

# Moodle: Techno-Communicative Applications The case of the mediation of ICT in project-based learning by the Universidad Tecnológica de Pereira

J.E. GÓMEZ<sup>1</sup>

Article received on February 1, 2018, approved for publication on March 26, 2018  
Traducción: María Del Pilar Gutiérrez, Departamento de Idiomas - Universidad de Manizales

## Abstract

Project-Based Learning is a learning model in which students plan, implement, and assess projects that can be applied in different contexts, and that go beyond the classroom (Blank, 1997; Dickinson, et al, 1998; Harwell, 1997). For that reason, in the framework of this document- oriented towards the recognition of the individual and collaborative tools of Learning Management Systems (LMS) - it is aimed at the technological, pedagogical and communicative applications of them as a teaching strategy in electronic learning (E-learning) and mixed (B Learning). In that sense, because of the systematization, the methodological process is described, including its strategies (forums, wikis, workshops, SCORM package, etc.) as long-term interdisciplinary learning activities focused on the student. It is concluded that this model facilitates the activation of cognitive processes and not only the fulfillment of curricular objectives.

**Keywords:** Project-based learning (PBL); ICT; Communicative mediation; Moodle; ADDIE; Techno-pedagogical design.

## 1. Introduction

In an era permeated by a constant evolution of Information and Communication Technologies (ICT), it is difficult to believe in the existence of educational processes that are conspicuous by their absence, due to factors such as the disinterest or lack of knowledge of teachers or managers for the integration of pedagogical, technological and communicative competences in the curricular design or for a fear of facing the changes that educational innovation brings. Thus, knowing the cognitive scopes of contemporary digital tools and resources allows a frequent updating of the strategies applied in face-to-face, blended or virtual contexts.

---

1 Master in Educational Communication, Bachelor in Communication and Computer Education. Professor, Bachelor of Communication and Computer Education, School of Spanish and Audiovisual Communication, Universidad Tecnológica de Pereira. Email: jhesgomez@utp.edu.co

In fact, when referring to a Project-Based Learning (PBL), teachers usually share their methodologies and reflections, leaving aside the use of Information and Communication Technologies. However, if ABP is addressed as a learning model in which students plan, implement and evaluate projects that have real-world application beyond the classroom (Blank, 1997; Dickinson, et al, 1998; Harwell, 1997), this methodology can be extrapolated to a level of education mediated by Electronic (E-Learning) and even blended (B-Learning) strategies through specialized platforms that allow a wide range of possibilities for knowledge management.

In this sense, the International University of Valencia has defined learning management platforms (LMP) as virtual learning spaces aimed at facilitating the distance training experience, both for educational institutions and for companies. Among the most popular LMS in the field of education, and which is currently implemented by the Universidad Tecnológica de Pereira for virtual education, is Moodle, understood as a learning platform designed to provide teachers and students with an integrated, dynamic and flexible to create virtual or blended learning environments. Within its possibilities, Moodle offers different activities focused on the development of individual and collective learning, which allow the development of interdisciplinary, long-term and student-centered learning processes, complying with the foundations of the PBL (Cited by Challenge, 2000). Under this principle, this document describes a series of didactic strategies of Project-Based Learning for virtual and blended learning contexts through the pedagogical scope of Moodle, specifically with collaborative activities such as:

- ✓ **The forum:** activity that strengthens bidirectional communication between students and their professors, allowing to exchange ideas when publishing comments as part of a debate or to socialize their work with external digital tools. Among its advantages is the inclusion of images, HTML and multimedia code within its publications.
- ✓ **The wiki:** activity to encourage collaborative work within the same document. A wiki starts with a cover page set by the teacher and each student can add information and other pages asynchronously.
- ✓ **The workshop:** peer evaluation activity. It consists of two phases for the student, in the first, the student sends the work done based on the criteria requested by the teacher and in the second phase, they receive several submissions from other students, which they have to evaluate according to the specifications from teacher.
- ✓ **The scorm:** (Sharable Content Object Reference Model) is a package of specifications that is created in external tools, but that can be provided through the LMS thanks to its compatibility. This type of activity allows the accessibility and reusability of contents.

The interaction between these tools and the new ways of appropriating contents, through the learning management systems, make it necessary to highlight the role that the teacher acquires in Project-Based Learning (mediated by ICT) as it facilitates students the resources and virtual consultancies in the measure in which they develop the activities. Students have the responsibility to collect and analyze the information in each of the activities, making individual and collective discoveries and reporting on their results.

