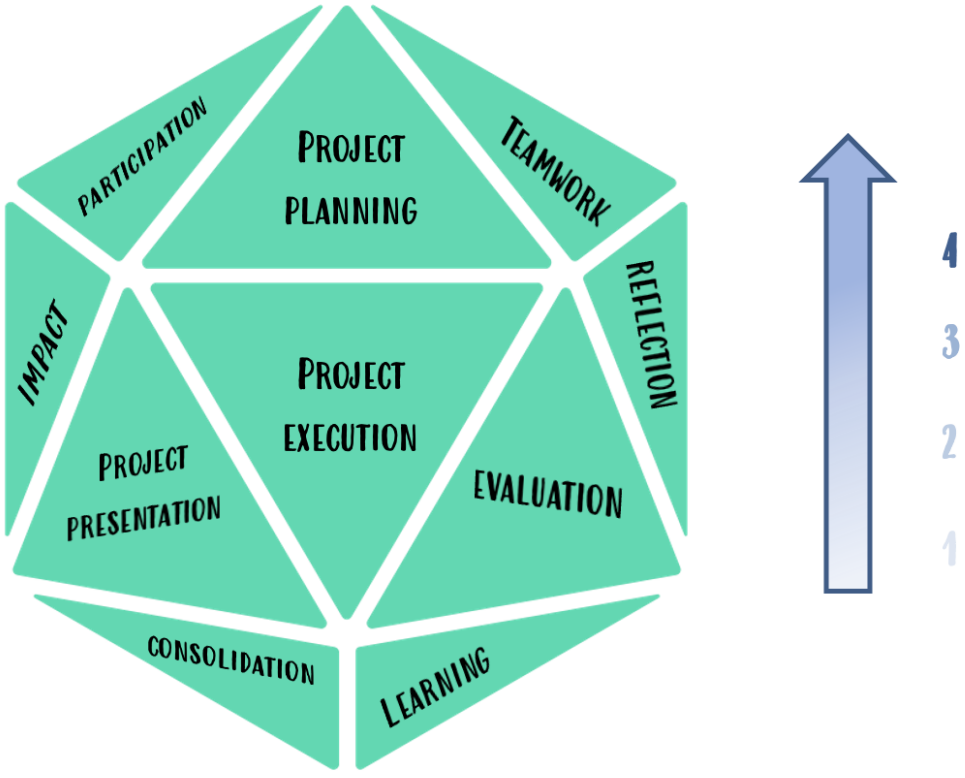
- A simple and practical memory of the experience, so that:
- It is not easily forgotten.
- It allows the participants to be accountable.
- It inspires other groups and educator to promote new project.

This step also involves assessing the learning outcomes and participation of students. Teachers can use a rubric to record students' progress and their learning outcomes. Rubrics allow teachers to grade student learning against certain standards and give effective feedback to the individual student at the end of the project. The assessment helps students in enhancing their skills and thus increases their confidence. Besides teachers, experts and the audience can also be consulted to give feedback.

In order to evaluate the project, the following rubric is suggested: "project evaluation rubric". It consists on an analysis tool with two dimensions:

