

Feedback Model when Applying the Evaluation by Indicators in the Development of Competences through Problem based Learning in a Systems Engineering Course

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Abstract—Feedback can be very influential in students' learning, therefore, the university must be very clear about its procedures and rules on the time lapse of the response of the work done by them, and the comments made to positively influence in a sustained manner in the evaluation of learning. The present work shows the experience of applying the Problem Based Learning (PBL) methodology and also developing research competencies through Formative Research, and as a result of the evaluation of the learning of the Criteria and its Performance Indicators corresponding to the course Business Electronic which is taught by two teachers in theory and laboratory practices. The objective is to design a Feedback Model for the problems solved by the students in order to support the improvement of their learning. The methodology used is Problem Based Learning together with the Feedback Model, of real problems posed contemplating different contexts of the organisations; we have that from the Deliverable Report of each problem at the same time the incidences and observations are registered in the corresponding register and in this way the Feedback Report is elaborated. The results obtained reveal that the objectives of producing the Feedback Report are achieved, which should be sent as soon as possible to the students for analysis, to propose their own strategies for improving the shortcomings or errors, as well as having the motivation to continue progressing by accepting the suggestions or contributions of the teacher; as well as seeing an increase in knowledge, development of their competences, skills, attitudes, making their own judgements, and achieving the Student Results. In conclusion, the application of a well-planned active didactic strategy, the adequate evaluation of learning through the qualification of the indicators of each criterion, and the elaboration of a timely feedback report on the problems, will achieve the expected results for both the course and the student.

Keywords—Problem based learning; competencies; evaluation; criteria; performance indicator; deliverable report; feedback report; skills; formative inquiry

I. INTRODUCTION

The Universidad Nacional de San Agustín de Arequipa [1], Arequipa - Peru, its Educational Model is based on professional training based on student competences, eliminating deficiencies in knowledge, soft skills and attitudes in students, and being able to use didactic strategies [2],[3],[4],

adapting them to the nature of the same to achieve the training objectives and competences.

In 2021, the Professional School of Systems Engineering (EPIS) [5] underwent the evaluation process for accreditation by the Accreditation Board for Engineering and Technology (ABET) [6], one of its objectives being that the educational institution demonstrates that its graduates and those in the process of training achieve the expected student results, having good results and awaiting official certification.

The experience is developed in the subject Business Electronic (BE) which corresponds to the VIII semester of the Study Plan.

The objective is to design a feedback model of the problems solved by students in the Business Electronic course, in order to carry out an analysis of the recorded incidences, make decisions and take actions for improvement, which also allow the teacher to make decisions for continuous improvement in the teaching-learning process by solving problems by applying Problem Based Learning.

The research is descriptive, the methodology is based on the phases of the scientific method for problem solving [7], which states that the student has access to develop skills, and thus we would say greater knowledge of the problem area, procedures, attitudes and values.

As a result of working in groups and applying the PBL to the qualification of each of the problems posed, the students receive the Feedback Report of Evaluation of Deliverables together with the qualification matrix of the Criteria and their indicators involved to be analysed, discussed, reach conclusions on what to improve and determine their strategies to improve in the teaching-learning process. In addition to the statistics of the incidences derived from this.

The conclusion is that by applying PBL and evaluating the criteria and their indicators, together with a record of the incidents and the preparation of a Feedback Report for the students, which is sent to them as soon as possible, they help to correct mistakes or errors, increase their knowledge, strengthen the development of competences and soft skills, their attitudes,

make their own judgements and assess the results of their work.

The article is organized in the Section II of Related Works - Context of the Experience, in Section III the Methodology is treated, in Section IV the Design of the Feedback Model is shown, in Section V the Method of Work is shown, in Section VI the Results of the work are shown, in Section VII the Discussion that is made is touched, that they worked or investigated others and of the result that is obtained, in Section VIII the conclusions of the work are shown, in Section IX the future works that can be carried out are shown.

II. RELATED WORK – CONTEXT OF THE EXPERIENCE

A. Current Situation

From 2019 we apply Formative Research adjacent to Active Didactic Strategies in the development of courses in the EPIS Given that the teaching learning process and competency based, training require feedback on the activities carried out by the students, this was done in a global way, not fulfilling the need to achieve significant and quality learning.

Thus, the evaluation of work, of each Deliverable Report, is based on the predefined criteria contemplated in the evaluation rubric, and thus a detailed, fair, real qualification, free as far as possible of subjectivities. This reflects the evolution and monitoring to be carried out on the group of students through adequate feedback. Thus, the problem is defined and will be considered in order to find a solution to the present work.

B. Formative Research

Formative research feeds research by training future researchers as stated by [8], that according to the professional training based on competences the student is at the centre of the process [9], with the teacher assuming the role of advisor with the rigor and demand in the development of the research.