## 2. Description of the PBL learning model

In this case, the methodology and strategies used in the subject of Design of Thematic Units in the blended modality of the Technological University of Pereira, aims that their students, from the Moodle platform and under the PBL methodology, develop in small working groups (four students) a final project that consists of the implementation and evaluation of a Virtual Learning Environment made with Educational Resources of the web and with which the following procedure was followed (schematized in figure 1), (any contemporary version of the PBL is based on the objectives pointed out by Barrows [1986]).

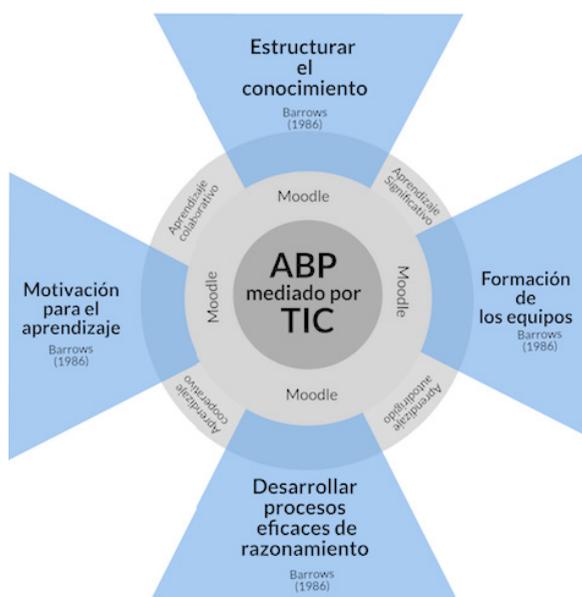


Figure 1. The PBL mediated by TIC Source: Barrows, 1986

### 2.1. Structuring knowledge

Initially, the teacher sets the learning objective, selects the relevant Moodle activities, delineates each of the products to be delivered, identifies the roles involved, ensures that the leadership responsibility is delegated according to the activity and raises the initial question with that will start the construction methodology. In this case: how can you design a virtual thematic unit of the contents that you guide in your work field? Regarding the way of structuring the problem, Barrows (1986) indicates that one of the main variables that determines the PBL is that they can be found from rigidly structured problems with a high degree of detail, to open or ill-defined problems that do not present data. And in those that remain in the student's hands the investigation of the problem and, to some extent, its definition. For this reason, the teacher is the one who makes the decision to formulate and choose the theme that will start the methodology.

Regarding the duration of the project there is no strict standard and only one methodology to define it. Within the multiple strategies to carry out the Project-Based Learning can be selected from the planning of an activity, to the set of several activities that will feed a final project.

## 2.2. Training of teams

It is estimated that the more heterogeneous the composition of the teams, the better the results will be, since the construction of thematic units from different perspectives allows broader views in the process of instructional design; for this, the conformation of the groups should preferably be of different careers. As a strategy to avoid the most common inconveniences that the conformation imposed by the teacher entails, it must be kept in mind that in the E-learning or B-Learning spaces the students themselves must make these decisions through the relevant spaces. This seeks that the student feels involved in the decisions, increase their motivation and their degree of responsibility is greater. This facilitates the student to reach agreements with their peers and play an active role in their group.

So, this time the forum becomes the optimal activity for students, based on the roles described by the teacher and making use of a digital resources for the visual representation of information, share their interests, strengths and challenges in front of to the learning process, so that they identify with one of the roles and find the companions that are needed to fulfill the objective of the activity.

Within the roles that can be attended throughout the training process, the teacher could choose between:

- ✓ **Instructional Designer:** is the one who leads the development of the thematic unit and designs the training actions. Among its responsibilities is the availability of communication spaces to reach collective agreements within the group, delegate tasks and establish the phases to be taken into account in the process of appropriation.
- ✓ **Pedagogical Leader:** According to the University of Medellin, pedagogical leaders construct contents and make the corresponding adjustments in order to comply with the technical and pedagogical requirements of virtualization.
- ✓ **Visual Designer:** responsible for the preparation of visual material that complements the theoretical content of the Thematic Unit, chooses the relevant Digital Educational Resources for its construction and makes the decision regarding the visual identity of the course.
- ✓ **Style corrector:** revises and validates the textual and graphic contents of the Thematic Unit, correcting writing style and unifying concepts.
- ✓ **Teacher:** leads the creation and development of formative and summative activities through external platforms that have SCORM compatibility.

