Reading comprehension and textual production about science in university students (Case studies at The Libre University and Popular University of Cesar, in Colombia)

Comprensión lectora y producción textual sobre la ciencia en estudiantes universitarios (Estudios de caso en la Universidad Libre y Universidad Popular del Cesar, en Colombia)

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Abstract

Similarly to how the low levels of reading comprehension and textual production underlie Colombia's low performance in PISA tests, they can also be associated with the students' inadequate scientific training and the lack of scientific research didactics. This project presents the results of research on reading comprehension and textual production in two Colombian universities, conducted within the context of teaching and the framework of epistemology and/or knowledge theory, as well as in other research-related programs. Participatory Action Research was employed as the methodology, involving teachers and students in a subject-object-subject relationship. The results showed that there is a basic

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level of reading comprehension and textual production, but it can also be surpassed through a dialogical didactic approach based on research.

Keywords

Reading comprehension; textual production; didactics; dialogical; research; scientific.

Resumen

De manera similar cómo el bajo nivel de comprensión lectora y producción textual subyace a los bajos resultados de Colombia en las pruebas Pisa, también puede asociarse a la precaria formación científica, de los estudiantes, como a la carencia de didácticas de la investigación científica. Este proyecto presenta resultados de una investigación sobre comprensión lectora y producción textual en dos universidades colombianas; trabajos realizados en el contexto de la labor docente, y en el marco de la epistemología y/o teoría del conocimiento, y en otros programas del área investigativa. Como metodología se utilizó la Investigación Acción Participativa, y esto implicó que docentes y estudiantes interactuaran en una relación sujeto-objeto-sujeto; los resultados mostraron que existe un nivel básico de comprensión lectora y producción textual, pero que también puede superarse, a través de una didáctica dialógica basada en la investigación.

Palabras clave

Comprensión lectora; producción textual; didáctica; dialógica; investigación; científica.

Introduction

If it is already a serious problem that Colombian university students have low reading comprehension and difficulties in writing (El Tiempo, April 26, 2021), including spelling (WEEK. 9/6/2022), much more distant they will be from the understanding of science, which requires, more than any other area of knowledge, higher cognitive skills and processes; So the outlook is much more serious than the other difficulties, regarding the little and/or precarious scientific development of the country.

Alarms are going off due to Colombia's low results in education ranking (EL COLOMBIANO. Published on 12/03/19), especially in the Pisa tests (WEEK. 3 / 12/ 2019); The matter is clear: if reading comprehension is at the base of the poor results of the Pisa tests, as of any other ranking, and traditional teaching does not favor reading comprehension and textual production, then targeting investigative training would have the effect to overcome the indicated delay.

The thing is more complex, since teaching is required to think, and this is prevented by intellectual colonialism, or cultural dependence; In addition, changes must be generated in scientific training, and this does not mean teaching research, but rather how to promote thinking and learning styles.

The first stage of this research began in the Faculty of Economic, Administrative and Accounting Sciences of the Autonomous University of the Caribbean, with the publication of the book "Didactics from the Perspective of Dialogical Pedagogy", which addresses, among other topics, the understanding and composition of texts with (Chajín , M, Turbay, T., Romero, M., Álvarez, C. & Rojas, J. 2007); The journey continued with the application in the chairs of Epistemology and Research Methodology at that University.

The research carried out on the reading comprehension of students of Public Accounting and International Business Administration at the Universidad Libre, Barranquilla, completed in December 2021, in subjects of epistemology and research methodology, corroborates the experience of the teacher-researcher on the low level of reading comprehension of university students, which affects the low ability to think scientifically; This research constituted the second stage of this project; followed by the third at the Popular University of Cesar, in the Faculty of Administrative, Economic and Accounting Sciences, with several subjects in the research area, and which also allowed students to understand their difficulties and evaluate them for themselves.

The fourth stage of this research that is beginning, in 2023-2, requires a broad training process in pedagogy and dialogic didactics, and transferring dialogic didactics for the training of researchers, assessing the learning results with their application; Also, generate new didactics, inspired by participatory understanding, in addition to validating reading comprehension and textual production instruments.

Research teachers who have already registered to participate in the project "Assessment of cognitive mediation experiences , through dialogic didactics, for teaching focused on research" can build their own experience in the training of researchers, having the objectives following:

General objective

Analyze the representations of teachers and students about the learning results with the application of dialogic didactics in different training scenarios.

Specific objectives

1. Apply dialogic teaching strategies in various subjects aimed at generating knowledge products.
2. Evaluate reading comprehension and textual production of knowledge products, according to rubrics of dialogic rationality and applying triangulation of data and researchers.
3. Describe the learning results of the application of dialogic strategies to train researchers, based on the development of thinking styles, level of personal autonomy, and self- and heteroevaluation processes.

