

*The society of the 21<sup>st</sup> century will be a cognitive society; the capital will turn to be a capital of advanced knowledge and competencies to solve problems and create new situations.*

UNESCO, 1998.

### **3. Characteristics of the educational model**

The educational model of Tec is based on specific characteristics that all courses must have, regardless to the level or discipline.

#### **1. Students learn to work collaboratively**

It is difficult to incorporate in a brief text the principles in which the collaborative learning is based. In previous chapters the use of team work has been justified due to its importance in the consolidation of the student's learning process and in his/her social development. However, there are anthropological and social reasons which have made collaboration the essential element in the learning process.

Education has passed through stages which have responded to the concept of person in each moment of its history. In the contemporary anthropologic philosophy, individuality was stressed and the relation aspect was set apart. This relation aspect is emphasized in the postmodern thought at present. At the beginning of the 20<sup>th</sup> century, John Dewey considered that schools should fulfill two missions in the social reconstruction: help to students' development, creating in them the wish of a continuous growth and making them find their happiness helping others improve their conditions.

*The collaborative experiences are the only way to  
Systematically socialize future generations and satisfy the needs  
of a world which is every time more urban, technological and  
interdependent.*

Kagan, 1985

According to this author, in order to reach these objectives, it is necessary to stop considering intelligence as a personal possession and study the communication and interaction processes. Men are intimately linked with human being and must construct with them a more caring world. Collaborative learning is a socialization experience which is oriented to get the student to have a solidarity life and where the essence of education is based. These two dimensions of a person, individual and social, establish a reciprocal and dynamic relation, they do not occur separately. Individual development is limited by individuals' relation with others and, at the same time he/she has qualities and resources to help others in their own development.

The emphasis given to this approach is the result of the social evolution. The progress in science and technology as well as the economic, social and political interdependence of our society has opened the world dimensions and demands to solidarity and collaboration. The need of solidarity within the democracy of nations is important to overcome the lack of solidarity humanity has. This is shown in the damage of social relations which is more obvious with the different communication and information means.

In the educational model, solidarity applied to collaborative learning is the most important element in the students' formation. It is more than a characteristic, it is a philosophy of life; it is the core of the academic life of the students and the professors. It is also included in all the activities and processes in which the students participate.

In collaborative learning activities, besides consolidating the learning process carried out individually, students develop at the same time abilities, civic and social attitudes such as effective communication, know and respect others, tolerance, collective decision-taking and mutual compromise. Collaboration is an appropriate way to promote ethic habits of behavior. Terms such as individualism, memorization, passive and competitive are not associated with collaborative learning; on the other hand, the elements that are always present in this kind of learning process are, according to the theory of the Johnsons brothers, David and Roger:

? *Cooperation.* Students support each other in an efficient and effective way in order to reach a common objective. They share goals, resources and

achievements in a way that a student cannot be successful without the others.

- ? *Individual responsibility.* All the students, as members of the group, have their own assignments to carry out and these assignments are fundamental to reach the groups' goal.
- ? *Communication:* The members of the group interchange information and materials. They analyze the assignments and individual conclusions; they reflect to achieve thoughts and results with a higher quality.
- ? *Group assignments.* Students learn to solve problems together developing abilities such as leadership, communication, confidence, decision-taking and conflict-solution.
- ? *Reflect about the process.* The members of each group evaluate the actions and plan the changes that should be done to improve their work.

When the professor creates a respectful environment where each student is accepted by the others and he/she feels secure to express his/her ideas, the personal growth is strengthened in both dimensions, individual and social. When students work collaboratively it is possible to achieve the following:

- ? Increase comfort and quality in the classroom.
- ? Encourage the intellectual strictness.
- ? Develop mental abilities of superior reasoning.
- ? Improve the self-esteem in a belonging and personal identity sense.
- ? Prepare him/her self for future life as a professional and as a citizen.
- ? Practice the ethic behavior.
- ? Increase the social cohesion of the group.
- ? Develop the interest in working and learning.