In this sense, it is reiterated [10] that the mission of the university is to pay great attention to Formative Research, the actors directly involved are teachers and students, as it should be built throughout the process and thus deepen scientific research in the training of students for work performance in society.

There is experience in the EPIS of conducting Formative Research in courses such as Writing Articles and Research Reports (RAII), Research Methods and Writing, (MIR), Database, Business Electronic; the results are reflected in the Formative Research Report.

Applying active learning strategies; such as PBL; being participatory, whose focus is the student, generates methodological mechanisms to integrate it into the teaching-learning process [11], and develop research competences in the undergraduate whose role of Formative Inquiry is analysed by [12]. Together with the development of soft skills validated and evidenced by [13], it also contributes to developing the competences of the course.

C. Student Competence Development

All part of the educational model of the institution, in this case it is based on competences, which together with the

Active Didactic Strategies as PBL make the competences to be developed appropriately by the students as referred by [14], we would say applied in different contexts.

Competence implies developing knowledge of an area of knowledge, skills and attitudes as referred to by [15]. If a methodology is also followed, as proposed by [16], the development of competences is demonstrated by solving problems of reality, discovering deficiencies or shortcomings, correcting weaknesses in the teaching learning process of engineering students supported by teachers. As well as valuing the achievements and learning from the experiences when carrying out research [17] by the students.

D. Problem based Learning

The training of students demands continuous updating so that when they graduate from the university they are able to work in different global contexts, to be part of multi- and trans disciplinary teams to solve problems of reality.

An alternative is to apply PBL, where the student is the centre of attention of the strategy [18], which in the area of engineering is used by offering interaction between teacher and student, and between students when working in groups of four to eight members. Working with PBL is based on the approach of a method such as that of [19] and [20] with steps to carry out the activities to be evaluated such as: reports, presentations, assessment of individual and team work as well as collaborative work, self-assessment, co-assessment, making judgements, critical thinking.

E. Effective Evaluation

If we start from the grade achieved in the resolution of a problem, task or work, this means approval, but it does not allow the student to know what his weaknesses and deficiencies are, which areas are weak in the subject treated, which concepts, methodologies, techniques, methods, the use of the appropriate tools, understanding his limitations, and what knowledge he should develop and deepen by researching in addition to what he has received in the class sessions.

In this regard [21] suggests that in order to have an effective evaluation, it must be:

- Valid; measuring what it should actually measure.
- Reliable; it must be consistent and fair.
- Transparent; that there are no tricks, traps or surprises.

The course contemplates and takes care that there is alignment between:

- Student Outcomes (SO).
- The defined contents to be covered in the course development.
- The learning activities in the theory and laboratory sessions to be carried out by the students.
- The evaluation method.
- The qualification tool that involves the general competences of the professional profile of the degree course, the course competences, the evaluation criteria

and their indicators, the qualification scales of the indicators.

F. Indicator based Evaluation of Learning

The assessment process generates information that when analysed, interpreted and then communicated generates knowledge with a value for action.

The assessment of learning should be a comprehensive and continuous process as discussed by [15] who considers basic questions such as What, How, When, Who to assess, the answers to which determine the type of assessment to be used, taking into account the context in which it takes place. This is also shared by [22] who highlights the finding of feedback as a formative act.

Thus, in the EPIS, professors apply Active Didactic Strategies that make it possible to evaluate student results in accordance with the ABET accreditation model, which works on the basis of criteria already defined for the courses of the Curricular Plan.

The Faculty of Production and Services Engineering (FIPS), to which the EPIS belongs, determined that the rubric should be used as an instrument, therefore in the present work the rubric [23, 24, 25, 26] was used to evaluate the criteria and its indicators related to student results, the achievement of increasing knowledge in the problem area, the development of competences, attitudes; for this purpose, rating scales are used according to the nature of the indicator to be rated in an objective and consistent manner.

It is through this assessment instrument that students are informed, in advance at the beginning of the course, which criteria are involved and must be fulfilled in order to reach the achievement levels of the Student Outcomes.

In the present work the BE course is taken as a case study applying the PBL in the laboratory sessions, taking as a result the evaluation of each Deliverable Report and recording and elaborating the Feedback Report addressed to the students.

G. Feedback in Learning

We have the contribution of [27] in the research of the literature review on feedback for learning. Thus it is considered the most salient as being:

a) *Concept*; citing Carless and Boud (2018) ... "deliver a definition of feedback from an understanding of a process through which learners use information to improve their work or learning strategies, this process being learner-driven in decision making to generate change (Dawson et al., 2019)".

b) *Conceptual moments for Feedback*.

