

MENDIVE

REVISTA DE EDUCACIÓN

Translated from the original in Spanish

Cognitive skills and didactic interaction strategy: a possibility through the questions asked in class

Habilidades cognitivas y estrategia de interacción didáctica: una posibilidad a través de las preguntas formuladas en clases

Competências cognitivas e estratégia de interação didática: uma possibilidade através de perguntas apresentadas nas aulas

Marisol del Carmen Álvarez Cisternas

Facultad de educación Docente
Postgrados. Universidad Arturo Prat.
Chile.

ORCID: <http://orcid.org/0000-0002-1418-9524>.

Correo electrónico:
marisol.alvarez.cis@gmail.com

Received: April 24th, 2020

Approved: October 6th, 2020

ABSTRACT

The article, describes how outstanding teachers through their questions, can develop cognitive skills in their students. The research was carried out, from a qualitative methodological approach, of a descriptive nature with a non-experimental design with an intrinsic case study, since the interactions

through the questions formulated in classes, between teacher and students of the subject of Language and Communication of fourth and fifth year of basic education according to Chilean legislation. The results show that teachers, through the questions they ask in class, stimulate in their students, preferably the development of rote memory skills, with questions that promote low cognitive demand prevailing, over higher level cognitive skills.

Keywords: outstanding teacher; cognitive thinking skills; didactic interaction.

RESUMEN

El artículo describe cómo profesores destacados, a través sus preguntas, pueden desarrollar habilidades cognitivas en sus estudiantes. La investigación se llevó a cabo desde un enfoque metodológico cualitativo, de corte descriptivo, con un diseño no experimental con un estudio intrínseco de casos; se describieron y analizaron a través de tres clases videograbadas las interacciones a través de las preguntas formuladas en clases, entre profesor y estudiantes de la asignatura de Lenguaje y Comunicación de quinto año de enseñanza básica, acorde a la legislación chilena. Los resultados dan cuenta de que los docentes, a través de las preguntas que formulan en clases, estimulan en sus estudiantes, preferentemente el desarrollo de habilidades memorísticas, predominando preguntas que promueven baja exigencia cognitiva, por sobre habilidades cognitivas de nivel superior.

Palabras clave: docente destacado; pensamiento cognitivo; interacción didáctica.

RESUMO

O artigo descreve como professores notáveis, através das suas perguntas, podem desenvolver competências

Translated from the original in Spanish

Available from: <http://mendive.upr.edu.cu/index.php/MendiveUPR/article/view/2004>

cognitivas nos seus alunos. A investigação foi realizada a partir de uma abordagem metodológica qualitativa, de corte descritivo, com um desenho não experimental com um estudo intrínseco de casos; as interações através das perguntas formuladas nas aulas, entre professor e alunos da disciplina de Língua e Comunicação do quinto ano do ensino básico, de acordo com a legislação chilena, foram descritas e analisadas através de três aulas gravadas em vídeo. Os resultados mostram que os professores, através das perguntas que fazem nas aulas, estimulam nos seus alunos, de preferência, o desenvolvimento de competências de memória, questões predominantes que promovem uma baixa procura cognitiva, sobre competências cognitivas de nível mais avançado.

Palavras-chave: professor notável; pensamento cognitivo; interação didática.

INTRODUCTION

At present, the debate on the quality of teaching practice and education in Chile has generated that most of the research topics are related to the teaching - learning process and the work of the teacher (Martinic and Villalta, 2015). Indeed, it is taking as reference the Framework for Good Teaching (MBE), it is possible to advance and deepen in matters relating to the teacher work. Thus, the MBE establishes four dominion performance with their respective criteria, ranging from the preparation of the class, creating suitable environments for the development of the class, to professional responsibilities.

