Evaluative Methodology to Develop Higher Skills

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Abstract

The objective of this research is to provide an evaluative methodology to develop higher cognitive skills. From the methodological perspective, a qualitative was required, based on primary and secondary sources of research to increase thinking. The results showed that a series of premises must be implemented for the development of lower and higher thinking, among them, purpose, explicit teaching, intentionality of the evaluation, evaluation criteria, simple and complex strategies, monitoring, formative evaluation, process feedback and homework, metacognition, among others. As part of the discussion, it seems that teachers need to apply training strategies and implement permanent monitoring in students to promote learning. On the other hand, they must recognize the lower skills that are not internalized in the learners, because these are the starting base to achieve the higher taxonomies. It is concluded that formative evaluation and feedback are effective actions to generate higher taxonomies.

Keywords: higher thinking, cognitive skills, formative evaluation, feedback, abstraction.

1. Introduction

The main purpose of this research is to present and explain deeply an evaluative methodology for improving the development of higher cognitive skills. It is made up, with a series of elements that pull over high cognitive skills and other premises of methodologies skills in some students, such as: (a) to formulate a purpose that specify the aims of what you really want to achieve; (b) to give the explicit knowledge about what is going to be taught (Beas et al., 2014).

Then, and not less important, is to describe the actual intentionality of the evaluation, diagnostic, formative and summative; which focuses and make emphasis in the process formative evaluation. Here, there are a bunch details about the activities that should be done in advance; those are the followings: to identify the progress and setbacks of the students. Besides, to provide

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clear criteria to be applied and how it is going to be implemented the feedback of the process and certain tasks (Hattie & Timperley, 2007), those actions are not clearly specified within a planning. On the other hand, it is clear that, the development of skills must be worked through activities and tasks both either inside the classroom or outside it through practicing, with high perseverance and dedication, those terms of excellence were described by Thomas Alba Edison (cited by Borrero, 2008), and that must be worked with high level of complexity.

Generally, some teachers do not consider lower skills inside the learning process itself, but it is important to point out that, those are the starting points to advance in the development of higher skills. For instance, a great example is the comparison, a taxonomically low skill is very important during this process, because comparison allows the identifying the similarities and differences between them, according to Borrero (2008).

The skill mentioned above. Is one of the most important skills that students must have to advance in their cognitive processes? Otherwise, the learning process is hardly done. Another basic or inferior skill is the comprehension, if a student does not understand what he reads, he will not be able to create and make schemes that synthesize information, and even he made some inferences about certain concepts between them.

1.1 *The intentionality of the evaluation*

The evaluation must be developed in all its fields of actions, it means, this should be applied according to the intention of the evaluation (diagnostic, formative and summative), including all moments and the internal agents (self-evaluation, co-evaluation and hetero-evaluation) that are involved in it (Sanmartí, 2007).

The diagnostic, formative, and summative evaluations are kinds of evaluation that allows us, to know what students can do in order to teach them what they need and the time they require for it.

1.1.1 *The diagnostic evaluation*

It allows determining the initial state in which the student is about during the learning process, at this moment, the teacher can apply, questionnaires, checklist, assessment scales, or other evaluative procedures to establish the skills and previous knowledge that the student carries out. Also, identify the attitudes, interests and the difficulties that the student has toward the learning process. That will help the teacher to have a starting base to prepare the implementation of didactic strategies and to be able to update their planning of the activities to be executed in the classroom to achieve the scheduled goals of the training itinerary.

1.1.2 *The formative assessment*

This phase of the evaluation is one of the most important, due to, it allows the interaction between teacher-student, in addition to it, teachers have the opportunity of monitoring the learning of didactic strategies in the process.

This branch of the evaluation is close and flexible because it does not carry a summative grade and it must be developed throughout the teaching/learning process. The concern of any training action is always gotten inside it, and allows the following:

- Give feedback to the student and the teacher on the progress and successes of the student through this formative evaluation.

- Identify the problems that students have to learn, the type of mistakes they make and how they take advantage of them for a better understanding of learning contexts.

- Identify the difficulties and failures that students have in the development of reading strategies to take immediate and remedial actions, favoring all students to learn why they are preparing for.

Through formative evaluation, the teacher takes advances of the evidence for the improvement of his teaching, the materials, means, and instructional procedures. Also, it allows the teachers to give differential attention to those students who require it, constituting a great factor of efficiency and professional development.

These types of evaluations must be brief and precise, owing to the fact that, the student wants to know where he made a mistake, at the same time, the teacher must give him the answer as soon as he can, in other words, here, the teacher must realize which part of the reading strategy is more difficult or easier to apply during the reading process.