Epistemological and pedagogical references

In general terms, it can be said that this research is framed within the Pedagogies of knowledge, as Louis Not (1994) would say, or simply Epistemology and pedagogy, as expressed by Bedoya and Gómez (1995), as well as Jiménez (2014); However, the approach of this work constitutes a new approach to the dialogic, in which the author has worked for more than 20 years; hence the abundance of self-references; However, this dialogic line of pedagogy has been built in "dialogue" with various authors, in what Not calls "Dialogous Teaching" (1989); which is not new, since it can be related to Socratic maieutics, and the teaching through parables used by Jesus Christ.

Due to the importance of PAR as a bridge between teaching and research, it is worth keeping in mind Jorge Murcia Florián (1992), because thirty years ago he saw the need to train research teachers as a necessity for the transformation of the university and of the society.

Starting from Dewey (1989), ideas derived from reflection and critical thinking are fundamental for understanding and solving problems, which include unforeseen situations, cause search, circumstances, responses given as potential solutions, implementation of solutions, and evaluation of results; these elements are, as we know, connected to the generation of scientific knowledge.

In this line of thought, Muñoz et al. (2023) propose that the development of critical thinking is associated with the cognitive approach, from which teaching is addressed, especially for the development of argumentative skills, analysis, and the ability to take a stance on texts, in problem-solving, which leads to the identification of didactics to be applied in the classroom.

It is evident that the common situation of low reading comprehension and textual production is associated with functional illiteracy, which, as De Meza & Cepeda (2005) point out, makes it difficult for students to identify main ideas, understand the author's intent, and be able to write coherent texts.

Considering the above, teaching-learning should not only revolve around the content to be transferred but also depend on the reflection and critical attitude of the students. This requires a shift in pedagogical and didactic models based on teaching to favor learning and dialogical feedback.

As Joanpere et al. (2023) would say, dialogical teaching is associated with feedback opportunities that traditional didactics lack, something that does not occur in dialogical approaches, which promote critical thinking and the Socratic method, linked to student participation.

Feedback opportunities in the dialogical approach were also addressed by Herrera (2023), from the perspective of an approach to developing complex thinking, resulting from the negotiation of meanings, the search for sense in information, and the co-construction of knowledge where the individual and the social are articulated.

From the perspective of Vargas & Quintero (2023), it is necessary to deepen the Socratic method from the perspective of hermeneutics to establish the value of questioning and dialogue in the construction of knowledge.

Andrades (2023) highlights the importance of what he calls the dialogical methodology in building an educational community, especially because it closely resembles the idea of diavergent thinking, proposed by Chajín et al. (2007), when emphasizing the process known as Z Kintun, cited by Ferrada and Pino (2018), for generating and validating collective knowledge with the intention of finding something together. Works from this collective construction approach in Dialogical Pedagogy can be seen in Ferrada et al. (2023). Therefore, the development of reading comprehension and scientific construction involves participation processes.

The community-based perspective of research, such as from the ethnic and cultural diversity lens, suggests cultural dialogues, as seen in Participatory Action Research (PAR) in Orlando Fals Borda in Colombia and the works of Ferrada in Chile on the dialectical-kishu kimkelay method or dialogical participatory research, where epistemological and gnoseological dimensions are integrated (Ferrada & Pino, 2018).

Villani and Pacca (2000) propose key ideas for developing dialogical competencies in science teachers related to epistemological and methodological foundations within a specific disciplinary framework, managing information from data and its contextualization, being mindful of biases or preconceptions, and committing to investigative work.

What is proposed regarding competencies for research training requires that the teacher-researcher become aware of the role of research in the performance of graduates, as expressed by Álvarez et al. (2023).

Obviously, the development of didactics that integrate teaching with research is supported by critical thinking, without which research training would be reduced to mere research methodology, as among other aspects, students and teachers need to analyze and evaluate information in a reflective manner, as Richard Paul (1992) proposes.

Regarding assessment, from a dialogical perspective, it has a formative purpose, and therefore the grading of reading comprehension is not something that falls within generating a single way of thinking, but towards the re-signification of knowledge, the awakening of voices, the hermeneutic encounter, and the rescue of speech and thought (Rivero, 2018).

This suggests that the dialogical perspective of critical thinking also involves moral judgment, as valuation is not something outside the individual but something that the individual decides whether or not to adhere to norms, rules, or ways of seeing from others; thus, it is a transaction between autonomy and heteronomy. This leads to the need to view the relationship between the individual and society, from a moral perspective, as a process of dialogical construction, which has already been addressed by authors like Josep Puig Rovira (1995).

In this way, the development of critical thinking starts with reflection and participation, from problem-solving where the student is a subject of knowledge, not just a receiver, and this implies that reading comprehension must take into account the development of autonomous learning, which can be enhanced with flipped classroom didactics, as well as requiring participation, where a teaching perspective based on research can use PAR as a dialogical didactic. This process requires promoting the creation of research teams within the classroom, who are interested in being co-researchers or research assistants on the same teaching-learning practice.