The students that have had the opportunity to participate in collaborative learning experiences in the Institute say that they learn more when they work with their classmates because they are able to enrich their points of view and learn aspects that they could not have been able to learn by themselves. At the beginning, there is resistance to this way of working which is conditioned by the emphasis the traditional education gives to individualism. However, if the professor manages the process well and students collaborate, they will have a rewarding experience, improve their grades and be more successful.

Collaborative learning does not mean that all the activities must be done in groups: it is necessary to carry out some of them individually. Some of these individual activities are information research, analysis and personal studying. This way, students prepare themselves to make meaningful contributions and participate efficiently in the group.

*In order to promote a constructive discussion, the classroom environment must be respectful, tolerant and active listening.*

Francisco Arellano, Teacher from Toluca Campus. 2001

At the same time, their development is strengthened through a process where individual and group activities are alternated.

On the other hand, the fact of working in groups does not guarantee that students are doing collaborative learning. The professor needs to organize the process step by step in order to reach the required conditions and with his/her help, students can learn with common assignments. (See Figure 3.1)

In conclusion, the collaborative learning can be defined as the following:

*In a group where everybody is equal, and with the professors' direction and help, students will learn to compare their points of view and accept their differences. They will also help each other, show solidarity, work in common projects, establish their own rules and carry out the obligations adopted collectively.*

Project of the Teaching Reform of the Education and Science Ministry form Spain, 1987:19

## **2. Students acquire relevant and deep knowledge**

An important element in the teaching-learning process is the academic content which is part of the study plans. Learning this content is the main objective in the professional formation of student. There is change in the new educational model which is the way these contents are taught. The most recent tendencies are oriented to study science through real problems with the objective to form persons able to be amazed by what happens in their environment. They should also be able to face the world changing permanently and the great technological advances.

The purpose of the new educational model does not use theories, concepts and procedures contained in the program as information that should be memorized and that should form the cultural background of the students. The main purpose is to use them to understand the world and apply them to solve problems of the present society.

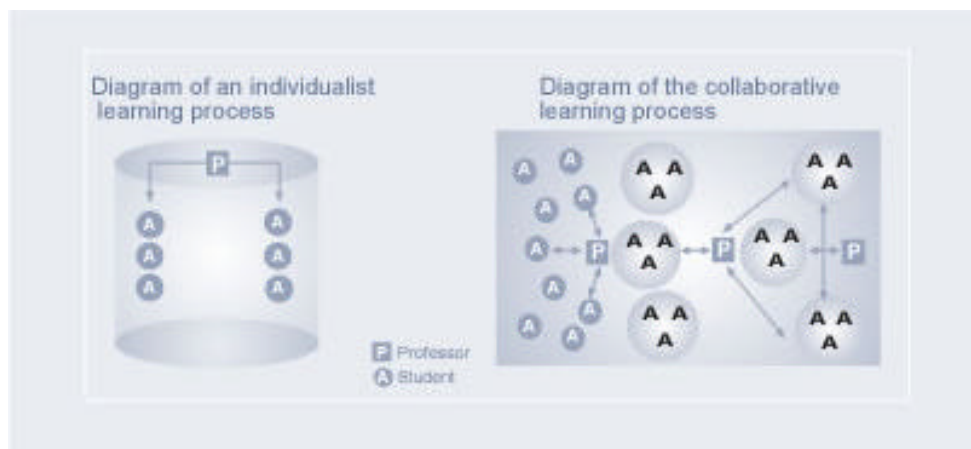
This strategy gives an important value to the contents of a program and helps to develop the Tec students' profile since it allows them to reflect about the ethical, political and social aspects related to topics of the course. These reflections are generally left in the background of the learning plan exclusively based on the discipline. Topics such as the relations among countries, the industrialization processes of world powers, the perspectives about the future of our societies can only be understood if the economic, social and ethic dimensions are taken into account. These reflections place the students in an appropriate platform to solve the problems related to the sustainable

development, even though this global perspective is not studied in the same way in all subjects.