- Feedback as a product; it is given by the teacher as the sole agent, it follows the idea of the corrective notion.
- Feedback as a dialogical act; the communication between teachers and students after the evaluation of a task based on criteria.
- Feedback as sustainable action; refers to interaction and dialogue as a support to the student in the tasks he/she performs; it is recursive in nature, it is delivered

through cycles giving the opportunity to correct erroneous knowledge, leading to improvement, supported by clear criteria.

c) *Feedback for Learning Model*; providing feedback requires practice, through cycles in a sustainable way that allows learning beyond just completing the task. It is shown in Fig. 1.

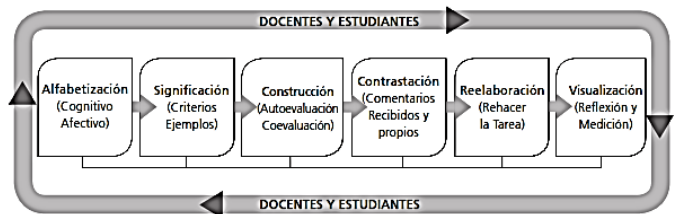


Fig. 1. Feedback Model for Learning. Source: Quezada [27].

The definition of Feedback [28] is ... Feedback is a process that helps to provide information about people's competencies, about what they know, what they do and how they act. Feedback allows us to describe how people think, feel and act in their environment and therefore allows us to know how it is performing and how it can be improved in the future."

In [29] citing Wiggins (2012) states characteristics that apply to the professor with respect to feedback such as:

a) *Objective*; the information given to the student should be related to the task being requested and conducive to learning.

b) *Constructive*; to consider the positive aspects, provide guidance, suggestions, how to overcome weaknesses, correct faults or mistakes.

c) *Understandable*; provide timely and detailed information on how to improve their learning.

d) *Timely*; the student receives feedback in time to improve their performance; or as we would say, to analyse and determine their strategies to improve their learning.

In educational evaluation, feedback is an essential component and is of great importance, as [30] points out that it is information that the student receives from each Deliverable Report of the BE course laboratory sessions about his or her performance. Having the following benefits it brings to providing the importance of feedback, such as:

- It clarifies the expected performance; the learning outcomes; based in our case on the analysis of the criteria and their indicators.
- It promotes dialogue between teacher and students, providing information about what has been achieved and allowing students to ask questions and thus improve their performance.
- Facilitates self-reflection; by instructing them to analyse the results of the scoring of the indicators of each criterion and thus address those where improvement is needed to achieve better results.
- Increases student motivation and self-esteem; students are motivated if through feedback they are shown the

positive aspects of their assessment and are told the level of marks they can achieve; they are also shown which points or aspects they need to improve and that they can make further progress, thus reinforcing their self-esteem.

The need arises for a procedure that provides students with a better feedback alternative in their course, compared to what is done in other courses in the curricula, and this is how the proposal of a simple and applicable feedback model arises, which has been maturing by applying the evaluation by indicators that make up a certain criterion.

III. METHODOLOGY

The methodological design is quasi-experimental, not employing a control group. The applied research is carried out to solve the problem of feedback through the Deliverable Evaluation Feedback Report. The research developed uses the feedback model generated, which involves the rubric instrument, the scoring tool for the indicators of each criterion of each defined competence of the subject.

IV. DESIGN OF THE FEEDBACK MODEL

The feedback model for learning should be delineated in dialogue, with the student gathering information from various sources about their performance and translating it into strategies for further improvement in their training.

The PBL uses a set of problems taken or adapted or posed by the professor, to be developed and solved by a group of students; for the course Business Electronic (BE) which is taken as a case for the present work.

Fig. 2 shows the Model developed and applied in semesters 2020 B and 2021 B in the BE course.

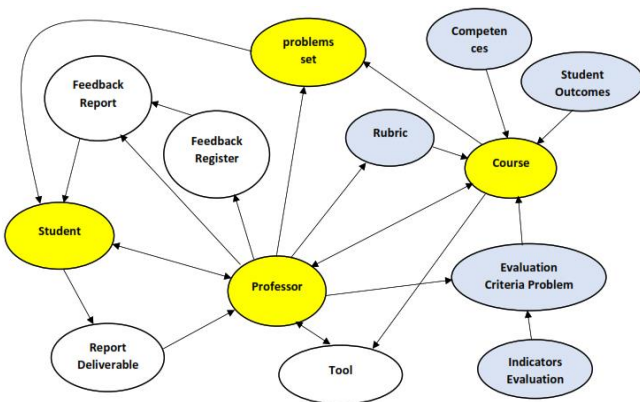


Fig. 2. Feedback Model. Source: Own Elaboration.