The formative evaluation is manifested in all the practical exercises that the students develop in the classroom, both individual or in group. A concrete example of it, is when a student is building a concept maps, the teacher could use guidelines that verify the status of the work done by the student.

In this case, a checklist will be applied as an example to verify this type of evaluation, which allows the student to identify if the map has a hierarchy, the correct use of essential concepts in it, and, if there are relation between concepts, and finally, the teacher can evaluate the graphical representation on the map. All these actions must be evaluated at a specific time.

This instrument is one of the first that should be used by the teachers, mainly, for the easy way of its application, especially when the student is learning a new strategy. Also, it can be applied as a co-evaluation, that is to say, when it is evaluated among pairs of students, which supports the learning and feedback from both the teacher and the student, this point will be detailed later in evaluation agents.

Likewise, within the formative evaluation, there is the opportunity for the student developing the formative evaluation (Sanmartí, 2007), that is, the self-regulation of their own learning process, to be exact, the student must develop their ability to regulate themselves; the student must learn to self-monitoring, as well as self-correcting to visualize their own progress.

1.1.3 *The summative evaluation*

It is the last evaluation that is applied to evaluate a final product, it allows to qualify the student, an evaluation which is required in most educational organizations; therefore, the teacher must use various evaluative procedures to qualify students at this stage.

Activities can be evaluated through task performance techniques, as well as, open and closed items instruments or other procedures that the teacher deems appropriated, according to the learning goals and the achievement indicators that have been raised in their planning.

The evaluation of the concept maps will be through rubrics. This instrument allows observing in a global way the student's task according to previously established criteria and levels of execution of a student's performance in the construction of a conceptual map.

It is important for the teacher to be clear for identifying the qualities to be evaluated, and the criteria must be comprehensively described, either the teacher or the student; Furthermore, these guidelines can be shared and socialized with other teachers with the same level, with the purpose of using valid and reliable instruments, evaluating with common criteria and common procedures too.

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It should not be forgotten, that the student must know this guideline previously, the construction of the final conceptual map.

1.2 *The evaluation agents*

The purpose of applying the internal agents of evaluation – self-evaluation and co-evaluation- is that the student takes his own responsibility and to be part of the evaluation process. The recommended percentage to apply to self-evaluation and co-evaluation agents fluctuates between 5% and 10% respectively.

It is suitable to use these agents at the beginning of the formative evaluation, so, that the student becomes accustomed and be familiar with this task, he/she must take advance of that, this is another function that he/she should fulfill in the classroom in certain activities. Likewise, this opportunity is given to the student to regulate their own learning on the subject.

Afterwards, the student will be adapted and internalized this new function; the teacher can apply it with a percentage that should be summative.

Following the internal agents of the evaluation are described, which are required to be applied within the curricular activities in a planned and graduated manner by the teacher, as well as, to be mingled with the students.

1.2.1 *Self evaluation*

The student evaluates his own activities, in order to learn the asses in his learning process in generic terms. This type of evaluation is generally applied at the end of each activity, it means, some teachers apply it at the end of the teaching-learning process, but in the case of primary and secondary students, it is advisable to use it more permanently, at the end of small units, in order that students become aware of learning and how they have learned it.

According to Castillo (2006), he points out that self-evaluation works both the teacher and the student, mainly because it allows the student to develop a critical and reflective attitude, a condition that is essential for students to carry out their own learning activities, as well as, They learn to self-regulate in the modifications that they must introduce to achieve the objectives, so, to choose the most appropriate and didactic strategies for their learning, supporting progressive improvement. For the teacher, it allows him to appreciate the performance and to know the situation of the students.

1.2.2 *Co-evaluation*

It is a mutual or joint evaluation of an activity carried out among several students. The main goal is to improve one's learning gradually. Furthermore, they become aware of both individual and group progress and problems.

In the application of the agents – self-evaluation and co-evaluation – the teacher also uses strategies before, during and after. At the beginning, it indicates the instructions in a clear and understandable way of how they will use these agents. During the development of the activities; he guides the activities and tasks, regarding how to do it, which are the difficulties and how they will have, how they should solve, that is, the teacher guides the student at all the times, because they are not used to evaluating themselves and when it comes to their classmates, it becomes more complex and difficult for them to carry it out.

During the process for both, self-evaluation and co-evaluation, the teacher must give the guidelines or planning instruments with the previously established. The teacher must promote the comments of the students and the reflection of the assigned tasks, in order to pull over conclusions and propose improvements to both the activity and the application of the agents.