Under these considerations, each student chooses the role with which he identifies himself, acquires one or two responsibilities, according to the teacher's indications and number of members, and relies not only on the complementarity of the skills of each group member,

but also assumes challenges Individuals that favor equality of responsibilities at the collective level (Slavin, 1990). In this way, when the roles are related in a non-arbitrary way to what the student already knows (where the ideas relate to an existing aspect), specifically relevant to the cognitive structure of the student, as an image, an already significant symbol, a concept or a proposition, significant learning is reached (Ausubel, 1983), increasing interest and responsibility in the educational process.

### 3. Develop effective reasoning processes

At this time, the teacher must clearly plan the work to be done by the students. The tasks are precisely defined, as well as the participation of each required role and the result achieved by each member of the group (Johnson & Johnson, 1993).

After the working group is formed, students, through a forum, must agree on a common theme that is related to their reality and academic context, which motivates them to learn and develop, individually and collectively, the objectives learning. For it:

(...) the student must manifest a disposition to relate substantially and not arbitrarily the new material with his cognitive structure, as the material he learns is potentially significant for him, that is, relatable with his knowledge structure on a non-arbitrary basis (Ausubel, 1983, p. 48).

Understanding the instructional design as the methodology that deals with the planning, preparation and design of resources and environments necessary for learning to take place in a Virtual Learning Environment (Bruner, 1969), one of the proposed theories is chosen, the ADDIE model being the most currently used because it is an interactive Instructional design process, where the results of the formative evaluation of each phase can mark the planning of the activities necessary to build the Thematic Unit. The final product of a phase is the product of the beginning of the next phase.

From the Belloch (s.f.) approach, the description of the phases of the ADDIE model are:

#### 3.1. Analysis

The initial step is to analyze the context and determine its characteristics, the result of which will be the description of a situation and its training needs. All the roles work in this phase, but they are led by the Instructional Designer and could be through a forum or a wiki. Remember that when choosing a wiki, the teacher must define the categories to fill out previously, such as:

- ✓ Members' contact information.
- ✓ Initial diagnosis of the context.
- ✓ Formative needs.
- ✓ Learning objective.

With this base information, each working group can take care of its own design. Moodle allows the option to work the activities by invisible micro groups, in which each of them enters and can develop asynchronously the activities and visualize what their other colleagues in the group are going to do. However, they are unaware of the work carried out by the other work teams. In addition, technologically speaking, this LMS offers the option of visible groups in its configuration of activities, allowing each student to visit the work of the other groups to see (without editing permission) and clarify construction questions.

### 3.2. Design

The planning of the Thematic Unit is developed through a Techno-pedagogical Design, stopping, especially, in the integration of communicative, technological and pedagogical competences, and in the way of sequencing and organizing the content. This activity is led by the pedagogical leader and the teacher. Techno-pedagogical design that is understood as a proposal that integrates both technological aspects as pedagogical or instructional and that takes the form of a techno-instructional design with the following elements:

- ✓ Contents.
- ✓ Learning Objectives or Competencies.
- ✓ Teaching and Learning Activities: formative and summative.
- ✓ Description and suggestions on how to carry out the activities.
- ✓ Visual resources.
- ✓ Supply of technological tools for the construction of visual resources (Coll, Onrubia and Mauri, 2007, p. 381).

Through a wiki, *Moodle* allows students to build meaningful knowledge through ICT, with a cognitive psychological process that involves the interaction between the background and relevant ideas in the student's mental structure and their attitude in relation to learning, acquisition and retention of knowledge (Ausubel, 2002, p. 11).

### 3.3. Development

Here begins with the creation of content and learning materials based on the design phase. As there are several activities and products derived from each of them, the roles are exchanged. The activities and leadership to be carried out during this phase are:

- ✓ The visual designer leads the creation of virtual resources.
- ✓ The style corrector and pedagogical leader are responsible for the delivery of content with the revision of spelling, writing and APA standards.
- ✓ The teacher delegates tasks for the construction of activities.
- ✓ The Instructional Designer is responsible for delivering the final link with the assembly of the contents, activities and resources to the chosen platform.

Through the question and answer forums, each work team shares its final products with the rest of the group. When making your contribution the group can know the work done by the other groups, problematizing, asking or making suggestions.