From the perspective of Bronckbank (1999), teaching and learning should, in practice, be based on reflective dialogue for the critical transformation of teachers and students, with the requirements of intentionality, context, and procedures to achieve a reflective practice.

As Cornejo Portugal (2022) expresses, within the framework of dialogical pedagogy from Freire, the traditional unidirectional and banking nature of the formative process, depending on the teacher, which in some ways reinforces power structures, is questioned. Thus, rethinking the relationship between teachers and students, in a horizontal manner as co-creators of knowledge, not only promotes information retention but also the ability to apply it in specific contexts, especially the student's own context (Cornejo Portugal, 2022).

Training for reflection and the development of critical thinking, as well as problem-solving, especially in the educational context, are elements that are part of the didactics of research, integrating pedagogy and epistemology, as already proposed by Piaget, and within its stages, as Peñafort and Bastiani (2022) point out, recognizing the influence of neurodidactics and dialogical didactics, where dialogue is privileged as a principle in the reconceptualization and construction of knowledge.

The idea prevails that dialogue has a significant role as a didactic strategy for learning, as Feijoo Mendieta et al. (2023) highlight, but in research on reading comprehension from the dialogical perspective, dialogicality is an epistemological paradigm, which implies that teaching and research must be integrated.

When research methodologies are emphasized as prerequisites for scientific production, what is done is to create a myth about science, making scientific development depend on the volume of publications derived from research work, even if such publications do not mean new knowledge.

A relevant project is to examine how much science is produced in Colombia, to give an example, taking into account the results of MINCIENCIAS, and it would come to light that the so-called scientometrics, under the idea that the categorization of groups and researchers measure the progress of Science does not correlate with new knowledge.

The exercise of seeing how scientists recognized by their communities are not the ones with the most categories in the framework of MINCIENCIAS can also be proposed. It is very curious that quantitative and qualitative do not go on the same side when it comes to assessing scientific development.

The same thing happens with degree projects in master's and doctoral degrees, as presented by the author at the "4th Colloquium on Postgraduate Studies, Research and Professional Projects" of UNES, 2022, with the presentation "Theses, without thesis, guidelines for overcome them."

The assessment of compression and textual production from the perspective of thinking styles has an epistemological basis; For this reason, Table 1 is proposed to facilitate the work of interpretation.

Table 1 is relevant for the identification of thinking styles and relating it to reading comprehension and textual production, since following Padrón's line it is about understanding thinking styles as paradigms. Obviously, it must be clarified that the epistemological perspective of this work is not that developed by José Padrón, although the general approaches were made within the framework of a postdoctorate in didactics of scientific research in which Padrón participated as a teacher, and where it was structured a proposal for dialogic didactics for the training of researchers.

Table 1
Paradigms of thought and rationalities

Paradigms of thought/ Rationalities	**Innovative thinking**	**Negotiating thinking**	**Planning thinking**	**Controlling thinking**	**Dialogical thinking**
Conceptual Rac : Thinking style	Divergent	Convergent	Usher	Assimilator	Divergent
Rac . Logic Knowledge logic	Deductive hypothetical / Find the why	Hermeneutics/ Find the how	Phenomenological Look for the why	Inductive/ Look for the what	Integrative/ Search for meaning
Paradigms of thought/ Rationalities	**Innovative thinking**	**Negotiating thinking**	**Planning thinking**	**Controlling thinking**	**Dialogical thinking**
Methodological pedagogical strategy	Discussion/ criticism of content	Assessment/ meaning of knowledge	Application/ exemplification/ Knowledge transfer	Presentation/ exposition of topics and information	Integrative (Collective construction of knowledge)
Gnoseology Thinking level	Explanatory	Interpretative	Comprehensive	Descriptive	Metatheoretical
Ontological (Elements of knowledge)	Method	Context	Subject	Object	Integration of the elements
Evaluative	Based on learning ability	Based on opportunities Learning	Based on learning actions	Based on learning needs	Based on achievements and/or learning outcomes
Rac . Practice Learning style	Intuitive	Thoughtful	Asset	Analytical	Participatory
Transcendent	Emphasis on thinking: Learning to learn (autonomous learning)	Emphasis on being: Learn to be (learn in a group)	Emphasis on doing: Learn to do (Learn by doing tasks)	Emphasis on having: Learn to have (Acquire information)	Emphasis on Being: Learn to serve (Transform and transform)

Source: Chajín : Adjusted from the doctoral thesis, 2016, and postdoctoral degree in 2019.

Materials and methods

Participatory Action Research from a dialogic and total perspective (Cerda, 1991), is the methodological reference of this research project, which has been carried out for more than a decade, but whose results in the form of empirical verification as naturalistic validation are recent.

