# A Research Model for Cultivating Imaginative Culture: Contextualized Cartoons in Science Education

Jaime Duván Reyes Roncancio[1], Edier Hernán Bustos Velazco[2], Wilson Pinzón Casallas[3]

[1]Professor, Universidad Distrital Francisco José de Caldas,
Email: jdreyesr@udistrital.edu.co, ORCID: 0000-0002-9229-1196
[2]Professor, Universidad Distrital Francisco José de Caldas,
Email: ehbustosv@udistrital.edu.co, ORCID: 0000-0003-0072-8598
[3]Professor, Universidad Distrital Francisco José de Caldas,
Email: wjpinzonc@udistrital.edu.co, ORCID: 0000-0003-0258-6810

## Abstract

This study analyzes the application of contextualized conceptual comics as a pedagogical tool to enhance imaginative thinking in science education. Drawing upon Vygotsky's theory of creative imagination (1996), phenomenon-based learning, and imaginative didactics, the research investigates how these comics support students in understanding abstract scientific concepts while fostering critical and creative thinking. Researchers employed a quasi-experimental approach that compared a control group with an experimental one. The experimental group used comics to study scientific topics like photosynthesis and fluid pressure. The results indicate that contextualized conceptual comics improve students' conceptual understanding and stimulate their imagination by linking theoretical knowledge to everyday experiences. This interdisciplinary strategy demonstrates the potential for broad application across educational contexts, promoting active learning and innovative problem-solving.

**Keywords:** pedagogical tool, Vygotsky's theory.

## 1. Introduction

Contextualized conceptual comics (CCCs) are educational tools that combine visual and narrative elements with real-life situations. This didactic resource simplifies the comprehension of abstract phenomena in fields such as science, mathematics, and other disciplines. CCCs further promote the development of imaginative culture, which enhances critical and creative thinking. This review explores how CCCs facilitate active learning and foster interdisciplinary understanding by utilizing current research in educational practices.

Contextualized Concept Cartoons in Science Teaching

Using contextualized conceptual comics (CCCs) in science teaching has proven highly effective in helping students grasp abstract phenomena. Jaimes Escobar et al. (2021) explain how CCCs allow students to visualize complex concepts, such as pulmonary ventilation, simplifying

understanding of the relationship between pressure and volume in gaseous substances. This approach, rooted in Phenomenon-Based Learning (PBL), bridges scientific theory with everyday experiences, promoting a deeper and more meaningful understanding of scientific phenomena (Reyes Roncancio et al., 2020).

Experimental practices related to CCCs also engage students in validating hypotheses and designing experiments, which actively contributes to their learning process (Reyes Roncancio et al., 2020). Jiménez Arriagada et al. (2020) highlight that this educational strategy fosters scientific literacy and develops advanced cognitive skills, which are crucial for effective science teaching.

Contextualized Concept Cartoons in Science Teaching

Using contextualized conceptual comics (CCCs) in science teaching has proven highly effective in helping students grasp abstract phenomena. Jaimes Escobar et al. (2021) explain how CCCs allow students to visualize complex concepts, such as pulmonary ventilation, simplifying understanding of the relationship between pressure and volume in gaseous substances. This approach, rooted in Phenomenon-Based Learning (PBL), bridges scientific theory with everyday experiences, promoting a deeper and more meaningful understanding of scientific phenomena (Reyes Roncancio et al., 2020).

Experimental practices related to CCCs also engage students in validating hypotheses and designing experiments, which actively contributes to their learning process (Reyes Roncancio et al., 2020). Jiménez Arriagada et al. (2020) highlight that this educational strategy fosters scientific literacy and develops advanced cognitive skills, which are crucial for effective science teaching.

Development of Imaginative Culture

One of the most notable benefits of CCCs is their ability to stimulate creative imagination. González-Moreno et al. (2022) note that CCCs encourage students to reframe their interpretations and develop creative solutions to academic problems. This ability is essential for flexible and adaptable thinking (González-Moreno et al., 2022). Furthermore, López-Larios et al. (2023) argue that CCCs connect academic representations with personal and everyday experiences, thus fostering imagination development from an early age.