Today in Chile, the System of Evaluation of Teacher Professional Performance (or Teacher Evaluation) is a mandatory evaluation for teachers who

work in municipal establishments and Local Education Services (SLE) throughout the country. The possibility of investigating the educational reality in the classroom allowed us to delve into those aspects of teacher-student interaction, perhaps little analyzed, that require further development and support. Thus, according to the evidenced results for the Teachers evaluation in Chile (MINEDUC, 2014), which states in the filmed classes was observed that most of the teachers establish interactions with students that do not favor the development of thought or do not constitute a significant support to enrich their learning, be it a conceptual or procedural content. By virtue of the foregoing, this article focused its analysis, precisely on the interactions that occur in the classroom; for it is situated inquiry into the domain C of the MBE, which is "education for all students learning", criteria 5, corresponding to the development of the thinking of the students. Depending on it, the questions that teachers performed and how through these skills can be developed cognitive skills in students were analyzed.

As indicated in the previous section, starting from the MBE, the study focused on the questions asked in their classes by teachers who have been evaluated as outstanding. Indeed, as specified in the evaluation system of the professional performance, the Outstanding teacher (DD) is the education professional that presents defining characteristics, so that their performance is satisfactory; On one hand, it is constituted as a facilitator of significant learning, and on the other hand, it is responsible for organizing learning situations, so that all students acquire the knowledge and skills expected in the curricular framework. In this regard, it is important to recognize that the DD uses strategies to achieve the best learning in their students.

The question as a teaching-learning strategy for the development of cognitive abilities

Among the different didactic strategies that the teacher develops in the classroom, it is the one related to the interaction that is generated between the teacher and the student, which allows promoting structures of pedagogical dialogues that by means of the question can make the students reflect; in this way, symmetrical dialogue structures must be fostered. In the classroom context, asking a question promotes an interaction between teacher and student. In most cases, the interaction is generated by the teacher, who uses this resource to stimulate their students from the cognitive aspect and achieve their participation. Now, each question formulated in a class is geared to play a role, for example, a question to the start of the class or at the end is far in its characteristics.

Together with the above, the question becomes the engine of interaction in the classroom, and at the same time, the strategy that allows learning into action; since it allows giving fluency once the expected response is achieved. When the question strategy works, there are always other questions around it. When using the question as a strategy of didactic interaction it must take into account the reality of the students, so that it can be understood more easily. It is precisely inside the classroom where they are delivering new knowledge, and that is where it should expand the use of questions and become a powerful teaching strategy interaction feasible to improve learning. The questions can fulfill different didactic objectives; that is, a type of question is aligned with a specific or determined phase of the learning cycle that takes place in the classroom. According to Roca (2005), the phases can be associated with a stage of the evaluation process: exploration, introduction, structuring and application.

Similarly, research by (Segal and Lefstein 2016) aware that teachers formulate their students a lot of questions during the development of the class, which are mostly closed; that is, certain answers are considered correct and the task of the students is to elaborate those answers. These questions are characterized by a low level of cognitive demand, since they require students to simply show that they remember the contents developed in previous classes, it is a rather rote approximation of what they have learned. The students' responses are short and simple; generally they are lists of learned facts, answering literally what the teacher wants. Teacher feedback is generally a short response to the correction; however, it is absent more elaborated development, from the initial response given by the student or suggestions for an additional consideration. It is important to have in mind that the interaction in the classroom through the questions asked is determined by cultural and status norms vis-à-vis the authority of the teacher, which limit the moments in which students can speak, as well as the themes that they can legitimately express (Segal and Lefstein 2016). The types of questions that the professors do in the classroom are indicators of what is known as dialogic teaching, where the voice of the student and their participation is important, for it established some criteria:

1. Authentic questions and open questions aimed at revealing the ideas and opinions of a student, since there is no set answer;
2. Capturing a situation where the speaker relies on what the previous speaker said, increasing the coherence of the dialogue;
3. Comments of the teacher about the correctness of a response the student as well as comments made about the content of the response of the student;

4. Open discussion and an interactive sequence that includes at least three participants (triadic interaction) that they match each other for more than 30 seconds.

Molinari and Mameli (2015) focus their study on triadic interactions. They affirm that the structural and emergent components of the discursive processes in the classroom, and their combination, contribute to the creation of learning opportunities; complex interactions that depend on the teacher. Therefore, teachers should consider a partial release of control over the development of communication through the questions they ask their students or other means of interaction, allowing a greater plurality of voices interaction in the classroom.