1.2.3 *Heteroevaluation*

It consists of the evaluation that one person performs on another one, in terms of their work, performance; specifically, it is the one that the teacher implements to the student.

A permanent evaluation allows the teacher to obtain valid and reliable information, through various evaluative procedures, with this information he can make a judgment about the activities, tasks and facts that the student develops to finally make relevant decisions regarding the achievement of learning, in order to adjust, design and adopt the best teaching strategies to consolidate skills in students.

1.3 *Lower habilities*

According to the lower-level taxonomy (Anderson et al., 2001; Krathwohl, 2002), it is understood by these, which are cognitively low level, among them, there are, knowledge, remembering, selecting, relating, understanding, comparing, etc.

Teachers must consider these skills before consolidating complex cognitive processes, because if a student does not understand it, is very difficult for him to create or elaborate a procedure within a didactic strategy.

1.4 *Higher habilities*

Higher thinking is one that encompasses skills such as: analyze, synthesize, evaluate, create, abstract, among others (Murray, 2014), that is to say, at this level a student must have consolidated lower skills (González-Murillo et al., 2017; Prieto-Parra et al., 2020), he tests himself, his ability to solve problems, creativity and achieve effective critical thinking and, above all, manage to combine new information and the knowledge stored, according to López and Whittington (2014).

One of the difficulties found in the learning results of curricular activities is the lack of higher taxonomies, which usually reach the application level, according to González-Murillo, Cárdenas-Galindo and Arellano-González (2017), they point out, in their writings of an intermediate level, and is "to use a procedure in a given situation", therefore, they do not generate situations that cause a creation in the student.

On the other hand, another difficulty is the teaching of the contents with unreal and decontextualized examples, which do not consider the experience and the environment where the student develops, thus, there is no meaningful learning for this, which is usually called authentic evaluation.

On this last point, Herrington and Herrington (1998), describe 4 categories, namely the authentic evaluation:

- Context: It is the place where the student is, and the environment that surrounds him.

- Student's role: It refers to the active role that the student has the situation, a role that must be the protagonist of learning.

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- Authentic activity: It consists of real activities of daily life with the student does during the day and that can be simulated in the evaluation so that they acquire knowledge.

- Indicators: The teacher must provide multiple learning indicators to evaluate a student's performance.

Table 1. Seven learning dimensions

Advantages	
1.	Deep knowledge
2.	Connecting knowledge with underlying concepts
3.	Problem solving
4.	Reasoning
5.	Communication
6.	Selecting technology effectively
7.	Applying technology effectively

Sources: Flewelling and Higginson, 2002.

In summary, these seven advantages of the learning dimensions of an authentic assessment that Flewelling and Higginson (2002) describe, generate deep learning in the student, connect knowledge with preconceived definitions, and develop the ability to solve problems in any context. Moreover, reasoning and communicating learning with the selection and use of technology are characteristics of an effective assessment.

Dimensions by Marzano and Pickering (2005), describes five dimensions to generate deep thought:

Dimension 1. Attitudes and perceptions. In this dimension, he describes that the student's perception of the learning environment where do the homework is an important and positive indicator for generating skills.

Dimension 2. Knowledge, acquisition and integration. It refers to the ability to acquire new knowledge you already have, in order to organize your thinking process.

Dimension 3. Extend and refines knowledge. It consists of using resources and techniques to extend knowledge, among them, they are: comparison, classification, abstraction, inductive reasoning, deductive reasoning, perspective analysis, among others.

Dimension 4. Meaningful use of knowledge. It refers to the use of knowledge in real and meaningful situations for the student, including decision-making and problem solving.