Imaginative didactics, an approach advocated by Guadalupe and López-Larios (2020), enhances this process by combining creativity with critical reflection. This method has shown positive outcomes in science education and teaching values and critical skills. Therefore, the development of imaginative culture through CCCs promotes a more holistic view of learning, integrating creative and reflective aspects into the educational process.

Interdisciplinary Applications

The impact of contextualized conceptual comics (CCCs) extends beyond science education. In mathematics, Yulaichah et al. (2024) demonstrate how CCCs enhance primary students' critical

and creative thinking skills by presenting mathematical problems within everyday contexts. This approach increases students' motivation and comprehension of abstract or complex concepts.

The interdisciplinary value of CCCs also appears in language and literature education. Martín (2022) explains that CCCs improve reading comprehension by combining text and images, making it easier for students to analyze and interpret literary narratives. Furthermore, CCCs promote visual literacy and multimodal learning, which is essential for teaching languages and interpreting complex texts (Jiménez Arriagada et al., 2020). In the humanities, Flantrmsky-Cárdenas (2022) underscores that CCCs are potent tools for clearly and accessibly conveying abstract cultural concepts. Their capacity to represent complex cultural phenomena makes CCCs a valuable resource for interdisciplinary education.

Promoting Active Learning

CCCs significantly promote active learning by involving students in hypothesis creation and experimentation. Reyes Roncancio et al. (2020) emphasize that active student participation is crucial for enhancing their critical thinking and engagement in the learning process. Studies by Jiménez-Pitre et al. (2022) also show that visual resources like CCCs stimulate critical and creative thinking, contributing to developing more advanced cognitive skills.

Additionally, learning that involves social interaction and hands-on experimentation strengthens students' understanding of concepts and promotes active, meaningful engagement in the classroom (Jaimes Escobar et al., 2021).

Research Model: Developing Imaginative Culture through CCCs

General Objective:

This research aims to explore how contextualized conceptual comics (CCCs) foster the development of imaginative culture in students by enhancing their critical thinking, creativity, and interdisciplinary understanding.

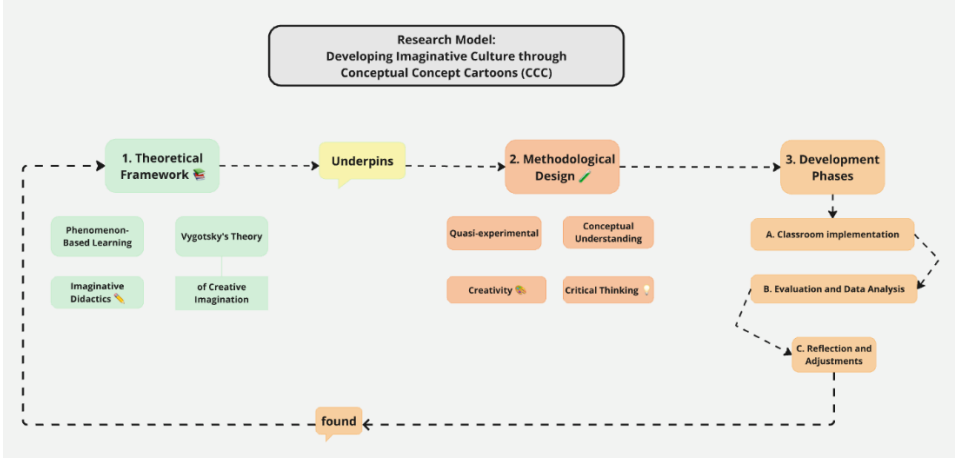


Figure 1. Research Model for Developing Imaginative Culture through Contextualized Concept Cartoons

Figure 1 presents a structured framework to foster imaginative culture using contextualized conceptual comics (CCCs). The model integrates theoretical foundations, including Vygotsky's theory of creative imagination, phenomenon-based learning, and imaginative didactics, to guide the educational process. The design emphasizes practical applications in the classroom and assesses students across creativity, critical thinking, and conceptual understanding. The CCCs serve as a tool to link scientific theories to real-world contexts, promoting both reflective and innovative thinking.

Components of the Model(fig. 1):

## 2. Theoretical Framework:

The model is grounded in three fundamental theories:

Vygotsky's Theory of Creative Imagination (1996) states that imagination develops not only during childhood play but also through interactions with cultural and educational elements, such as CCCs.