The philosophy of how the contents are learned is beyond a learning process based on reproducing and remembering everything considered important. The concepts that are used in the classroom, and included in the textbooks, are generally abstract concepts that are enclosed knowledge isolated and away from the experiential world of the student. For this reason, they seem meaningless and as a consequence do not motivate students to learn them. As expressed by Jerome Bruner (1997): *A teaching system away from reality or presented to the students in such a fragmented and theoretical way that makes it unrecognizable is not useful to stimulate students' interest which is the core of a constructive activity.*

When the knowledge is applied to improve the environment, students become agents of history and stop being just spectators; they become the key of the

Figure 3.1 Diagram of the individualist learning and the collaborative learning



evolution of history. This way of having access to knowledge is important to develop students' commitment to his/her reality and promote a more active, responsible, critic and efficient participation.

The results that have reached educational investigators (Bruner, Piaget and Vigotsky, among others), do not mean that the present curricula is not coherent, but it is difficult for students and even for professors to see the relation between the curricula and reality. (See Table 3.1)

The knowledge acquisition from real situations present important advantages for the students:

- ? It develops a positive attitude toward permanent education.
- ? It makes the student more competitive in the professional area.
- ? It helps the student understand the reality in which he/she lives.
- ? It gives sense to his every-day work.

- ? It makes rewarding and meaningful his/her learning experience.
- ? It helps the long-term retention of knowledge.

Table 3.1 Diagram that contrasts the different approaches of knowledge.

<p>Knowledge in the traditional educational model:</p> <ul style="list-style-type: none"> <li>? is reproduced.</li> <li>? does not motivate students to study them.</li> <li>? is abstract and is closed into itself.</li> <li>? is not associated to real life.</li> <li>? is memorized.</li> </ul>	<p>Knowledge of the Tec's educational model</p> <ul style="list-style-type: none"> <li>? It is applied to solve problems.</li> <li>? Motivates students to study and</li> <li>? It is connected to real life</li> <li>? It is used for a scientific comprehension of reality.</li> <li>? It is used for critical, realistic and social compromise.</li> </ul>
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According to Brunner (1997) *the unconnected things are easily forgotten, they require a big effort to be remembered and unfortunately have a short life in memory.*

The learning processes mentioned above can be achieved if the student:

- ? Applies theory exploring and experimenting in real or simulated situations.
- ? Works on real life cases which require solutions based on theories or principles.
- ? Explains concepts offering valid reasons.
- ? Solves problems in practical situations.
- ? Participates in investigation projects and applies acquired knowledge to interpret a particular situation or phenomenon.

The educational model still has, as one of its main objectives, the acquisition of knowledge, since it is necessary to understand reality, move forward in the scientific knowledge, achieve more technological developments and, plan and take better decisions.

### **Challenges for professors**

Teaching contents of a course using real situations demands additional work to the professor. It becomes a challenge to which he/she must dedicate time, effort and creativity.

In this process the professor has to:

- ? Identify real situations which are challenging for the students. These situations should be connected to the contents of the course and should be described in a way that they could motivate students to study.
- ? Cover the content of the program incorporating the analysis of reality.
- ? Organize the process to give continuity to the students' reflection. It is important to consider that they have a school schedule in which they have a different subject and a different professor every fifty minutes.

### **3. Students direct their own learning process**

In order to prepare students for a constantly changing world, it is necessary to get students to learn not only relevant knowledge, but also the processes through which they learn. This learning process prepares them to be autonomous and to be able to educate themselves in a continuous way. It also prepares them to carry out actions from his/ her own interpretation of social reality within a frame of values and beliefs which define the obligations he/she has towards the others.

A professor helps his/her students develop autonomous learning when they are allowed to participate in experiences in which they are able to construct their own knowledge, this is, when students investigate, analyze and contrast information by themselves. Professors also facilitate this process when they propose working activities and organize the time in which they must be carried out. Another way is to present solutions defending their ideas and communicate them clearly so they could be understood.

In the self-learning process the professor previously establishes the criteria students must follow to carry out the activities. For example, in a report some criteria could be: appropriate use of technical terminology, structured ideas, opinions based on knowledge, original presentations. All of these criteria should be related to the objectives of the course.

On the other hand, at the beginning of the semester the professor informs the student what behavior is expected from them. This behavior is expressed in rules and policies to be followed, such as, the ability to administer his/her time handling in the homework assignment established in the established dates, the performance of the responsibilities in his/her team, the respect of the rules, as well as the ability to negotiate.