The applied methodology is not only derived from rationality or dialogic method, but from a type of applied research, which in this case is Participatory Action Research (PAR); PAR as didactics applied to research training is based on approaches

to participatory rationality; For this reason, the teacher did not separate the development of the subject (pedagogy and didactics) from the research (epistemology and methodology); That is, he made teaching a space for research; in the case of the co-authors of this article, in which some of them were her students on two occasions, in the second semester, with Research Epistemology and then in the sixth semester with Research Models, within the Public Accounting program of the Universidad Libre, Barranquilla section, were constituted as subject-object-subject of research, within the framework of the IAP.

Training the team to in turn investigate the reading comprehension of second semester students would allow the main researcher to reduce the teacher's bias or prejudices about the students' level of reading comprehension, especially due to their belief, from their previous stage with the Autonomous University of the Caribbean, and then at The Libre University, that Administration students have better reading comprehension than Accounting students, in research subjects. Obviously that requires new research.

The results of comparing both approaches to reading comprehension in similar academic programs in the Colombian Caribbean, in the same subject and semester, corroborate previous research experiences; Subsequently, the work continues with a third university, in this case the Popular University of Cesar, and with subjects in the research area.

The work is still open, as there are 70 researchers in 10 Latin American countries who have shown interest in joining this project from various disciplines and levels of training, through the diploma in Dialogical Didactics for the training of researchers. Obviously the social impact, especially for the training of researchers, is the greatest justification of this project, in such a way that this work constitutes an input for new research.

Each work with each student and their group constitutes case studies, and therefore cannot be generalized; Although the methodological orientation is PAR, it is approached from a total or mixed perspective, through the dialogic method.

The practical perspective or terrain from which the observation on reading comprehension and textual production is carried out is the exercise of teaching in subjects of epistemology and research methodology, in the Faculty of Economic, Administrative and Accounting Sciences of the Autonomous University of Caribbean,

between 2012 and 2013, with the Public Accounting, Business Administration and International Finance Programs; then, between the years 2015 to 2021, at the Universidad Libre, Barranquilla section, with the Public Accounting and International Business Administration programs, in the subjects of Epistemology and Research Models; later, in 2022-1, in the Tourism and Hotel Business Administration, Business Administration and International Trade programs, in subjects such as Theory of Knowledge, Research Methodology, Introduction to Science, Technology and Innovation, and Tourism Theory.

The pedagogical and didactic framework from which the various experiences and/or assessments on reading comprehension and textual production were carried out contains four moments of the development of curricular content; The first moment has been called in various ways, such as documentation, conceptualization and presentation of the topic; moment in which traditional teaching remains or focuses, which depends on the role of the teacher as a transmitter of information or "knowledge"; knowledge is in quotes, because the student is not regularly allowed to reflect, understand, criticize and/or discuss the information or knowledge, which is the point that the researcher repeatedly refers to as thinking scientifically; nor does it lead to the application or transfer of information, or contextualized knowledge; Finally, the evaluation is assumed by the teacher and not from the assessment of the training process with the students, without having to do with their representations, their validity criteria, and especially their thinking styles.

Below is a historical overview of how those moments have been present, and their adjustments in the application of dialogic didactics.

Table 2.
Historicity of the moments of dialogic didactics

1998. Article in Disciplinary Essays, Autonomous University of the Caribbean	**2007.** Book on Didactics from the perspective of dialogic Pedagogy	**2019.** Publication of the Externado University of Colombia.	**2022** Subject development plans, UPC
Teachable moments	**Teachable moments**	**Teachable moments**	**Teachable moments**
Documentation	Conceptualization	Documentation	Presentation of the topic
Reflection	Comprehension	Critical stage	Discussion
Discussion	Application	Discussion	Transfer (application)
Agreements	Assessment	Agreements	Assessment

Source: Chajín , 2022

The previous research, at the Universidad Libre, to measure reading comprehension and textual production was done using a rubric that was built with the research team.

Table 3
Expanded rationality, for reading comprehension

Rationality	***Validity of knowledge***
Conceptual rationality: does the student identify the central theme or referent of the article?	Clarity: The student clearly describes the reference of the article.
Logical rationality: Does the student identify the processes, steps, structure of the article?	Coherence: The student is able to make a synoptic table, conceptual map, or any heuristic resource.
Methodological rationality: How does the student argue for understanding the text?	Demonstration: The student writes a paragraph of what is understood.
Epistemological rationality: How does the student use prior knowledge to understand a text?	Corroboration: The student is able to reconstruct the text from his or her own perspective
Ontological rationality: What is the student's disciplinary, professional, contextual frame of reference?	Credibility: The student expresses ideas from his or her personal perspective.
Evaluative rationality: Can the student present value criteria on the topic?	Reliability: The student can present positions of agreement or disagreement with what he reads.
Practical rationality: What benefits do students find from reading?	Usefulness: The student can pose scenarios where the information is useful.
Transcendent rationality: What meaning does the student find in the text?	Meaning: The student understands the intention of the author of the text.