Other researchers such as Boyd and Markarian (2015) point out that closed questions are also capable of encouraging students to actively participate in an open discussion. An opposite situation are formulated by Lefstein, Snell and Israeli (2015), who argue that a teacher can make in their classes, open questions without necessarily encourage the development and student reflection through the answers. The decisive factor is the basic epistemology of the interaction in classes through questions; that is, the degree to which students should think and formulate ideas for themselves, rather than simply repeating the ideas of others.

For their part, Lehesvuori and Viiri (2015) propose a classification of the questions asked by teachers in classes, according to criteria of openness (authenticity) and cognitive demand: closed question with low cognitive demand, for example: the test question with a predetermined answer that students must know by heart; closed question of high cognitive demand, for example: a test question with a given answer in which students must arrive using their own thought processes; low cognitive demand

open question: students answer based on their attitudes, feelings and experience; open question of high cognitive demand, for example: an authentic question with varied answer possibilities requires further elaboration and higher-level cognitive skills. Cutrera and Stipcich (2016) point out that the discursive procedures used by the teacher to promote inter subjective exchanges, through the questions they ask their students, delimit the times of participation in the classroom and the nature of the exchanges with the students.

Similarly, Sedova, Sedlacek and Švaříček (2016) confirm that the act of making an open question does not necessarily encourage the student to give an elaborate response; it may happen that students, faced with a question asked by the teacher, made brief comments and without content. In this way, they affirm that the need to integrate the student's conversation with reasoning constitutes a central indicator of a dialogic nature; this means that students actively participate in the dialogical co-construction of meanings, such as the autonomous formulation of their own ideas based on appropriate questions that trigger said process. The questions formulated by the teacher in his class can function as predictors of the students' actions, with the possibility of promoting cognitive demand, capture and open discussion. In this way, within dialogic teaching, it is expected that the questions formulated by the teacher be structured to promote reflective responses, with the possibility of generating new questions, such as open questions of high cognitive demand, which induce to the dialogue; these are questions that promote in students an argumentative response from his own reflection.

Godoy Ossa *et al.* (2016) characterize a group of Chilean schools, with successful improvement trajectories; appreciate in

these schools classes highly structured, productive, organized, but preferentially focused on the work of the teacher, over opportunities for students to expose and exchange ideas, ask good questions, reflect and engage in inquiry activities or analysis.

Through the researchers analyzed, it is possible to confirm the relevance of the dialogic construction that occurs in the classroom, in which the questions that the teachers ask in their classes, depending on certain criteria such as openness and cognitive demand, could promote in the students the develop of higher-level of cognitive skills. From this perspective, for the Ministry of Education "Skills are capacities to perform tasks and to solve problems with precision and adaptability. A skill can be developed in the intellectual, psychomotor, affective and/or social sphere" (Anon 2012, p.22). The skills are a set of mental operations, whose objective is that the student integrates information acquired through the senses; the subject not only acquires the contents, but also learns the process that used to make it, so it not only learn what met but how learned that knowledge. In the search to improve learning in students in our country, the Ministry of Education has set certain parameters; One of them is for students to develop critical thinking, free and creative expression, according to the words of the document, the following is expressed: "Emphasis on critical thinking, deep understanding of concepts and free and creative expression ideas" (Anón 2012, p.2). Regarding the development of Learning Skills (HA), and from Bloom's taxonomy, it is possible to analyze the exchanges through the questions formulated in classes, between the teacher and the students, describing types of exchanges, according to the type of questions, in cognitive demand - high or low - that the teacher promotes

in the students. According Villalta, Assael and Martinický (2013):

The exchanges in the classroom describe the process of building school knowledge and how to appropriate it. The didactic interaction refers precisely to the meeting point between the intentional teaching action by the teacher, with the consequent and also emerging interventions of the students to learn.

In this way, the objective of this article was to describe and analyze how outstanding teachers, through their questions, can develop cognitive skills in their students.

MATERIALS AND METHODS

The study was approached from an interpretive approach with qualitative techniques for data collection. Thus, observation was used starting from the audiovisual material, corresponding to the three video recorded classes of forty minutes, corresponding to three teachers evaluated as featured in 2016, in the area of Language and Communication of fifth year of basic education, according to Chilean legislation. As a tool for gathering information there were used the written record of pedagogical interactions that were observed in the three video recorded classes analyzed. The qualitative analysis software Transana was used.