The criteria and rules are what must be done and have several functions. On the one hand, they are the guidelines to orient students in their process and on the other, students learn the process performing high quality activities. They are a reference frame used to contrast the work done, this is an essential condition that will help the student to evaluate and the group co-evaluate themselves.



#### 4. Student improve his/her learning process through a continuous evaluation

An implicit characteristic in the self-learning process is the improvement of the students' learning process throughout the process. As a result of this evaluation the students has the opportunity to reflect about the activities through with he/she learns and develops the ability to improve permanently. This is the ability to learn how to learn.

In the educational model based on the students, students generate an endless number of products from the activities. These activities allow the professor to have permanent information of how they have improved. With this information, professors can evaluate the performance of the group and of each one of its members, give feedback to the student and reflect with him/her about the process and about the results obtained. Finally, professors can also encourage the students to propose improvements and since he/she is the expert, he/she can reinforce those aspects that students did not understand. These characteristics add to the evaluation an educational function. This does not occur in the traditional model explicitly.

This function is the core of the educational model and the thermometers of all the other elements. It is also the essence of the professor as a facilitator and a guide of the learning process. The importance of this dimension has taken some change agents to conceptualize it as: *the basic tool to transform the teaching-learning process.*

This evaluation is known as *formative evaluation*, which is integrates to the working process and it is part of the learning process. Through this evaluation it is possible to know how students learn: It assumes that the professor will have a conscious and reflexive attention as one of their concerns when they teach.

(Sacritsan, 1992) The formative evaluation has the following intrinsic qualities:

- ? It turns the education and the learning process into a experience of innovation and continuous improvement and, to the group formed by the professor and the students, in an authentic community of learning, surpassing therefore the conservative character that has prevailed in the traditional education during many years.
- ? It is based on the concept that evaluation is practiced to improve. This is close to Stufflebeam's theory ( 1971) for whom the main objective of the evaluation is the perfection of teaching.
- ? It allows the professors to carry out permanent investigations in the classroom, being aware of learning complexity and of unpredictable situations of the educational phenomenon.

*The professor promotes the learning process giving the students the access to critical dialogs they come up with while doing their homework. This type of evaluation is part of the learning process and it is not considered a final activity based on results.*

Elliot, 1990

The formative evaluation contrast with the evaluation after the learning period for example at the end of a meaningful part of a subject, a unit or a course. This evaluation tries to test knowledge, no matter how

students work. Its view is retrospective and penalizes what has happened, viewing the last part of the process. It pretends to determine the level of performance and its main objective is to figure out if students have passed based on the results obtained. This evaluation is known as summative evaluation. It is most used and known by the professors. It does not have an educational objective, does not help to improve the process and is considered as the final step. This conventional evaluation method has become the goal of the learning process in such a way that students are more worried about passing the course than about learning.

Both evaluations, summative and formative, complement each other. When they are used the professor should be able to make the distinction between the different objectives, moments and ways to carry them out. However, the administration requires the summative evaluation which is necessary to prove to society that Tec graduate students have acquired knowledge, abilities and attitudes which are required to practice his/her professions. The formative evaluation will help them fulfill his mission as a professor.

### **Characteristics of the formative evaluation**

- ? It is carried out with less severity than the summative evaluation; however, it provides more information.
- ? It requires the student to participate in a communicative environment to be conscious of his/her reality and to be able to propose improving alternatives.
- ? It is practiced through out all the learning process and allows the professor to correct the educational action continuously before getting to the end.
- ? It is practiced in a frame of values which are more varied than the ones which are exclusively academic. This way, they are applied not only to knowledge but also to abilities, attitudes and values.
- ? It understands students in a more human way, since it is centered not only in the intellectual aspect of persons but also in affective, ethic and social dimensions.
- ? It gathers data not only about the students' improvements and results, but also other aspects related to teaching such as: the professor, the methodology and the activities and relationships and among others.
- ? It requires the professor to establish the criteria or reference frames that specify the characteristics that a project of assignment should have or how students' performance should be in order to evaluate them positively.

In table 3.2 these two evaluation types are contrasted.