A. Reality of the Problem

Most of the evaluations carried out by professors teachers do not contain a documented record of the incidents, observations or suggestions made to the student or working group in the resolution of a problem that helps them to continuously improve in the development of the competences of the course involved.

B. Elements of the Model

The Feedback model includes the following elements:

- 1) Teacher
- 2) Student
- 3) Course
- 4) Competences
- 5) Student Outcomes to be assessed - criteria for SO
- 6) Evaluation Rubric - with criteria of the competences
- 7) Problem Evaluation Criteria
- 8) Evaluation Indicators of the Problem Evaluation Criteria
- 9) Problem Set
- 10) Qualification Tool
- 11) Deliverable Report
- 12) Deliverable Feedback Report Record
- 13) Deliverable Feedback Report.

The functions of each element of the model are detailed below:

- Professor
 - Generates and updates the problem set
 - Performs the grading of each Deliverable Report for each problem.
 - Records the ratings in the Deliverable Feedback Report Log.
 - Issues the Deliverable Feedback Report.
- 14) Student
- Form the working group for the academic semester.
 - Work as a group to solve the proposed problems.
 - Analyse, discuss the Deliverable Feedback Report, and make agreements for continuous improvement in the development of the course.
- 15) Course
- Contain the corresponding data and information for the development of the semester.
- Involves a:
- Course competencies
 - Student outcomes to be assessed - SO criteria
 - Evaluation Rubric - with SO criteria
 - Problem Evaluation Criteria
 - Indicators of the problem's Evaluation Criteria.
- 16) Competences
- Contain the achievements to be attained by the students according to the general competences of the Professional Career Profile.
- 17) Student outcomes to be assessed - criteria of SO

- Contain the Student Outcomes expected to be achieved in the student's education in each course of the Curriculum.

18) Evaluation Rubric - with competency criteria

- Contain the evaluation criteria for each competency for the qualification of the Deliverable Report for each problem posed in the course.

19) Evaluation Criteria of the problem

- Generate the frame of reference for professors to evaluate the academic performance of students.
- Define the knowledge that students must acquire, what they have to learn to perform or create with such knowledge.
- They are those defined to be evaluated for each competence for the qualification of the Deliverable Report of each problem posed in the course.

20) Evaluation Indicators of the Evaluation Criteria of the problem

- Contain the indicators that are the most specific defined within a criterion and that will be evaluated from each Evaluation Criterion for the qualification of the Deliverable Report of each problem posed in the course.

21) Problem Set

- Contains the set of problems to be developed by the students during the semester.

22) Qualification Tool

Based on the Electronic Spreadsheet - EXCEL.

Involves:

- Course
- Course Competences
- Problem Evaluation Criteria
- Indicators of the Problem Evaluation Criteria.
- Indicator qualification scales.

Its responsibilities are to:

- Storing the marking data for the criteria indicators for each competency, for each proposed problem to be worked on.
- Calculate and record the continuous evaluation and examination marks for each semester evaluation period of the course.
- Calculate and record the marks for each Student Outcomes Criterion involved.

23) Deliverable Report

- Contain the development of the constituent parts of the Deliverable Report according to a predefined structure.

24) Deliverables Feedback Report Record

- Contain the observations, suggestions, contributions derived from the qualification of each indicator of each criterion of the Deliverable Report.

25) Deliverable Feedback Report

- Contain the observations, suggestions and inputs from the Feedback Report Register and from the qualification of the indicators of each criterion.

C. The Project

The design of the project contemplated the aspects considered in the professor's evaluation of the Deliverables Reports containing the criteria and their indicators, contemplating the application of the indicator-based evaluation system of [31]. And of the application of the system taking the results shown by [32] of the experience of evaluation based on indicators.

The developed project has the following characteristics:

- It contains problems of reality organisations or adaptations or case studies.
- The work team is made up of four or three students, taking into account the availability of time and timetables of its members, and also taking into account the other courses of study and personal interrelation, which provides very good results.
- The problems are developed during the academic semester, preparing the Deliverable Report for each one.
- Carry out the analysis of the Feedback Report and take actions for the continuous improvement of the Deliverable Reports to be elaborated in the following sessions.

D. Incidences

The table of incidences (observation) has been determined according to the evolution of the qualification of the indicators in the work done in the semesters involved, and what each teacher has found and how he/she has applied in the recording of incidences. Table I shows the incidences.

TABLE I. INCIDENCES

Codig	Description
1	Absent
2	Very incipient
3	Insufficient
4	Incomplete
5	No further explanation
6	No guard coherence
7	Stake out
8	Are not such
9	Inconsistent
10	Improve to reach excellent
11	To draft adequately

Source: Own Elaboration.