### 3.4. Implementation

In this fourth phase, the Thematic Unit is executed and put into practice. All the roles lead the activity taking into account that under the methodology of Project-Based Learning, activities must be oriented towards the realization of a project, following the project design approach. The final activity is oriented, precisely to that planning of the possible solution of the problem initially proposed; it is expected to meet the training needs identified in the first phase through the implementation of the Virtual Learning Environment; at this time, students have greater autonomy than in a traditional class, when deciding how to implement the Thematic Unit in a real context. This process of interaction modifies both the meaning of the new knowledge acquired and the meaning of the concepts that were previously consolidated (Ausubel, 1983).

During this phase, through a simple discussion forum, the evidence of the implementation is shared through a short video (10 minutes), requesting that at the end of it all the members of the group share their personal experience with the process of implementation. Again, the teacher requests that they problematize, ask or make suggestions to their classmates as part of the activity note. This application ensures: 1) that students visualize the material created by their peers; 2) generate learning networks; 3) the discussion in the forums is encouraged; and 4) collaborative learning takes place.

### 3.5. Evaluation

In this last phase, a co-evaluation, a hetero-evaluation and a self-evaluation of the whole development process of the project is carried out, bearing in mind the following:

3.5.1. Co-evaluation: This type of evaluation is developed through a workshop-type activity, which consists of 5 phases in the construction process.

- ✓ Configuration phase: the teacher poses and describes the basic guidelines for the activity.
- ✓ Sending phase: students send the link of their project.
- ✓ Evaluation phase: the students evaluate the work of their classmates according to the instructions and criteria that the teacher suggests. For the coevaluation process to be effective, the application of evaluation rubrics is recommended, which can be technologically included in this activity. According to Andrade (2005) and Mertier (2001), rubrics are validation guides used in the evaluation of student performance, in which the specific characteristics of the project are described at various levels of performance in order to clarify what is expected of the student's work, to evaluate its execution and to facilitate the proportion of feedback. In this way, and in order to make the most objective coevaluation processes, the following general categories are proposed to be validated.

- ✓ Learning objective.
- ✓ Coherence between the objective, the contents and the activities.
- ✓ Evidence of implementation.
- ✓ Relevance of the Thematic Unit.
- ✓ Qualification evaluation phase: the teacher reviews the relevance of the grades and the feedback made by the classmates. If applicable, correct or provide feedback to the evaluator.
- ✓ Workshop closing: In this phase, the final grades are integrated in the Moodle grade book.

*3.5.2. Hetero-evaluation:* Through the grade book, the teacher performs the summative evaluation, if you wish, do so at your discretion or adhere to the rubric you designed for the peer assessment, including additional categories such as individual performance and group work. Additionally, constant feedback must be made throughout the development of the project to help the student understand how the final product of good quality is made. For this, it is recommended to implement the discussion seed in the forums as a strategy for students to observe what are the standards that this final work should take, and as a way to break the ice in these activities, in the same way, it is suggested to use of the heading TIGRE to keep the thread of the forums and the permanent interaction between the students.

As a way to strengthen the content during the summative activities, the students can be enabled, progressively, to SCORM type activities so that, through games, they validate their appropriation of concepts and procedures. These evaluation characteristics in Project-Based Learning contribute to the student's motivation and active commitment. For a high level of internal motivation and commitment is required for the model to be successful (Galeana, 2006).

*3.5.3. Self-evaluation:* In this case, the teacher can make use of individual activities such as homework, where each student uploads their evaluation made in a Word format or if you want to encourage collaborative learning, raises the self-assessment as a forum activity. If so, you should be aware that the questions can not be very personal to ensure success in the answers; In this sense, you can evaluate about: Individual note and argument.

- ✓ Group grade and arguments.
- ✓ What you learned during the development of the project.
- ✓ What would improve the project.

## 4. Motivation for learning

Barrows (1986) states that, because the work proposal places students in a real context with a challenging problem, it requires their immediate participation and the self-directed exploration of resources that substantially increases the motivation of the participants. Therefore,

when the teacher includes the student in the evaluation processes and inquires about their previous interests and needs, they are implementing contextualized strategies that facilitate meaningful learning in the classroom. In words of Ausubel, it would be: "(...) the most important factor that influences learning is what the student already knows. Find out this and teach yourself accordingly" (1976, p. 6).

In this phase of motivation, the development of skills for working in a group is involved, which includes skills such as communication, constructive confrontation of ideas and the collective agreement of meanings and ways to solve problems. In this way, students develop skills such as collaboration, project planning, interaction, decision-making and time management (Blank, 1997, Dickinson, et al., 1998).