Phenomenon-Based Learning (PBL) connects scientific theory with everyday situations, contextualizing concepts to promote critical reflection.

Imaginative Didactics: This approach integrates creativity with critical thinking, encouraging the development of imagination from an interdisciplinary perspective.

Practical Example:

Using a phenomenon-based approach as a theoretical framework can explore the impact of CCCs in science education. For instance, teachers can use CCCs to explain photosynthesis, where students visualize the process through characters representing water, carbon dioxide, and sunlight interacting.

Methodological Design

Researchers will implement a quasi-experimental design to compare a control group (without CCCs) and an experimental group (using CCCs). They will evaluate participants across three dimensions:

Creativity: Tools like the Torrance Test of Creative Thinking will measure how CCCs impact students' imagination.

Critical Thinking: Formative assessments evaluate how students apply prior knowledge and generate new hypotheses.

Conceptual Understanding: Exams will assess students' ability to explain complex concepts in their own words, with CCCs as a learning aid.

Practical Example:

In a math class, a CCC could introduce the concept of fractions through a relatable context, such as dividing a pizza. Researchers would compare the experimental group (using CCCs) and the control group (without CCCs) on creativity (creating their own fraction stories), critical thinking (explaining and comparing fractions), and conceptual understanding.

Phases of Model Development

Planning and Designing CCCs:

During this phase, researchers design CCCs based on the concepts they intend to teach. These cartoons must be contextualized within familiar scenarios to facilitate greater identification and understanding.

Practical Example:

In a physics course, students might interact with a CCC that explains the concept of pressure through a story in which a group of friends dives underwater and must understand the relationship between depth and pressure to safely resurface.

Implementation in the Classroom:

Educators incorporate CCCs into the regular curriculum alongside group discussions and hands-on experiments.

Practical Example:

After reading a CCC about underwater pressure, students can design a simple experiment using water bottles to measure pressure at different depths, applying the knowledge gained from the comic.

Evaluation and Data Analysis:

Researchers conduct formative and summative evaluations to assess the impact of CCCs on the development of imaginative culture and conceptual learning.

Practical Example:

Students will create their CCCs to explain another physics concept, such as buoyant force. Researchers will then analyze the results to assess critical thinking and conceptual understanding both before and after

Implementing the CCCs. Reflection and Adjustments:

Researchers review the results and adjust their approach if necessary, refining the CCCs or the teaching strategies based on student feedback and collected data.

Practical Example:

If students struggle to relate the concept of pressure to their daily lives, the CCC might be revised to include a more accessible setting, such as swimming in a local pool.

## 3. Discussion

This study's theoretical framework builds on Vygotsky's Theory of Creative Imagination (1996), Phenomenon-Based Learning (PBL), and Imaginative Didactics. Vygotsky highlights the critical role of imagination in cognitive development, emphasizing that it strengthens through interactions with cultural tools like contextualized conceptual cartoons (CCCs). These comics allow students to visualize abstract phenomena and connect them to their everyday experiences, facilitating understanding and stimulating creative and critical thinking. In the context of PBL, CCCs effectively link theory to practice. Reyes Roncancio et al. (2020) noted that this approach fosters a more profound comprehension of complex scientific concepts, such as photosynthesis and fluid pressure. Imaginative Didactics (Guadalupe & López-Larios, 2020) further supports this strategy by promoting creativity and critical reflection in the learning process.

The proposed methodological model uses a quasi-experimental design to assess how CCCs influence students' creativity, critical thinking, and conceptual understanding. The activities engage students in creating stories or experiments based on CCCs, allowing researchers to evaluate how these tools encourage hypothesis formation and the development of innovative solutions. This methodological approach, aligned with Vygotsky's principles and PBL, promotes active learning and critical reflection, integrating theoretical knowledge into educational practice

(Jaimes Escobar et al., 2021; Yulaichah et al., 2024). Evaluating the impact of CCCs across different interdisciplinary fields reinforces their potential to transform the teaching-learning process, making it more dynamic and participatory.