### **Students' self-evaluation**

An important component in the self-learning process is to incorporate the student as an evaluator of his own learning process. Self-evaluation is considered as *the students' reflection about his/her own actions through a self-critic process which will help in his/her autonomy and will promote student's responsibilities and obligations with his/her learning process*. If students control and register their advances, they have a chance to evaluate their progress and be conscious about

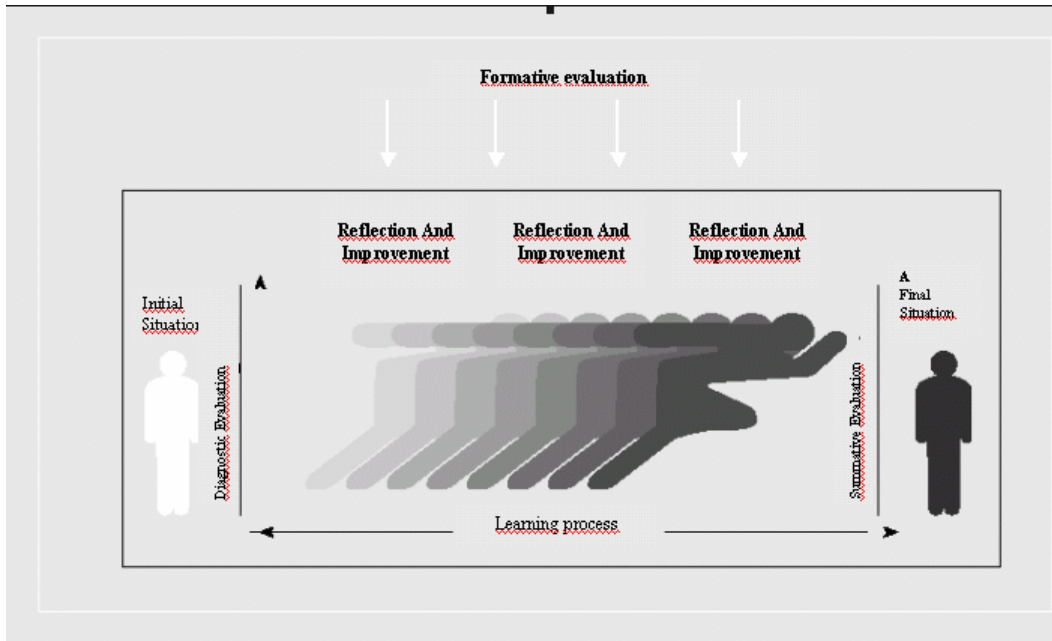
how far or near they are from their goal. After analyzing their own results students can make improvements and can even propose alternative learning processes, this is always done under the professors' observation and guide. ( See Figure 3.2)

The self-evaluation is framed in a democratic and formative conception of the educational process in which all the members participate actively, and it is incorporated as a learning process which offers the following:

Table 3.2 Summative evaluation in contrast to formative evaluation

Summative evaluation	Formative evaluation
? It has an administrative and social function.	? It is used to improve.
? It is oriented to evaluate knowledge.	? It is oriented to evaluate all areas.
? It is applied at the end of the learning process.	? It is integrated to the learning process as an activity.
? It is carried out by the professor.	? Students are the main evaluation agents.
? It uses formal exams.	? It uses a variety of natural situations in which students can participate.
? It is stricter.	? It includes dialogue.
? It is used as if they were the main objective.	? It is an instrument used to reach an educational goal.

Figure 3.2 Continuous improvement process



- ? It helps the self-learning process.
- ? It develops critical ability.
- ? It promotes the decision-taking ability.
- ? It gives the student the responsibility of his/her own learning process.
- ? It prepares the student for a continuous education.
- ? It teaches students to think.
- ? It promotes a culture of high quality.
- ? It performs a continuous improvement.

### How to perform formative evaluation

In order to facilitate the students evaluation in different areas, the professor uses a variety of instruments, since in each one of them are used to get certain information. Table 2.3 shows the most used methods.

