World Journal of Information Systems 3(4) 54-68
DOI: https://doi.org/10.17013/wjis.v3i4.71

Article

Virtual Reality, Computational Thinking, and Verbal Reasoning: Pre-Service Teachers' Perceptions of the Delightex Platform

Mariela Tapia-Leon [1,*], María Merchán Gavilanez [1], Gerardo Benavides-Montenegro [2] and Sergio Luján-Mora [3]

[1] Universidad de Guayaquil, Ecuador

[2] Universidad Hemisferios, Ecuador

[3] Universidad de Alicante, España

***** Correspondence: mariela.tapial@ug.edu.ec

(Article history: Received 5 September 2026; Received in revised form 10 October 2026; Accepted 12 November 2026; Available online 15 December 2026)

Abstract: This study analyzes pre-service teachers' perceptions of the use of virtual reality (VR) as an educational resource to strengthen verbal reasoning. Forty-four students from the University of Guayaquil participated, designing educational applications on the Delightex platform. The students integrated activities such as reading comprehension, synonyms, antonyms, and analogies, among others, into an immersive environment. Subsequently, a survey was conducted, which was answered by 90% of the participants. The results indicate that 97% of students believe that their resource contributes to verbal reasoning. They explain that this is because VR is motivating since it is interactive, experiential, visual, and playful, conditions repeatedly associated with more effective language stimulation. Likewise, it was evident that working with Delightex developed digital and social skills in pre-service teachers. Although some students noted pros and cons of using this VR platform, 85% expressed interest in continuing to use Delightex in future educational projects. These findings are interpreted considering recent evidence on VR in teacher training, computational thinking, language-skill development, and the educational needs of students with high intellectual abilities (HIA). The study concludes that VR not only contributes to strengthening verbal reasoning through the creation of innovative educational resources, but also enhances creativity, fosters collaborative work, and develops digital and pedagogical skills relevant to teacher training.

Keywords: Computational thinking; Delightex; Gamification; High intellectual abilities; Immersive learning; Teacher training; Verbal reasoning; Virtual reality.

© 2026 ITMA. All rights reserved.

1. Introduction

Verbal reasoning plays a crucial role in people's academic, professional, and career success, given that all the activities we carry out are based on communication. Burton et al. [1] conceptualize verbal reasoning not as a single skill, but as a set of interconnected cognitive and metacognitive operations, ranging from understanding and interpreting discourse to constructing new understandings and monitoring whether they are being understood. Verbal reasoning does not only involve having a broad vocabulary or writing without spelling mistakes; it also has to do with the ability to infer meanings, find logical relationships between words, and express ideas coherently [2]. This understanding of what verbal reasoning means justifies why its development cannot depend solely on lexical richness or knowledge of grammar rules. Strengthening verbal reasoning requires tasks that demand inference, relational thinking, and the ability to construct meaning on one's own. However, verbal reasoning is an area that requires intervention to improve it. According to Álvarez-Cedrón, a speech therapist and early childhood and primary school teacher, 40% of school failure is due to language difficulties [3], a problem that carries into adulthood. A study of 119 students from the Language and Literature program at the National University of Loja (Ecuador) found an average performance of only 52.5% in verbal skills, well below the 70% (7/10) that Ecuadorian universities typically require as a passing threshold, which is insufficient for future Language teachers. For this reason, it is important to develop verbal reasoning from an early age.

Immersive environments, such as virtual reality (VR), favor learning because they use visual and auditory channels at the same time. According to multimedia learning theory, this produces deeper encoding than information presented through a single channel [5]. In addition to creating visual and auditory stimuli, VR generates experiential interaction and, depending on its design, also a playful experience. These conditions are associated with more effective language stimulation [6].

VR is an immersive technology that captures students' attention, promoting meaningful learning through the creation of three-dimensional (3D) scenarios. This is evidenced by an article presenting a literature review on VR [7], in which the author highlights the positive impact that this emerging technology has on student learning, given its high interactive, immersive, and motivational potential. A recent study [8] reinforces these findings, showing that most participants engaged positively with Virtual Reality Learning Environments (VRLEs), reporting high motivation and positive emotional responses, particularly in interactive experiences. However, challenges such as motion sickness and technical issues were also identified. Overall, the evidence suggests that immersive VR experiences can significantly enhance student motivation and engagement, provided their implementation is carefully aligned with pedagogical objectives, supported by high-quality design, and attentive to user experience. VR is a tool that can help transform the teaching-learning process, but discretion is required, because it may not be the most appropriate tool in every case [9].