For the classification of the questions evidences in video recorded class there was used, the Roca proposed (2005), who classified the questions according to the phase of the class in which they are given: exploration, introduction, structure and application, as illustrated in chapter 1.

Chapter 1- Types of questions by phase

Phases	Description
--------	-------------

Translated from the original in Spanish

Exploration	It is given to the start of class and pretending to know what the student thinks, for it questions suitable in this phase and are of the type of what do you think?, how do you think? There are not right or wrong answers here, the goal is to provoke the student's curiosity. They can also be motivating questions around contradictory situations or facts, questions or historical problems.
Introduction	In this phase, new points of view are introduced, paying attention to the observation, search and discussion of new information. The questions are focused on the search for causes and/or consequences at different levels or scales. Questions of the type how?, for what? Are necessary in this phase.
Structuring or Synthesis	The student becomes aware of what he has learned. He Acquires an overview of the theory or model. The questions of the type, for what? are key in this phase of learning.
Application	In this phase the student must, based on what has been learned, transfer learning to new situations or contexts, achieving useful knowledge for society. Predictive questions are important: what measures?, what data should be collected?, what type of analysis should be done?, how will it conclude?, what should be done to avoid this?

* Source: Roca (2005)

Similarly, the questions were classified of Martinic and Villalta (2015) was according to the cognitive ability applied, as illustrated in chapter 2. they develop; In this way, the proposal

Chapter 2- Cognitive Skills and guiding questions

Cognitive ability	Guiding questions
Know	Recall previously learned material such as facts, terms, basic concepts, and answers.
Understand	Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, describing, and presenting main ideas.
Apply	Solve or resolve problems applying the acquired knowledge, facts, techniques and rules, in a different way.
Analyze	Examine and fragment the information into different parts by identifying causes and motives; make inferences and find evidence to support generalizations.
Synthesize	Compile information and relate it in a different way, combining elements with a new pattern or proposing different solution alternatives.
Evaluate	Present, evaluate and support opinions by making judgments about information, validating ideas about quality work based on established criteria.

* Source: Martinic and Villalta (2015)

Deepening in the classification of the demand" and " High cognitive questions according to cognitive demand", as illustrated in chapter 3, abilities, these are categorized according based on the proposal of Martinic and to their demand in "Low cognitive Villalta (2015).

Translated from the original in Spanish

Available from: <http://mendive.upr.edu.cu/index.php/MendiveUPR/article/view/2004>

Chapter 3 - Classification of skills according to cognitive demand

Low cognitive demand	High cognitive demand
Know - Understand - Apply	Analyze - Synthesize - Evaluate

* Source: Martinic and Villalta (2015)

RESULTS

In this section, the central theme revolves around the questions posed by prominent teachers in their classes and that arise from the exchanges that take place in the class. In the present study, it is found that the greatest number of questions formulated by outstanding teachers in their classes correspond to the Structuring or Synthesis phase, equivalent to 58.7 %. This means that the questions- made lead the students take awareness of what they have learned. Along with the above, the Application phase registers the least amount of questions formulated by the outstanding teachers in their classes, covering 6.7 % of the total questions they formulate. The requirement made to the student when asking these questions is that the student, from lessons learned transfer learning to new situations or contexts, achieving a useful and significant knowledge because it place their learning in an environment so closer to reality. When comparing both results, it is realized that the questions asked by the outstanding teachers aim to collect evidence on the appropriation of the content of their students, beyond transferring that knowledge to a real

context where it can be applied by the students.

The questions corresponding to the Exploration and Introduction phase both have an average 16.5 %, which shows that outstanding teachers promote a low percentage of questions corresponding to knowing what students think; within these questions, there are no correct or incorrect answers, the objective is to provoke the student's curiosity. They can also be motivating questions around contradictory situations or facts, questions or historical problems. Added to this is that outstanding teachers are not encouraging questions with introductory characteristics to the topics to be discussed in class, leaving out the possibility of stimulating the production of new points of view. This questions, in turn, are focused in the search for causes and / or consequences at different levels or scales. Questions of the type how?, Why are necessary in this phase?