Source: M. Chajín , Fernández, M. Acuña, K. Ramírez, L. Ramírez, N. Povea, V. (2020).

Because the understanding of science is regularly associated with the teaching of research methodologies, and Professor José Padrón is a support for the development of an alternative proposal for scientific training based on thinking styles, such as paradigms, the following comments by the author regarding the topic are proposed, within the framework of a postdoctoral degree in Didactics of scientific research.

Regarding the problem of scientific research

Video 1: https://www.youtube.com/watch?v=CcYWC77iaww&t=644s

For a greater illustration of how the subjects were developed, three video tutorials are included; In this case, those developed in 2022-1 at the Popular University of Cesar (UPC) will be taken.

Theory of knowledge. Video 2. https://www.youtube.com/watch?v=HoKwaz8iWR8&t=609s

Research methodology Video 3. https://www.youtube.com/watch?v=qqt3QNgBnYM

Introduction to science, technology and innovation.
Video 4. https://www.youtube.com/watch?v=STHxhGge-BU&t=31s

Given the importance of the description of dialogic didactics, a 15-minute class is included to describe it, especially for the third stage of the research, associated with a proposal made at the Popular University of Cesar that will have the support of 32 researchers from 9 countries.

Dialogical didactics for training researchers.
Video 6. https://www.youtube.com/watch?v=aOZu8u_5tSs

It is relevant to include a workshop with the team of students who developed the research at the Universidad Libre de Barranquilla, and who had to first go through a training process, not only in the subject of research epistemology, which they had already seen in the second semester. of the Public Accounting Program, but in the sixth semester in the subject of research models they worked on the methodological construction of the project on reading comprehension of students of Public Accounting and International Business Administration.

Reading comprehension and thinking styles: readings of the scientific method
Video 7. https://www.youtube.com/watch?v=4-0yrZ0Iwck

An awareness class with epistemology students at the University is also included.

Free, on the importance of differentiating scientific from everyday thinking, especially relevant in the training of researchers.

Video 8. https://www.youtube.com/watch?v=prEh117uFEk&t=1729s

With the purpose of expanding the topic of what is sought with scientific training, not from the perspective of teaching research, but rather from a teaching focused on research, to learn to think, two interviews with the researcher are included from

the La Voz Universitaria Program: Radio Comunidad, from the Simón Bolívar University, in Venezuela, hosted by professors Luis Buttó and Raúl Pulido.

Learning to think: Video 9. https://www.youtube.com/watch?v=fDw-xKRXtS4&t=1449s

Training of the scientific researcher
Video 10 https://www.youtube.com/watch?v=2FMoZsxvKy0&t=1273s

Finally, to illustrate the context from which the research on reading comprehension and thinking styles was carried out, which is the basis for the new project, it is important to listen to the voices of the students, in this case from the Universidad Libre, Barranquilla section, about the evidence of dialogic didactics in the purpose of learning to think

Participatory evaluation of learning results of the subject of Epistemology and research methodology, in the second semester.
Video 11. https://www.youtube.com/watch?v=VNNgEXkBm0I&t=1650s

In the research with The Libre University, two groups of 20 students were taken, from the Epistemology courses, in Accounting and International Business Administration; Each student in both groups was evaluated three times, and for that the research team was divided into three, so that the results could be valid through interpretive triangulation; That is, the teacher-researcher did not intervene in the students' assessment of reading and/or textual comprehension, even though the teacher had to submit both groups to evaluation, through a partial exam.

The reliability of the assessment of reading comprehension made by the Public Accounting research team of the Universidad Libre was not only due to the fact that they had taken that subject in the second semester of their degree and were taking research models, in the sixth semester, but that the teacher, apart from preparing them in the epistemological and pedagogical dimensions of the dialogic, applied the same workshop to the research team, and gave them feedback for each co-researcher, so that they had a guide on how to apply the rubric that they had previously developed. ; At this point, the researcher introduced the problem of interpretive biases, based on thinking styles, since this could alter the way in which each person assessed the reading comprehension of both groups of Accounting and Administration students; That is why that point was discussed in video 7; However,

they were not asked to take it into account when evaluating the students' work, since at that time there was no reading comprehension rubric that took thinking styles into account.

Participatory Action Research is a long and open process, as it involves not only identifying situations or conditions of a reality in which the researcher is not responsible, and on the other hand the researcher, and in this case the teacher, promotes processes of transformation of the one that is responsible, through dialogic didactics; However, to achieve this, the participation of the subject under study is required; This was precisely what was achieved with the research team of the Universidad Libre, which assumed the role of subject-object-subject of research, something that in the PAR is carried out through small groups that play the role of co-researchers, such as as applied by Fals Borda in his monumental work Double History of the Coast (2002).

In the case of the Popular University of Cesar, the students were not aware that they were participating in a research project on reading comprehension and textual production, but they were proposed to assume a critical position regarding the training process in scientific research itself, in such a way. so that their interventions and self-assessment processes became techniques and instruments of this project.