E. Follow-Up

Sessions are held to deliver the Deliverable Report during the semester, which contains the result of the problem, the presentation, the evaluation with the corresponding qualification of the indicators of each criterion, and at the same time the Feedback Report is drawn up. This is distributed to the members of the team involved so that in a joint session they can analyse the evaluation carried out by the teacher, and determine the shortcomings and weaknesses which must be corrected, taking into account the suggestions and opinions; and on this basis propose their strategies for continuous improvement in the development of the problems and therefore of the following deliverable reports.

As a principle of PBL, the teacher plays the role of a coach by providing suggestions, guidelines, pointing out shortcomings, giving guidance and comments to the students.

The qualification of the Deliverable Reports is carried out on the basis of the work done by [32] and at the same time, in parallel, the incidences of the indicators of each criterion are recorded in the Feedback Report of each group of students' work.

V. METHOD OF WORK

A. Conceptual Design

Having defined the Student Outcomes for each course of the Curriculum Plan, the teacher must propose the products, behaviours, actions or others that will be requested to the group of students in order to know the level of achievement.

The purpose is for the student to investigate, as referred to in [33] by carrying out research activities and using PBL to solve problems in order to discover more knowledge related to the problem area, reinforce other concepts, develop competences [33] soft and procedural skills, make their own judgements, and evaluate the results achieved.

The research for the development of the work is based on the stages of problem solving, of the scientific method, which associated with the active didactic strategy of PBL, the group of students develop each problem posed and elaborate the Deliverable Report following the stages of the project proposed by [32] in order for the professor to elaborate the Feedback Report.

In order to obtain the data on the students' assessment of the Feedback Model, the survey technique and its instrument, the questionnaire, are used, and then the results are systematised in order to analyse them and draw conclusions that can be used to make decisions regarding the continuous improvement of the teaching-learning process of the course.

Methodologies, Techniques and Instruments to be used

A Methodologies, Techniques and Instruments

- Problem Based Learning Methodology - PBL.
 - Problem solving, in sessions determined in the development of the course.
- Survey Technique
 - Questionnaire - Questionnaire of Assessment of the Feedback Model for the Application of Problem-Based Learning.

B Evidence

- Digital files, of the Reports of Deliverables of the laboratory work.
- Digital files, of the records of Incidents or Observations for the Deliverables Evaluation Feedback Report.
- Digital files of the Feedback Reports.
- Moodle, Virtual Classroom as a repository of the course work.

Evaluation Instruments

- Deliverable Report Qualification Tool.
- Evaluation rubrics.
 - Evaluation of Competences and Student Outcomes.

B. Participants

The BE course in the EPIS is taken as a case study, which is developed in the eighth semester (4th year), with five hours per week, three theoretical and two laboratory hours, in 17 weeks, the theory and laboratory practices were carried out by two professors. The students participated in the elaboration of the Deliverable Report, taking as a case study the semester 2020 B with 10 subgroups and a total of 35 students; the semester 2021 B with 15 subgroups and a total of 57 students.

C. Data Analysis Technique

From the registration of the incidences by the qualification of the indicators of each criterion of the developed problems, the data were systematised in the electronic spreadsheet EXCEL, visualising and analysing the results achieving frequencies, averages, tables, graphs.

D. Instruments

The following instruments are used:

- Template for the elaboration of the Feedback Report.
- Evaluation rubrics.
- Deliverable Report Qualification Tool.
- Feedback Model Valuation Questionnaire.

E. Techniques

Evaluation techniques are used:

- The rubric.
- The qualification scale.
- Survey.

F. Deliverables

It was established that the Feedback Report of the evaluation of the deliverables will be delivered to each working subgroup and stored in the repository of the virtual classroom.

The structure of the Feedback Report contains two parts:

- Feedback Report of each Deliverable Report
- Evaluation of Deliverable Report.

VI. RESULTS

The results of the Evaluation of the Deliverable Report are shown below; with a defined and used structure, based on the rubric defined for the BE course in semester 2020 B. Fig. 3 shows a sample of the course competences that are related to the general competences of the course, the criteria, the indicators of the criteria with the qualification scale determined for each one of them, and the qualification of the proposed problem of the working groups.