Dimension 5. Productive mental habits. This last dimension refers to the thinking habits that a student can achieve, which are critical thinking, creative and metacognitive thinking.
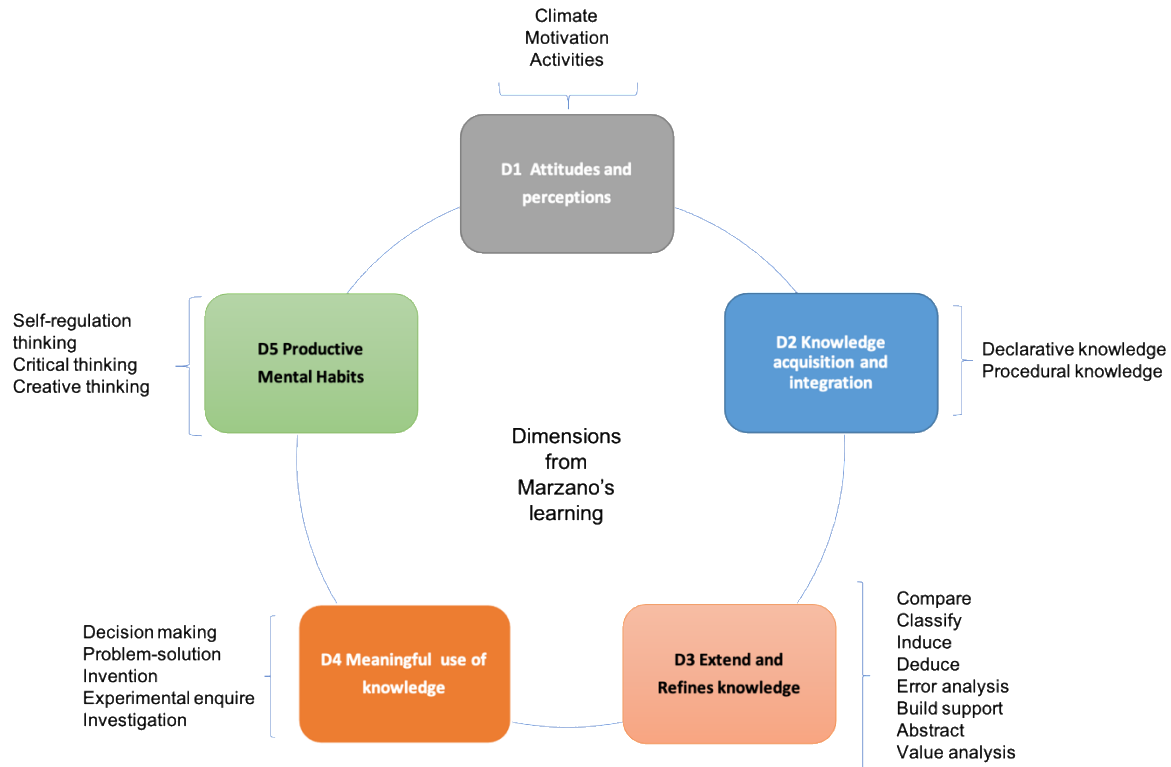
Figure 1. Dimensions from Marzano's perspective Source: Calvo (2014)

In short, according to Marzano's dimensions, it must be worked on, in an integrated way, because in isolation it is not possible to develop good learning, therefore, this model presents us a methodology with different dimensions and components that have a didactic sequence to finally arrive at critical, creative and self-regulated thinking.

1.5 *Metacognition*

Another point to consider is the metacognition activities, which is thinking about their own thinking, also to transferring learning to different real-life situations (Beas et al., 2014; Herrera, Valdivia, García & Zagalaz (2018). Several researches highlight it in their writings, due to, the student must identify their weaknesses and strengths, what are their mental habits, what disposition they have towards learning, how they carry out their own monitoring or progress and what strategies are the ones that put up them to work the tasks according to the degree of ease or complexity that these grant you and finally, decide whether to make a change or not.

Flavel (1979), is one of the pioneering authors who introduced this term through research, stating that it is "cognition about cognition, also defines metacognition as" ... the active monitoring and consequent regulation and orchestration of these processes [processing activities] in relation to the cognitive objects or data on which they bear, usually in service of some concrete goal or objective..." (Flavell, 1976: 232). In other words, it highlights monitoring and regulation to comply with the proposed goals.

The author classifies in three aspects: Metacognitive Knowledge, Metacognitive Regulation and Cognitive vs Metacognitive Strategies.

Nevertheless, Lusk (2016), describes that metacognitive processes develop during the learning process of a student, in which various activities are applied, including: evaluating one's

own knowledge and the ability to learn new knowledge or generate another skill together with the planning and application of a series of actions or tasks to achieve it, likewise, monitoring your own progress and evaluating the results you have achieved to finally make the decision if it is necessary to adjust or change those actions that you have implemented .

Gaviria (2019), concludes in his studies that metacognition is essential mechanism in the teaching and learning processes in all areas of knowledge, however, adds an influential variable in this concept factors associated with motivation, beliefs and individual goals.

Burón (1996), represents the metacognition in four characteristics, among them, the identification of the objectives to achieve the mental process, selection of strategies, the observation of the process itself that generates the new knowledge in order to verify if the strategies are the appropriate ones and finally, the evaluation of the results, to determine if the objectives have been achieved.

To sum up, metacognition contemplates several aspects that the student himself must carry out to become aware of his learning, but it is the teacher who must guide and deliver the strategies in each of the phases (beginning – development – end) so, that the student achieves this ability, it means, this scaffolding is given by the teacher, however, the student must also generate their own strategies because he is the one who must know how to produce this metacognition process and realize what is happening in his learning and request help when required, which is part of the monitoring and control that are not usually reflected in planning.