From what has been expressed, it can be considered that three stages of the project have been developed since its beginnings in 2012; the first, consisting of structured observation on the levels of thoughts of students of Public Accounting and International Business Administration at the Autonomous University of the Caribbean. The second stage was developed at the Universidad Libre, first with observation by the researcher, and then with the implementation of the project "Levels of reading comprehension among Public Accounting and Administration students at the Universidad Libre". The third stage corresponds to the systematization of these experiences and the validation of dialogic didactics, on the learning results, which begins at The Libre University, according to video No. 11, and continues at the Popular University of Cesar, through student self-assessments. At this time, the fourth stage of the project begins, in a broad way, with the participation of 32 researchers in 9 Latin American countries.

For this fourth stage of the research, a rubric is proposed, which takes into account the thinking styles in reading comprehension and textual production.

It is evident that each person interprets and produces texts from their own style of thinking; That may be acceptable from the pedagogical perspective, but perhaps not from the epistemological perspective, in which, in addition to making rationality explicit, the validity of knowledge is required; That is, it is not enough for a student to understand and produce a text from his or her style of thinking, but it is necessary to seek the validity of his or her approaches; So the theoretical prejudice underlying the new rubric is that each style of thinking only accounts for one perspective on the object of study, in such a way that the integration of all perspectives corresponds to dialogic thinking. This research goes beyond the above, as it integrates epistemology and pedagogy, which is essential to be able to develop teaching focused on research.

Another way of seeing the relevance of including thinking styles within research on reading comprehension is that theories cannot be presented as truths in scientific research, but rather as conceptual references; That is why the concept of the theoretical framework is used in research, since each researcher decides what to take, what to reinterpret and what to leave out of their work, in relation to authors, theories, and schools; So leading the student to become aware that the development of autonomous thinking is a prerequisite for scientific training, leads to assuming an active position towards knowledge, very far from the passivity that traditional teaching promotes. .

Much of science is a process of constant reinterpretation of theories, and this is because each researcher is free to make their own theoretical integrations; Metatheoretical works are precisely among the challenges of scientific research in any field, in such a way that thinking styles constitute fundamental elements of scientific development. To give an example, this dialogic proposal is a metatheoretical product , integrating epistemological paradigms, thinking styles and pedagogical theories.

In this way, the proposed research goes beyond the problem of identifying the levels of reading comprehension and textual production, since it is about developing a didactics of scientific research.

Table 4.
Reading comprehension and textual production from thinking styles.

Rationality	**Innovative thinking**	**Negotiating thinking**	**Planning thinking**	**Controlling thinking**	**Dialogical thinking**	**Score**
Conceptual How the reader relates to the referent and aspects of the referent of the text.	The reader understands the text and can propose ideas that go beyond what has been read.	The reader can interrogate the text, trying to find answers to questions related to the topic.	The reader arranges what has been read, trying to organize the ideas.	The reader assumes the text as it is presented; It only seeks to be clear about what it communicates.	The reader tries to integrate all possible readings of the text.	
Qualification	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	
Rationality	**Innovative thinking**	**Negotiating thinking**	**Planning thinking**	**Controlling thinking**	**Dialogical thinking**	**Score**
Logic How the reader understands the ideas developed in the text.	The reader may find other methods or paths to address the topic.	The reader looks for steps or ways to approach the topic in other references, readings, or authors.	The reader seeks to establish the route that allows him or her to understand the topic.	The reader creates a table or heuristic resource that makes it easier for them to assimilate the topic.	The reader tries to articulate all the routes, paths or methods on the topic.	
Qualification	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	
Methodological Strategies that allow the reader to present ideas related to the text.	The reader argues with the text.	The reader tries to grasp the meaning of the text, as an interlocutor of the author.	The reader can present examples about the content of the text.	The reader can write a summary or exposition about the text.	The reader has the ability to integrate various ways of developing the themes.	
Qualification	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	
Gnoseology Level of knowledge at which the reader reads	The reader tries to go to the essence, establish the causal links or reason for the topics.	The reader interprets the text.	The reader tries to grasp the general meaning or orientation of the text.	The reader describes the theme	The reader integrates the concepts, themes, theories and assumptions of textual products.	
Qualification	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	