UNIVERSIDAD NACIONAL DE SAN AGUSTIN DE AREQUIPA		ASSESSMENT OF DELIVERABLE REPORT AND FORMATIVE I																													
FACULTY OF PRODUCTION AND SERVICES ENGINEERING		Course : Business Electrónica																													
PROFESSIONAL SCHOOL OF SYSTEMS ENGINEERING		Semester : 2020 B (VII)																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25					
Competencies		Ca (C.r)											Cb (C.p)																		
Criterion		Plan the treat			Organise the			Problem			Theoretical framework			Generation of			Comparison			Group work											
Indicators		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3			
Qualification scale		General Objective		Specific Objective		Organisation of the team		Assignment of roles and		Description of the context		Identify the problem		Search for new information		Organisation of the information		Search for models related to the		Statement		Advantages		Models related to the problem		Multidisciplinary related to the		Last of activities earned out by		Last of IT proposals	
		4	4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3		
		=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No		
		1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg			
		2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go	2=Go			
		3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo	3=Vgo			
		4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe			
Teo Laborato		minimum amount (egood) (se 4-5=Vgo)																													
Gro:GroSub		Surname and first name																													
A	A 1	Group 1		4	3	3	3	3	3	4			3	4	3	4	3	3	2	3	2	3	2	3	2	3	2	3			
A	A 2	Group 2		3	3	4	3	3	4	3	1	3	3	3	3	2	3	1	2												
A	A 3	Group 3		3	3	2	2	3	4	2	2	2							3	2	2	2	2								

Fig. 3. Report of Assessment of Deliverable Report 2020 B with Qualification Tool. Source: Own Elaboration.

Then the results of the evaluation of the Deliverable Report are shown; which are reflected in the Feedback Report implemented in semester 2020 B showing the criteria and indicators with observation of the incidences found as the professor includes them always based on the defined rubric of the BE course. In Fig. 4 there is a sample, where the Feedback Report is included in the cover of the Deliverable Report for its registration and storage and its qualification resulting from applying the qualification tool of the proposed problem of the working group.

CURSO: NEGOCIOS ELECTRÓNICOS

Problema de aplicación:

3 integrantes

Elaborado por:

Observaciones.-

Nota: 15.50

Criterios	Indicador(es) a ser superado(s)
Marco Teórico	Antecedentes Investigativos - Ausente
Comparativa de la selección de aspectos	métodos relacionadas al problema - Son de inventarios presentados y de CRM??
Generación de posibles soluciones (Alt Acciones a Ejecutar - Ausente	
	Innovación en la propuesta de solución - Ausente
	Otros - Ausente
Prototipo o Análisis Situacional	Configuración - No mayor explicación
	Instalación - No mayor explicación
	No se muestran todos los print screen de resultados de la Tienda
Conclusiones	Redacción coherente con los objetivos - No guarda coherencia
Comentario General	Los otros indicadores de los criterios están en calificación: Bueno, Muy Bueno o Excelente
	Debe mejorarse los que están debajo de Excelente.
	Eso lo tienen en el Registro de Evaluación - Conforme a Rubrica de Evaluación que se les envía

Fig. 4. Deliverable Report Including Rating Observations - Semester 2020 B. Source: Own Elaboration.

According to the analysis and conclusions reached from the development of semester 2020 B, the relevant modifications and inclusions were made to improve the grading tool, as well as the Feedback Report to make it more practical in its registration, by creating a coding of the criteria and indicators that serves for the systematisation of the same; and that serves as a better communication between the professor and the student, being clearer and more understandable, as shown in Fig. 5 and Fig. 6.

The results of the Evaluation of the Deliverable Report are shown below; with a structure determined and used, based on the defined rubric of the BE course of semester 2021 B. In Fig. 5 there is a sample, where the Competences of the course related to those of the degree course are shown, the inclusion of the Student Results to be achieved, the Criteria and the Indicators with the Qualification Scale determined for each one of them, and their qualification carried out of the problem proposed to the work groups; which at the end is reflected in the marks obtained for each student result, as well as the marks for the resolution of each problem posed.

Fig. 6 shows the results of the evaluation of the Deliverable Report; with the observations of the Incidences determined or found of the criteria and indicators involved and are reflected in the Feedback Report implemented in semester 2021 B, which in its design is more explicit and improves the communication between the professor and the students.

The Feedback Report that is sent to the members of each of the subgroups consists of the content of Fig. 6 Deliverable Report including incidents of the Feedback Report and of the Fig. 5 Evaluation of the Deliverable Report.

As a further result, Tables II and III reflect the performance results according to the level of ABET accreditation performance rating for the EPIS courses, which are at the satisfactory and outstanding level, showing that the Student Outcomes are achieved, as well as the development of the Competences and the Feedback Report plays an important role in achieving this.