## 4. Conclusion

Contextualized conceptual comics (CCCs) represent a significant advancement in science education, facilitating the comprehension of abstract phenomena and promoting the development of imaginative culture within the classroom. Educators use CCCs to transform complex scientific concepts like photosynthesis and fluid pressure into everyday narratives that resonate with students' prior experiences. This multimodal approach, which integrates text and visuals, enhances information access and fosters critical reflection and creativity. Students gain a better understanding of scientific concepts and apply them to form hypotheses, solve problems, and develop innovative solutions—skills essential for their cognitive development and readiness to tackle contemporary scientific challenges.

The research model based on CCCs offers several critical advantages for cultivating an imaginative culture in science education. First, it encourages active learning, where students become participants in their knowledge construction by creating their own comics or applying learned scientific concepts to new situations. This model also strengthens interdisciplinary thinking, as CCCs can easily be adapted to other subjects, such as mathematics or literature, fostering a holistic educational approach. Additionally, the comics stimulate creativity by requiring students to interpret, imagine, and represent scientific phenomena, promoting flexible and adaptable thinking. By embedding scientific concepts in everyday situations, CCCs make learning more meaningful and enduring. This educational model has the potential to revolutionize science teaching by integrating imagination, critical reflection, and creativity, thus equipping students with the tools they need to face the challenges of the 21st century.

## WORKS CITED

Bustos Velasco, E. H., & Reyes Roncancio, J. D. (2020). Aprendizaje basado en fenómenos: uso de HCC en la enseñanza de física. Educación en Ciencias, 7(1), 12-24.

Flantrmsky-Cárdenas, O. G. (2022). Cómic y novela gráfica como literatura menor: debates y validez como producto cultural. Folios, (56), 3-16.

González-Moreno, C. X., Solovieva, Y., & Quintanar-Rojas, L. (2022). Evaluación de la imaginación creadora en la edad escolar. CIENCIA ergo-sum, 29(1).

Guadalupe, D., & López-Larios, C. (2020). Impacto del enfoque educación imaginativa dentro de una comunidad escolar sonorense, México.

Jaimes Escobar, J. P., Bustos Velasco, E. H., & Reyes Roncancio, J. D. (2021). Historietas conceptuales contextualizadas como herramienta para comprender fenómenos donde intervienen sustancias gaseosas. Universidad Distrital Francisco José de Caldas.

Jiménez Arriagada, V., Bañales Faz, G., & Lobos Sepúlveda, M. T. (2020). Investigaciones del cómic en el área de la didáctica de la lengua y la literatura en Hispanoamérica. Revista Mexicana de Investigación Educativa, 25(85), 375-393.

Jiménez Arriagada, V., Bustos, M., & Sánchez, J. (2021). Multimodalidad en la educación: uso de cómics y HCC en la enseñanza de la lengua. Didáctica Lingüística, 18(2), 45-62.
Jiménez-Pitre, I., Molina-Bolívar, G., & Gamez Pitre, R. (2022). A scientometrics analysis of Colombian universities applying for patents. Journal of Positive Psychology & Wellbeing, 6(2), 731-738.
López-Larios, C., González-Bello, E. O., & Covarrubias Capaceta, D. (2023). Didáctica imaginativa para la planificación de la enseñanza. Revista Internacional de Educación, 13(26), e498.
Martín, A. (2022). Entender el cómic: el arte invisible. Revista de Estudios Sociales, 30, 114-123.
Reyes Roncancio, J. D., Bustos Velasco, E. H., & Romero Osma, G. P. (2020). Historietas Conceptuales Contextualizadas. Revista de Didáctica de las Ciencias Experimentales, 35(3), 12-48.
Reyes Roncancio, J. D., Romero Osma, G. P., & Bustos Velasco, E. H. (2020). Historietas Conceptuales Contextualizadas. Herramienta Didáctica para Promover Explicaciones en la Enseñanza de las Ciencias. Universidad Distrital Francisco José de Caldas.
Vygotsky, L. S. (1996). Imagination and creativity in childhood. The MIT Press.
Yulaichah, S., Mariana, N., & Wiryanto. (2024). The Use of E-Comics Based on A Realistic Mathematical Approach to Improve Critical and Creative Thinking Skills of Elementary School Students. IJORER, 5(1), 90-105.