Rationality	Innovative thinking	Negotiating thinking	Planning thinking	Controlling thinking	Dialogical thinking	Score
Ontological Shapes how the text is approached.	The reader focuses on the method underlying the text.	The reader focuses on the context of the message or text.	The reader focuses on the subject or actor who writes the text.	The reader revolves around the object or thing the text is about.	The reader integrates all the elements of the text: Method, context, subject and object.	
Qualification	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	
Evaluative Reader criteria to rate the text	The reader evaluates the text from the perspective of his own criteria regarding the topic.	The reader values the text based on what it contributes to their own learning project.	The reader evaluates the text according to the task that must be carried out.	The reader evaluates the text from what he or she is expected to do.	The reader values the text from the possibility of building new knowledge.	
Qualification	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	
Rationality	**Innovative thinking**	**Negotiating thinking**	**Planning thinking**	**Controlling thinking**	**Dialogical thinking**	**Score**
Practice Usefulness and/or benefits of the text.	The reader assumes the text as raw material for the knowledge process.	The reader tries to integrate the text into what may be convenient.	The reader assumes the text as a link within a value chain.	The reader performs an analysis of the text to fulfill assigned activities.	The reader participates in the text, enriching it with new ways of understanding it	
Qualification	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	1_2_3_4_5_	
Transcendent Durability or impact of the text on the reader's life.	The reader remains autonomous in front of the text.	The reader tries to be a friend of the text, or open up about its scope.	The reader applies the text to a training plan.	The reader secures the text in his memory.	The reader transforms and is transformed by the text.	
Qualification						

Source: Miguel Chajín , 2022.

Results

This part presents the general results of the research at the Universidad Libre, Barranquilla section, and the expansion of the research proposal with the participation of several groups in subjects of the research area at the Universidad Popular del Cesar, in Valledupar, Colombia.

The results of the research with the Universidad Libre are carried out according to the rubric in Table 3.

Table 5
The assessment of compression and textual production

4.8 to 5.0	SUPERIOR
4.1 to 4.70	HIGH
3.1 to 4.0	ESSENTIAL
0 to 3	LOW

Source: Free University Research Team

The team of students, in order not to distance themselves from the grading criteria used by the teacher-researcher, considered that the acceptable level of reading comprehension and textual production should be above 4.0.

In the words of the teacher-researcher, what the traditional system considers a 3.0, in this approach is equivalent to 4.0; For this reason, a student is informed that the assignment of a grade of 3.8 is considered a loss for the research teacher. There an ethical criterion comes into play , because students come with reading comprehension deficiencies from previous levels of training.

Table 6.
Results with the groups of The Libre University of Barranquilla

Average CP	Average AD	Difference	Observations
3.9	3.1	0.8	Between the two groups evaluated HE sample a difference of 0.8 tenths, where he cluster of Accounting is above the Administration group, neither of the two groups was above 4.1, which is the minimum standard established to measure, as good, the students' reading comprehension. We noticed that both groups were not able to identify the central theme or reference of the article with clarity and coherence. In this ask many students they took fragments textual of the article, it that, in average low the qualification besides that they responded the ask of shape very elementary.
3,7	3,1	0,6	Between the two groups evaluated HE sample a difference of 0.6 tenths, in he that he cluster of Accounting is above the Administration group, neither of the two groups was above 4.1, which is the minimum standard established to measure how good, students' reading comprehension. In this question the students of both groups presented difficulties in identifying the structure of the article and therefore did not they got build a idea organized about the theme.

Average CP	Average AD	Difference	Observations
4,0	3,4	0,6	Between the two groups evaluated, a difference of 0.6 tenths is shown, in which the Accounting group is above the Administration group; making clear that neither of the two groups was above 4.1, which is the minimum standard established to measure students' reading comprehension. In this question both groups presented difficulties for demonstrate the comprehension of it read. Some students they took examples textual of Internet and others they made some modifications, it that, in average low the qualification, and could not be evaluated Yeah the students they could be able of develop he spot by their own media.
3,9	3,7	0,2	Between the two groups evaluated, a difference of 0.2 tenths is shown, in favor of the group of Accountancy; leaving clear that none of the two groups was by on of 4.1 which is the minimum standard established to measure how good the reading comprehension of the students. In this ask we observe that the students they have difficulties for rebuild the information and have ownership of knowledge on information supplied; Both groups of students had classes where they discussed the topic, having the opportunity to read about it, and acquire prior information; However, its results were quite low.
4.2	4.5	0.3	Between the two groups evaluated, a difference of 0.3 tenths is shown, in favor of the group of Administration; This question has the particularity of being from a personal perspective; It is a question in which there are no bad answers. The difference shows that there is a greater reception by the Administration students to the way of approaching the text.
4.2	4.0	0.2	Between the two groups evaluated, a difference of 0.2 tenths is shown, in favor of the group of Accountancy; In this question the two groups had some difficulties to expose criteria of value on the topic presented; establish a position on the structure and content of the article, although in general they did not do a complete analysis of the deeper aspects of the article; their responses met some of the requested requirements. The Accounting group finds 0.1 tenth above what is established as a minimum to evaluate comprehension as good the compression reader of the students.
4,0	4,1	0,1	Between the two groups evaluated, a difference of 0.1 tenth is shown, in favor of the group of Administration; In this question, the groups presented some difficulties in asking scenarios, or fields of reality where the information is useful. Although some express a real situation in which it can be applied, they were not able to thoroughly justify the implementation of the scientific method in the field they mention. The Administration group is located in established as a minimum to evaluate students' reading comprehension as good. and the of Accountancy 0.1 tenth per under the Administration group. In this sense, this is at the minimum level of reading comprehension considered good.
3,9	3,8	0,1	Between the two groups evaluated, a difference of 0.1 decimal is shown, in which the group of Accounting is above the Administration group; neither of the two groups was above 4.1, which is the minimum standard established to measure how good the students' reading comprehension. In this question, students had difficulty expressing their ideas about the author's intention; They do not go deeper, which suggests that they are makes it difficult to construct an idea from oneself, or by oneself to discern the author's intention. The ideas they present they stay in a flat very superficial.
3.97	**3.71**		

Source: Research team.