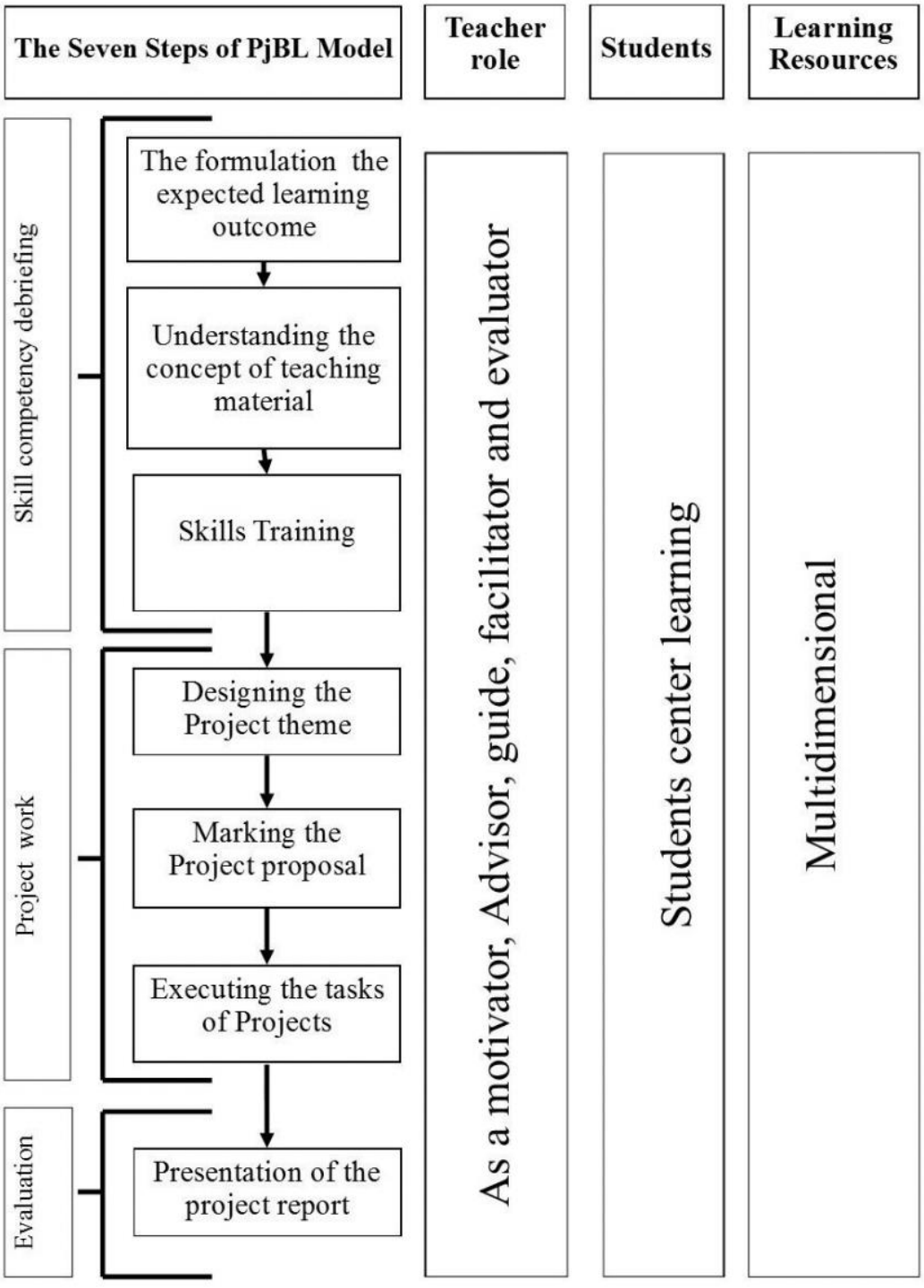
- The dynamism, which are "pedagogical elements that, organized according to specific purposes, give global form to the service-learning experiences".
- The level, which correspond to the degree of pedagogical development of each one of the dynamics.

The rubric presents eight dynamics and four levels of evaluation (which range from the occasional and unorganized presence of the dynamism to the maximum involvement of the participants), and proposes modes of analysis and debate of the experiences, as well as forms of graphic representation. The following diagram shows the twelve dynamics and the four levels of evaluation that have been identified.



Annex

According to the pilot test and research study of the University Negeri Padang (Indonesia), these seven steps of PBL model can be useful to carry out the project.



1 STARTING POINT

- Brainstorming
- Driving question
- What we already know?

2 WORKING TEAMS

3 FINAL OUTCOME

- Defining the final outcomes
- Learning objectives
- Resources needed

CREATIVITY

4 PROJECT PLANNING

- Timeline and schedule
- Steps to follow
- Tasks and roles assignment

5 RESEARCH

- Information research
- Review of objectives
- Introducing new concepts

6 DATA ANALYSIS

- Sharing information
- Problem solving
- Decision making

7 PROJECT EXECUTION

- Implementation
- Practicing the news Skills learned
- Product development

MAINSTREAMING

8 PRESENTATION

- Public presentation of the outcome
- Dissemination

9 CLOSURE GROUP

- Group reflection
- Self-evaluation
- Review of learning and results achieved

10 EVALUATION

- Teacher' evaluation
- Detecting areas for improving
- Report

MEANINGFUL LEARNING

List of abbreviations

BIE: Buck Institute for Education

PBL: Project-based learning

SL: Service Learning

TEC: Instituto Tecnológico de Investigación y Desarrollo Educativo de Monterrey

VET: Vocational and Educational Training

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