The information gathered in this investigation realizes, from a macro vision, outstanding teachers formulated various types of questions as a resource for dyadic interaction between teacher-student. These questions, according to the classification made, show that they

stimulate the development of skills with low cognitive demand (Knowing and Understanding). Analyzing the performance of each outstanding teacher who is seen in terms of the development of the ability to know the outstanding Teacher 1 (DD1) uses 55.6 % of questions focused on promoting this skill, so that it equals 10 questions from a total of 18 In the case of Outstanding Teacher 2 (DD2), 16.6 % of their questions correspond to developing the ability to know, which is equivalent to three questions out of a total of 18. Outstanding Teacher 3 (DD3): 33, 3 % of your questions develop the ability to know in your students, which is equivalent to three questions out of a total of nine.

Outstanding teachers, when integrating these features, encourage the student to perform basic mental actions, such as, for example: remember learned material; usually, these questions start with How is...? When does it happen? Along with the above, categorizing the questions that develop understanding ability yields the following results. The DD1 used by 38.8 % of questions that are linked to the development of the ability to understand, which is equivalent to seven questions for a total of 18. The DD2 uses 83.3 % of questions that develop the ability to understand, equivalent to 15 questions out of 18. Coincidentally, the DD3 maintains the same percentage of questions focused on developing the skill is knowing and understanding reaching a percentage of 33.3 %, which correspond to three questions from a total of nine. The questions that promote this ability favor the student's ability to demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, making descriptions and presenting main ideas.

A large part of the questions promoted by outstanding teachers, based on the ability to understand, and are associated with the action of extracting information, both explicit and implicit. Research accounts of a number

of questions asked by teachers' featured leads students to extract explicit information and literal reading of a text, preventing the promotion of other equivalent skills such as, for example: infer, relate, compare, etc.

The questions focused on the development of the application skill are the most diminished in terms of use by the outstanding teachers. The figures indicate that the DD1 uses only one question to promote this skill out of 18, which corresponds to 5.5 %. The DD2 does not incorporate any type of question related to the development of the application skill. DD3 is the one with the highest percentage of questions that favor the development of this skill, reaching a percentage of 33.3 %, equivalent to three questions out of a total of nine. The development of the application skill provides the student with the ability to translate the acquired learning to other contexts or situations.

According to the results obtained, it is found that the skills promoted by outstanding teachers stimulate students to work on content and skills that do not completely favor the transfer of this learning to other situations or daily contexts of the students. To this is added, according to the information collected, that the outstanding teachers of the Language and Communication subject of the fifth year of basic education do not encourage questions that develop cognitive skills of high demand; this is to analyze, synthesize and evaluate, excluding students develop skills to relate causes and consequences, make inferences, support opinions through argument or evaluate opinions making judgments about information given.

DISCUSSION

Research realizes that classes analyzed the three prominent teachers, it promotes interaction in class through

questions that were made by the teachers to his students, developing in them skills of thinking with low cognitive demand, meet, understand and, to a lesser extent, apply, which confirms the findings of Segal and Lefstein (2016) regarding the predominance of questions asked by the teacher in classes, of low elaboration by students and with a low level of cognitive demand. Similarly, the findings of Lehesvuori and Viiri (2015) are confirmed, since in the questions asked by the teachers, closed questions of low cognitive demand predominate; that is, memory aspects prevail. It was not possible to confirm the findings of Boyd and Markarian (2015), because although the teachers asked closed questions, it was not possible to demonstrate an active and open participation of the students. In the same way, according to the questions asked by the teachers, the contributions of Lefstein *et al.* (2015), since few open questions posed by teachers failed to stimulate in students the reflection.

Similarly, the study is consistent with the findings of Cutrera and Stipcich (2016), in the direction in which the questions posed by the teacher in classes regulate the dialogical dyadic interaction time; Since questions between teacher and students predominated, triadic interactions involving other voices within the classroom were not appreciated through the questions, as expressed by Molinari and Mameli (2015).