UNIVERSIDAD NACIONAL DE SAN AGUSTIN DE AREQUIPA		EVALUATION OF THE DELIVERABLE REPORT AND																																				
FACULTY OF PRODUCTION AND SERVICE ENGINEERING		PROFESSIONAL SCHOOL OF SYSTEMS ENGINEERING															Course : Business Electronics																					
		Semester : 2021 B (VII)																																				
Competences		r	r	r	r	r	p	p	p	p																												
Student Outcomes		7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	8.2	8.2	8.2	8.2																									
Criteria		Plann	Organi	Problem	Theori	Compari	Preser	Prototipo																														
Indicators		1	1	1	2	3	2	5	2	1																												
Grading Scale		General objective		Organisation of the team		Description of the context		Identify the problem		New concepts		methodologies related to the		tools related to the problem		Presentation of the results of the IT Requirements		Note = (DBan +DDS1 1)/33 RE.7.2																				
		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4																				
		=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No	=No																				
		1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg	1=Reg																				
		2=Bue	2=Bue	2=Bue	2=Bue	2=Bue	2=Bue	2=Bue	2=Bue	2=Bue	2=Bue	2=Bue	2=Bue	2=Bue	2=Bue	2=Bue	2=Bue	2=Bue																				
		3=Mbu	3=Mbu	3=Mbu	3=Mbu	3=Mbu	3=Mbu	3=Mbu	3=Mbu	3=Mbu	3=Mbu	3=Mbu	3=Mbu	3=Mbu	3=Mbu	3=Mbu	3=Mbu	3=Mbu																				
		4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe	4=Exe																				
Teo Laborato		Minimum amount (egood)(se 4-5=Mbu)															8		2		3																	
Gro:GroSub		Surname and first name															2		3		2		3		3		4		3		3		4		3		16	
A	A 1	Group 1		2	3	2	3	3	4	3	3	4	3	3	4	3	3	4	3	4	3	16																
A	A 2	Group 2		4	3	3	4	1	3	3	3	4	3																									
A	A 3	Group 3		3	3	3	3	3	3	3	4	4	4																									
B	A 4	Group 4		2	3	2	2	1	4	3	3	3	0																									

Fig. 5. Report of Assessment of Deliverable Report 2021 B with Qualification Tool. Source: Own Elaboration.

Course : Business Electronics			
Professor: César Baluarte Araya			
Deliverable Report			
Supply Chain Management - SCM			
Note: 16.00			
Prepared by : 3 Members			
UNIVERSIDAD NACIONAL DE SAN AGUSTIN			
FACULTY OF PRODUCTION AND SERVICE ENGINEERING			
PROFESSIONAL SCHOOL OF SYSTEMS ENGINEERING			
Course : Business Electronics		Deliverables Evaluation Feedback Report - Continuous Assessment	
Semester : VIII 2021 B			
Credits : 4			
Laboratory Session	Criteria	Item(s) / Indicator(s) to be passed(s)	Observation
3 - Supply Chain Management SCM	4. Theoretical Framework	13 New concepts	3 Insufficient - Only 7 do not reach the minimum
	9. Prototype or Situational Analysis	50 IT requirements	2 Very incipient
	9. Prototype or Situational Analysis	53 Prints Screen of results	4 Incomplete
	10. Lessons Learned	55 List of Lessons Learned	11 Drafting adequately
	16 General Commentary	67 The other indicators of the criteria are rated, Good, Very Good or Excellent.	
	16 General Commentary	68 Those below Excellent should be improved	
	16 General Commentary	69 Have it in the Evaluation Record - Feedback Report - As submitted	

Fig. 6. Deliverable Report Including Incidents of the Feedback Report - Semester 2021 B. Source: Own Elaboration.

TABLE II. PERFORMANCE REPORT OF THE BUSINESS ELECTRONICS 2020 B COURSE - ABET

Grade Obtained	Number Students	%	%	Performance
	Global	Global	Evaluated	Qualified
AB Abandonment	0	0	0,00	Abandonment
From 1 to 7	0	0	0.00	Unsatisfactory
From 8 to 10	0	0	0.00	In Progress
From 11 to 14	3	8.5714	8.57	Satisfactory
From 15 to 20	32	91.4286	91.43	Outstanding
	35	100.0000	100.00	

Source: Own Elaboration.

TABLE III. PERFORMANCE REPORT OF THE BUSINESS ELECTRONICS 2021 B COURSE - ABET

Grade Obtained	Number Students	%	%	Performance
	Global	Global	Evaluated	Qualified
AB Abandonment	1	1.7544	1.75	Abandonment
From 1 to 7	0	0	0.00	Unsatisfactory
From 8 to 10	0	0	0.00	In Progress
From 11 to 14	15	26.3158	26.32	Satisfactory
From 15 to 20	41	71.9298	71.93	Outstanding
	57	100.0000	100.00	

Source: Own Elaboration.

Fig. 7 shows the progress of group three in the development of the problems set during the 2020 B academic semester.