Table 3.3 Evaluation instrument

	Characteristics
Open questions	
Oral	
? Conventional questions	? They have more than one correct answer.
? Debates and discussions	? They promote high-level thoughts such as diversity and creativity. They also establish different understanding levels.
? Students presentations	? They measure conceptual comprehension.
Written	? They develop written communication.
? Essays	? They express organization of knowledge and structure of thought.
? Answer questions	? They allow the professor to test the type of operations and abilities used in the instruments' elaboration.
? Problem-solving projects	? They allow the professor to evaluate the appropriate, vocabulary, originality and creativity.
? Text comments	? They allow the professor to know the students' learning style and intervene in
? Reports or assignments on specific topics	
? Lab reports	
Practices	
? Design, creation, realization, elaboration or construction of a product.	

	<p>them.</p> <ul style="list-style-type: none"> <li>? They are techniques which are easy to be elaborated by the professor.</li> </ul> <p>Limitations</p> <ul style="list-style-type: none"> <li>? The professor needs time to evaluate the products done by the students.</li> </ul>
<p>Closed questions</p> <p>Types</p> <ul style="list-style-type: none"> <li>? Brief answers and fill in the blanks</li> <li>? Multiple-option questions</li> <li>? Matching</li> <li>? Ordering</li> <li>? Analogies</li> </ul>	<p>Characteristics</p> <ul style="list-style-type: none"> <li>? Students should identify the correct answer through discrimination.</li> <li>? They offer the possibility to discuss in class and use the mistakes as class material: identify the wrong ideas and determine which aspects are exceeded and which ones are missing in order to correct them.</li> <li>? They promote the students' interest giving feedback based on their mistakes and correct answers.</li> </ul> <p>Limitations</p> <ul style="list-style-type: none"> <li>? They do not measure creativity, originality, elaboration capacity, nor the student's personal way to focus on the topics and the way he/she expresses them.</li> <li>? They do not offer information about objectives of attitudes, collaboration, participation, responsibility, implication in the assignment and leadership.</li> </ul>
<p>Observation</p> <ul style="list-style-type: none"> <li>? Diaries</li> <li>? Observation guides which indicate the components of a specific behavior or learning component.</li> <li>? Valuation scales</li> <li>? Attitude scales.</li> <li>? Questionnaires with the objective to explore students' attitudes.</li> <li>? Less elaborated forms such as narratives, diaries and reports.</li> </ul>	<p>Characteristics</p> <ul style="list-style-type: none"> <li>? They are specialized to obtain information about the natural conduct and events in the classroom. Conduct is interpreted as a wide range of manifestations and behaviors in activities and situations that show how students are and act. It is not possible to have access to this information through other types of evaluations.</li> <li>? They are more commonly used in natural situations in opposition to exams, which are carried out in situations specifically planned for the evaluation.</li> <li>? It is possible to use affective objectives, interest, working habits and learning techniques.</li> </ul> <p>Limitations</p> <ul style="list-style-type: none"> <li>? They demand the professor to be well prepared as an observer.</li> <li>? They require effort, dedication and time.</li> <li>? Results are not generalized, they are idiosyncratic, however, this can be considered a strength.</li> </ul>
<p>Interviews</p> <p>They are used a special context in which there is a straight relation between the professor and the student. It is much more than just feedback of the learning results. They demand time from the professor. This is a very important function and must be part of the course plan.</p>	<p>Characteristics</p> <ul style="list-style-type: none"> <li>? They have a lot of contributions and help to obtain personalized information.</li> <li>? They are important sources of reinforcement, proximity and communication.</li> <li>? They are a relevant source to evaluate</li> </ul>