Results with the groups of the Popular University of Cesar

Because this is an open investigation, which draws on previous cases, some of the results are shared with the Popular University of Cesar.

In 2022-1, the dialogic teaching strategy was resumed, for Theory of Knowledge, Tourism Theory, Research Methodology and the subject of Introduction to Science, Technology and Innovation, with students of Tourism and Hotel Business Administration, and students of International Trade from the Popular University of Cesar. The research process that had as its starting point the Autonomous University of the Caribbean was continued, later continued at the Universidad Libre, Barranquilla section.

The results in five groups with four subjects at the Popular University of Cesar can be summarized as follows:

a) It was proposed to the students of the subject Introduction to science, technology and innovation that they themselves grade the third exam, or final partial, where they had to establish the connection between theory and practice; The result was that 51% were rated with grades less than or equal to three, taking into account the feedback on the topic of the development of scientific thinking.

b) With the same group of students from the previous experience, but in the Tourism Theory subject, they were asked to propose indicators to carry out a self-assessment of the subject; The proposed indicators were: Autonomous learning, critical thinking, creative thinking, ability to apply what was learned, and responsibility. 44% of the students assigned a grade less than or equal to three. These results show that awareness was acquired of the difference between levels of thinking that they brought from high school and those required in scientific training. These groups were in their first semester.

c) Another group of students, in the Theory of Knowledge subject, in the second semester of their course, were asked to describe the learning results of the entire academic semester, and 62% indicated that applied didactics helped them assess the importance to focus attention on the development of thinking, a matter that they valued as more important than the assimilation of the contents or development of the subject plan.

d) Regarding the evaluation processes in all subjects, under the formative evaluation modality, tests were carried out that showed that the majority of students: 1) do not establish connections between topics, 2) do not assume a criterion about reading or objects. of learning, 3) they do not apply what they have learned to their immediate contexts, 4) they do not go beyond the description in reading or observation, and 5) only when confronted with formative evaluations, in each class, do they recognize that there are learning problems. understanding, and low level of scientific thinking.

e) Regarding the students' reading comprehension, it was as follows: The research methodology group obtained an average of 4.1; that of Tourist Theory 3. 56; the Theory of Knowledge group 3.9; and two groups, Introduction to Science, technology and innovation, obtained a rating of 3.4 and 3.6. These results are at a similar level to previous research at The Libre University.

Discussion

Of the students of the Universidad Libre, Barranquilla

With the research team of accounting students, because they defend or identify with their profession, they may have given a higher score to the students in their professional group; In the table presented by the students, they did not mention that the score obtained by the Administration group in question 7 was at the minimum point of the high level of reading comprehension. This wording was modified, by the main researcher, for a greater understanding of this research.

In the researcher's teaching practice from the Epistemology and Research Methodology groups at the Faculty of Administrative and Accounting Economic Sciences of the Autonomous University of the Caribbean, between the years 2010 to 2013, the teacher adopted 3.8 as a symbolic grade for students who did not meet the minimum requirements in terms of learning outcomes; This implies that if the teacher's grading system were adjusted, a large part of the students would fail the subjects, something that would not be easy to justify in a traditional educational system, based on the repetition of content. This was indirectly tested with the research at the Universidad Libre, allowing students to evaluate the reading comprehension and textual production of other groups.

Of the students of the Popular University of Cesar

It can be seen that the students' self-assessment scores show that there is awareness of the difficulties of reading comprehension and textual production, to the extent that they are prepared to differentiate the way they regularly approach texts and write about them. Getting the student to assume a position on reading is not something that has been encouraged in the educational system; Rather the opposite, it can be hypothesized that the low levels of reading comprehension are due to the predominance of traditional teaching, focused on teaching and not on learning, more on the transmission of knowledge than on conceptual construction.

The next step is not so much to prove that there are low levels of reading comprehension and text production, an issue that becomes evident when statistics are published on some rankings of educational quality.

The application of dialogic didactics with four moments, such as the presentation of the topic, reflection, transfer, and assessment, added to the fact that the student is made a participant in the way he approaches learning, leads to Participatory Action Research can be used as dialogic didactics, and that the learning results of research-based teaching can also be validated.

The way is then open for the next step to be the application of dialogic didactics from thinking styles.

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