2. Method

The type of study that uses a qualitative methodology, owing to the fact that, it works with secondary quantitative and qualitative data sources from research to develop skills, based on data from research to progress skills.

2.1 *Design*

The design is descriptive, so, the results of four investigations that deal with higher thinking, skills are described.

2.2 *Sample*

The selection of the sample was of an intentional one, the nature from investigations that will work on superior abilities. Finally, a variable was considered that the conclusions of the studies were to enhance student learning.

2.3 *Procedure*

Secondary data used as a source of information regarding the evaluation methodology. Secondary data analysis is the analysis of data that was collected for a different initial purpose, being an alternative when you do not have much time and resources (Johnston, 2017).

The selection was intentional about the premises to develop skills, authors such as: Murillo, Galindo and González (2017); Herrera, Valdivia, Alonso & Zagalaz (2018); Roys & Pérez, (2018); Bonilla and Díaz (2018) and Aravena-Gaete, Campos-Soto and Rodríguez-Jiménez (2020). The procedure was to analyze the results of studies on effective actions to generate higher thinking skills, in order to contrast the results of the investigations.

3. Results

Subsequently, it shows some research results on higher thinking, which reflects in their conclusions that certain actions are effective to generate cognitive skills in students.

Table 2. Research results

Investigation	Authors /year	Results
Development of higher thinking skills, through performance activities	González-Murillo, Cárdenas-Galindo & Arellano-González (2017)	Actividades formativas Retroalimentación
Metacognition in Second Language Learning: Strategies, Instruments and Assessment	Bonilla & Díaz (2018)	Metacognition Metacognitive strategies Monitoring
Metacognition and autonomous learning in higher Education	Herrera, Valdivia, Alonso & Zagalaz (2018)	Metacognition
Meaningful learning strategies in higher education students and their association with academic achievement	Roys & Pérez, (2018)	Planning, control and self-regulation strategies
Learning Strategies at a Higher Taxonomic Level in Primary Education Students in the Digital Age	Aravena-Gaete, Campos-Soto & Rodríguez-Jiménez (2020)	Simple and complex strategies

Source: Own elaboration based on thought development studies

The results of the studies shows that to implement strategies that are carried out from the simplest to the most complex, through planning, monitoring and self-regulation by the teacher together with the metacognition that the student does, a process of thinking about your own thinking, so, those are one of the most effective actions to generate lower and higher skills, on the other hand, the training and feedback activities that the teacher must do collaborate and cooperate so that these skills can be produced within the mind of each individual.

4. Discussion

Reflection on the responsibilities of the students' thought processes is a subject to be discussed, because it is generally thought that teachers are the ones who should do this task, however, this job is the responsibility of the entire educational community, including the State, who must deliver the curricular guidelines and bases to carry it out. On the other hand, parents are also part of this process, which from childhood can contribute to this work with the formation of study habits to ensure that a person has good quality thinking.

Today, Universities are responsible for delivering the tools and initial teacher training to teachers so that they in turn train their own students with higher thinking skills, therefore, they have to take charge of these competencies during the training process of a teacher.

5. Conclusions

It is determined that formative evaluation and feedback are effective actions to generate higher taxonomies in students, however, these variables must be complemented by

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varied and innovative strategies together with the explicit teaching of the contents, otherwise, by themselves, they cannot generate higher thinking.

On the contrary, metacognition is an action that must be integrated into the teaching and learning process, so, the student should be aware of how he advances and retreats in his own thinking, but then, it is also necessary that he discerns what skills are more complex to develop when executing a task, these are some of the premises that the teacher must consider in his planning in order to monitoring and controlling learning together with the strategies he uses to generate a reflection on his thinking.

The teacher is one of the responsible agents who must plan the didactic strategies, the level of lower and higher skills that they must achieve in the students within their learning results declared in their curricular activity, in addition to specifying when they will implement the evaluation formative, feedback even declaring the metacognitive process.

Finally, according to what was discussed previously, exposed and considering. Marzano's model becoming aware of the premises that we must do for developing and increasing our cognitive skills.

It is a responsibility of all of us who teach, to challenge ourselves; we have to advance step by step to achieve it in each of our students, through an assessment methodology to develop skills. On the other hand, implementing an evaluation methodology, which integrates various aspects, is complex in these times of health crisis, since the use of technologies is one of the variables that is influencing this effectiveness, therefore, the commitment and motivation plays an important role in effectiveness of the teaching process.

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