<p>Types of interviews according to its objective:</p> <ul style="list-style-type: none"> <li>? Complete data form other sources</li> <li>? Offer orientation to the students.</li> </ul>	<p>students' attitudes, perceptions and assessments which affect directly the learning process.</p> <ul style="list-style-type: none"> <li>? They allow the professor to use appropriate reinforcements, stimulations and orientations according to students' needs.</li> </ul> <p>Limitations</p> <ul style="list-style-type: none"> <li>? They require a context which allow and open and sincere dialogue where the student can feel secure.</li> <li>? It requires previous training form the professor.</li> </ul>
<p>Portfolio Evaluation</p> <ul style="list-style-type: none"> <li>? It is a very good technique to perform formative and self-evaluation.</li> <li>? It is a container of assignments chosen by the student which illustrates his/her learning development and achievements through out a specific period of time.</li> <li>? It is an evidence file which shows students' competence.</li> <li>? It belongs to the student and it is administered by him/her.</li> <li>? It is evaluated by the student and the professor.</li> </ul>	<p>Characteristics</p> <ul style="list-style-type: none"> <li>? It records the students' growth and the advance of his/her knowledge which occurs during the learning process.</li> <li>? It is a structured and continuous way to perform the evaluation.</li> <li>? It allows the students to reflect and become responsible of his/her learning process.</li> <li>? It is also a learning activity and it develops in the student the following abilities: <ul style="list-style-type: none"> <li>o Be conscious about the process.</li> <li>o Obligation with his/her learning process.</li> <li>o Critical thinking.</li> <li>o Decision-taking ability.</li> <li>o Problem management and solution proposals.</li> <li>o Be prepared for continuous education.</li> </ul> </li> </ul>

## Expression of students assessments

The formative evaluation is also complex in expressing its results. It does not offer an appropriate orientation to reduce to a number all the information obtained form the student. The expression of the evaluations always imply an information reduction; this has required the use of complex and varied formats, such as a rubric which is a table that has a vertical column where the categories or criteria to be evaluated are incorporated. It also has a horizontal column where the ranges where the professor can find the students' domain level in each one of them. (See table 3.4 and 3.5)

Table 3.4 Rubric for an investigation project.

Aspect to evaluate	Ranges			
	1	2	3	4
Presentation	Boring Unprepared Disregard	Not practiced Low voice Mistakes in	Clear voice. New information.	Creative Uses expressions

Originality	Unfinished	the product.	Correct product. Practiced. Accessible, it looks real.	Movement Real product
	The project is a minimum collection or repetition of ideas from other persons, products or inventions. There's no evidence of new ideas.	The project is an extensive collection and a repetition of ideas from other persons, products and inventions. There's no evidence of new ideas	The project shows evidence of originality and ingenious. The project is more than a collection and offers new information	The product shows evidence of meaningful originality and ingenious. Most of the content and most of the ideas are original based in logical conclusions and are supported by a good investigation.

Table 3.5 Rubric of Group Participation

Aspect to be evaluated	Exceptional	Admirable	Acceptable	Amateur
Degree of incorporation of the group members.	All students enthusiastically participate.	Most students actively participate.	At least half of the students discuss and present their ideas.	Only one or two persons actively participate.
Shared responsibility	Responsibility for task is shared evenly.	Responsibility is shared by most group members.	Responsibility is shared by one or two members and the others are not involved.	Exclusive reliance on one person.
Interaction quality	Excellent listening and	Students show	Some integration	Little interaction;

	leadership skills exhibited; students reflect awareness of other's views and opinions in their discussions.	adeptness in interacting; lively discussion centers on the task.	abilities are shown, they listen attentively, there is evidence of discussions and alternatives.	brief conversations; some students are distracted or did not show interest.
Roles in the group	Each student assigned a clearly defined role; group members perform roles effectively.	Each student has a role, but the roles are not clearly defined or are not consistent.	Students assigned roles but did not adhere to them in a constant way.	There was no effort done to assign roles to the group members.

### **Professors' experience**

When professors apply formative evaluation they face difficulties such as:

- ? Students do not value an evaluation that does not affect his/her final grade, therefore, they are not interested in evaluate something that does not have any value. This information shows the control the final evaluation has in the learning process.
- ? The professor frequently observes that students are not honest that they need time to understand that there is an evaluation dimension which is only used to improve and does not interfere in their final grade. As long as the formative evaluation has a grade, it will be difficult for students to feel free to express their opinions in an open and objective way.
- ? The professors' tendency to give formative evaluation the same importance of summative evaluation, takes him/her to give a grade to the students result and forms the students' final grade with an addition of different percentages which belong to different situations.
- ? It is difficult for the professor to assume, on the one hand the role of the students' friend which he performs as a facilitator and on the other, a judge role when he/she has to evaluate students at the end of a course. Both roles contaminate the relation between them.