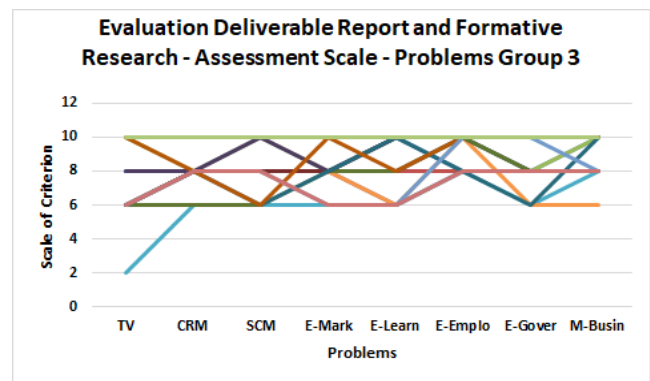


Fig. 7. EDRFR – AS – PG3 - Evaluation Deliverable Report and Formative Research-Assessment Scale-Problems Group 3, Semester 2020 B. Source: Own Elaboration.

Fig. 8 also shows how in one way or another the progress in this case of group 21, in the development of the problems that were posed for the academic semester 2021 B.

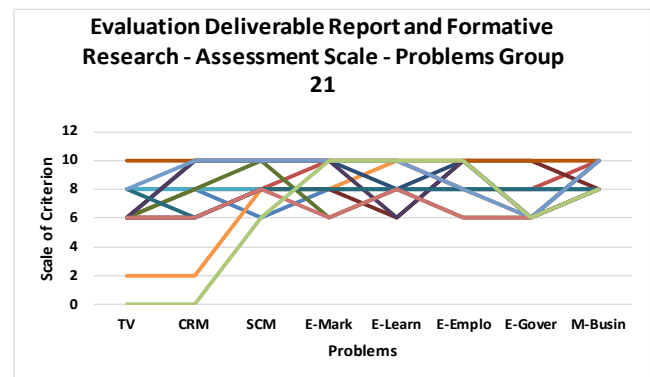


Fig. 8. EDRFR – AS – PG21 - Evaluation Deliverable Report and Formative Research-Assessment Scale-Problems Group 3, Semester 2021 B. Source: Own Elaboration.

VII. DISCUSSION

There are works on the application of didactic strategies such as that of [34] emphasising in his book the relevant explanations to achieve the objectives set out in each context where the teaching-learning process takes place.

The proposal of [35] is to go beyond a simple evaluation and use didactic teaching-learning strategies applied to the context of reality that contribute to student learning.

In the research, the application of PBL in the work of [32] has been achieved by having, at the moment of the qualification of the indicators of each criterion, the possibility of determining the incidences and observations to which it gives rise and registering them in the corresponding medium..

We have the results of the evaluation grades of the last four years, which show how the qualification based on indicators allow a fairer and more objective evaluation of each student's Deliverable Report, when applying PBL from 2019, which are shown in Table IV regarding the Mobile Business problem, being on average at an outstanding level according to the scale determined for the measurement of student performance (the minimum is 15) in the EPIS courses.

TABLE IV. GRADE POINT AVERAGE

Course	Grade Point Average			
	2018	2019	2020	2021
Business Electronics Theme: Mobile Business	15.17	16.15	17.4	15.10

Source: Own Elaboration.

Also [36] presents some general principles of effective feedback, and how, as he calls it, the Decalogue, helps students to improve and supports their self-esteem, which we consider a good contribution to be contemplated by the professor. Also taking into account what has been discussed by [37] regarding the principles of effective feedback.

VIII. CONCLUSION

The following conclusions have been reached:

The objectives of the Feedback Report have been achieved by reaching a better communication between the professor and the student so that they can formulate their strategies and take the relevant actions for continuous improvement.

The Student Outcomes determined for the course are achieved at an outstanding level; and students achieve through feedback a better development of their competences as well as those of the course, and thus also achieve the competences of the Professional School's syllabus.

Problem Based Learning as an active methodology and the Feedback Report allow; to increase motivation for autonomous learning, to increase knowledge on topics of the problems of the area, to apply the knowledge achieved, motivation for teamwork, to complement the development of soft and procedural skills, progressively improving their academic performance.

Through the evaluation of the Deliverable Report, students obtain an evaluation according to the qualification of each indicator in the criteria involved in each problem, which is more objective, fair, real and with less subjectivity on the part of the qualifier; students recognising that the feedback provided in the Feedback Report helps them to improve and perform better in teamwork.

Providing students with feedback in the Deliverable Reports on the reviews, qualifications and observations made by the professor, allows them to continuously improve in the work group.

IX. FUTURE WORK

To carry out comparative research on the application of PBL and others such as PrBL (Project Based Learning) in the courses of the Curriculum Plan using the evaluation by indicators and its Feedback Report.

The systematisation of the criteria and their indicators as well as the result of the work of [32] will allow the subsequent development of an evaluation and feedback system.

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continuous improvement based on Active Didactic Strategies with the favourable results being of benefit to the students and the teaching-learning process.

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