This collaborative learning process allows us to evaluate, from educational perspectives, the work that the educator and the students do towards a specific learning; It shows that the importance assigned to it when sharing with others opens the doors to generate teaching-learning strategies centered on collective design (Vygotsky, 1978). In the implementation of this technique, each member of the work team is responsible not only for their learning, but also for helping their peers to appropriate the concepts, creating an atmosphere of satisfaction. In this regard, Prescott (1993) supports it as a way of propitiating spaces in which the development of individual and group skills occurs from the discussion among students when exploring new concepts, each of whom is responsible for their own learning.

## 5. By way of closure

As a colophon that synthesizes the topic addressed, these techno-communicative and techno-pedagogical applications, within the model of learning through the application of strategies of Project-Based Learning mediated by the LMS, specifically Moodle, make it possible to demonstrate that:

- ✓ The relevant use of Moodle provides an optimal learning environment for the creation of didactic strategies and interaction spaces based on the PBL.
- ✓ Interaction between students is strengthened and enables them to study, understand, apply, generalize and deepen concepts, supporting each other so that the appropriation and construction of new meanings is collective.
- ✓ The ABP allows knowing the formative needs of the students under challenging projects in real contexts.
- ✓ The design of collaborative activities through the LMS allows the exploration and selection of Digital Educational Resources for the construction of the partial products of the project, directly relating to the final project.
- ✓ Interest in face-to-face or blended learning increases by involving students in decision-making between each micro-group and by evaluating their peers.

- ✓ The teacher should not be an expert in the management of Learning Management Systems; he should only dare to integrate the pedagogical, technological and communicative competences in his curricular design.

In short, Information and Communication Technologies complement Project-Based Learning through the management of learning, mediating the teaching for the development of skills to solve problems, selecting and using learning materials with greater autonomy, making self-assessments and strengthening skills self-learning.

## References

- Ausubel, D. P. (1976). *Psicología educativa. Un punto de vista cognoscitivo*. México: Trillas.
- Ausubel, D. (1983). *Psicología educativa: Un punto de vista cognoscitivo*. México: Trillas
- Ausubel, D. P. (2002). *Adquisición y retención del conocimiento. Una perspectiva cognitiva*. Barcelona: Paidós Ibérica.
- Barrows H.S. (1986). *A Taxonomy of problembased learning methods. Medical Education*, 20: 481-486.
- Belloch, C. (s.f). *Diseño Instruccional, Unidad de Tecnología Educativa (UTE)*. Valencia: Universidad de Valencia.
- Blank, W. (1997). Authentic instruction. W.E. Blank & S. Harwell (Eds.). *Promising practices for connecting high school to the real world* (pp. 15–21). Tampa, FL: University of South Florida. (ERIC Document Reproduction Service No. ED407586).
- Bruner, G. (1969). *Hacia una teoría de la instrucción*. México: Uthea
- Challenge (2000). *Why do projectbased learning?* San Mateo, CA: San Mateo County Office of Education. Available in: <http://pblmm.k12.ca.us/PBLGuide/WhyPBL.html>
- Dickinson, K.P., Soukamneuth, S., Yu, H.C., Kimball, M., D'Amico, R., Perry, R., et al. (1998). *Providing educational services in the Summer Youth Employment and Training Program [Technical assistance guide]*. Washington, DC: U.S. Department of Labor, Office of Policy & Research. (ERIC Document Reproduction Service No. ED420756).
- Galeana, L. (2006). Aprendizaje Basado en Proyectos. Investigación en Educación a Distancia. Universidad de Colima. *Revista Digital*. Available in: <http://ceupromed.ucol.mx/revista/>
- Harwell, S. (1997). Project-based learning. In: W.E. Blank & S. Harwell (Eds.), *Promising practices for connecting high school to the real world* (pp. 23–28). Tampa, FL: University of South Florida. (ERIC Document eproduction Service No. ED407586).
- Johnson, D. W. & Johnson, R. T. (1993). *Learning together and alone. Englewood Cliffs*. New York: Prentice-Hall.
- Moodle PTY Ltd [AU]. (2017), GNU General Public License. Available in: <https://docs.moodle.org/all/es/UsodeWiki>.
- Prescott, A. (1993). A dilemma of dioxygenases (or where biochemistry and molecular biology fail to meet). *Journal of Experimental Botany*, 44, 849–861.
- Slavin, R.E. (1990). *Cooperative learning. Theory, research, and practice*. Needham Heights, MA: Allyn and Bacon.
- Vygotsky, L. (1978). *Pensamiento y Lenguaje*. Buenos Aires: La Pleyade.