Finally, the study findings agree with the study by Godoy Ossa *et al.* (2016) compared to the few possibilities for students to develop superior cognitive abilities, because it stimulates knowledge focused on knowledge, as rote and, to a lesser degree, in other cognitive skills highly demanding as to analyze, synthesize and evaluate, which causes students not to be able to transfer the knowledge acquired to other contexts outside the classroom, in everyday

situations that allow them to solve or resolve problems.

By not promoting these types of skills, it hinders the development of critical and reflective thinking; students limit their ability to present and support an opinion or identify causes and motives. Along with the above, and from the three cases studied, it can be pointed out that it was not possible to appreciate that, through the questions formulated by the teacher to his students, the development of critical thinking and a deep understanding of concepts, as established by the Ministry of Education of Chile (2012), implementation of the Curricular Bases of 1° to 6° Basic 2012. However, the findings of this research open up the possibility of exploring other disciplines the use of the question as a powerful didactic interaction strategy. In this sense it must be suggestive to inroads the triadic Interaction in formulating questions in the classroom, involving other voices, and investigate the impact of the use of authentic and open questions to be issued in the classroom.

BIBLIOGRAPHIC REFERENCES

- Anón. (2012). "Bases Curriculares y programas de estudio 1° a 6° Básico". Santiago de Chile: Ministerio de Educación de Chile.
- Boyd, M. P. & Markarian, W. C. (2015). Dialogic teaching and dialogic stance: Moving beyond interactional form. *Research in the Teaching of English*, 49(3). 272-296.
- Cutrera, G., y Stipcich, S. (2016). "Enseñanza y estrategias discursivas. Principales aportes desde la investigación educativa". *Revista Iberoamericana de Producción*

- Académica y Gestión Educativa* 3(5).
- Godoy Ossa, F., Varas Scheuch, L., Martínez Videla, M., Treviño, E. y Meyer, A. (2016). "Interacciones pedagógicas y percepción de los estudiantes en escuelas chilenas que mejoran: una aproximación exploratoria". *Estudios Pedagógicos* 42(3):149-69.
- Lefstein, A., Snell, J. e Israeli, M. (2015). "From Moves to Sequences: Expanding the Unit of Analysis in the Study of Classroom Discourse". *British Educational Research Journal* 41(5):866-85.
- Lehesvuori, S., y Viiri, J. (2015). "Od teorie k praxi: Od plánování dialogického vyučování k jeho reflexi". *Studia paedagogica* 20(2):9-31.
- Martinic, S., y Villalta, M. (2015). "La gestión del tiempo en la sala de clases y los rendimientos escolares en escuelas con jornada completa en Chile". *Perfiles educativos* 37(147):28-49.
- MINEDUC (2014). *Evaluación docente en Chile*. Santiago de Chile: Ministerio de Educación de Chile.
- Molinari, L., y Mameli, C. (2015). "Triadické interakce ve výukové komunikaci". *Studia paedagogica* 20(3):7-19.
- Roca Tort, M. (2005). "Las Preguntas En El Proceso de Enseñanza-Aprendizaje de Las Ciencias". *Educar (Guadalajara, Jal.)* (33):74-80.
- Sedova, K., Sedlacek, M. y Svaricek, R. (2016). "Teacher Professional Development as a Means of Transforming Student Classroom Talk". *Teaching and Teacher Education* 57:14-25.
- Segal, A., y Lefstein, A. (2016). "Exuberant Voiceless Participation: Dialogic Sensibilities in the Israel Primary Classroom". Israel
- Villalta Páucar, M. A., Assael Budnik, C. y Martinic Valencia, S. (2013). "Conocimiento escolar y procesos cognitivos en la interacción didáctica en la sala de clase". *Perfiles educativos* 35(141):84-96.
- Conflict of interest:**
- Authors declare not to have any conflict of interest.
- Authors' Contribution:**
- Authors participated in the writing process of this article and in the analysis of documents.



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Copyright (c) Marisol del Carmen Álvarez Cisternas

Translated from the original in Spanish

Available from: <http://mendive.upr.edu.cu/index.php/MendiveUPR/article/view/2004>