© 2026 ITMA. All rights reserved.

1.1. Virtual Reality in Pre-Service Teacher Training

Given the potential of immersive technologies to enhance learning, VR has attracted interest as a tool for preparing pre-service teachers. A systematic review and meta-analysis of 52 studies conducted between 2014 and 2024 found that VR has a positive, moderate effect on teacher training (Hedges' g = 0.524), especially regarding content knowledge, classroom management, and socio-relational competencies [10]. In the same vein, a study on VR-based microteaching found that pre-service teachers improved their ability to formulate pedagogical questions and their verbal and non-verbal communication skills during a simulated VR class [11]. These findings support the use of tasks in which pre-service teachers design their own VR resources as a genuine teacher-training strategy, rather than a mere technological novelty. Unlike the microteaching study, where participants rehearsed teaching a class to students within VR, creating educational resources with VR requires additional reasoning: anticipating how a child unfamiliar with the tool will understand the instructions, navigate the different scenes, and respond to feedback.

1.2. Virtual Reality and the Development of Verbal and Language Skills

Research on the use of VR in the field of language has also grown in recent years. A meta-analysis of 21 studies, between 2015 and 2025, found that VR applications have a moderately positive and significant effect on productive language skills (speaking and writing), with a Hedges' g of 0.538, outperforming traditional instruction [12]. This is consistent with the theoretical position noted earlier [5,6], that immersive, interactive, and multisensory experiences allow language to be used in a practical and meaningful way, unlike isolated exercises. Consequently, this meta-analysis supports a key point of this study: the resources designed by the participants (language and verbal-reasoning activities embedded in an interactive 3D narrative) are more likely to engage learners than the same tasks presented as static exercises.

1.3. Gamification and Computational Thinking through Block-Based Programming

This study employs Delightex (formerly known as CoSpaces Edu), a platform that allows users without programming experience to design and explore interactive three-dimensional and virtual-reality environments; its education-oriented version, Delightex Edu, is aimed specifically at classroom use. It was already integrated into the "Use of Virtual Reality in Education" course at the University of Guayaquil, which is why it was selected for this study rather than an alternative VR-authoring platform. Its visual programming tool, CoBlocks, lets users add interactivity, animations, and simple logic to their 3D scenes without writing code. This type of block-based programming environment is associated with improvements in learning, with a small-to-moderate effect size (g = 0.37–0.47) [13]. A recent study on gamified programming training in higher education found that gamification improves both learning and motivation compared to traditional instruction, in addition to reducing the

© 2026 ITMA. All rights reserved.

perceived difficulty of programming tasks [14]. This supports the use of CoBlocks as an accessible pathway for pre-service teachers to develop computational thinking, even without prior programming experience.

1.4. Digital Tools and the Educational Needs of Students with High Intellectual Abilities

Students with High Intellectual Abilities (HIA) do not usually receive attention adapted to their needs in educational institutions. Classes are planned around the learning pace of the average student, leaving aside the depth, novelty, and autonomy that HIA students seek in order to stay motivated [15]. A systematic review of digital tools for gifted students, which examined 55 studies between 2000 and 2024, found that technology platforms can effectively foster their autonomy, creativity, and collaboration. However, unequal access to infrastructure and insufficient teacher preparation are barriers that hinder learning [16]. Hence, before training teachers to use immersive technologies such as Delightex, it is necessary to know whether they consider it practical, motivating, and pedagogically sound for developing computational-thinking and verbal-reasoning skills in those who would become their future students with HIA.

1.5. Problem Statement and Study Objective

These four reviewed themes converge on a concrete problem identified in educational practice that motivated this study. At the Minerva Educational Unit, an institution affiliated with the University of Guayaquil (Ecuador), a problem related to verbal reasoning was identified. The Wechsler Intelligence Scale for Children–V (WISC-V) [17] (a clinical instrument for individual administration that assesses general and specific intellectual abilities in children between 6 and 16 years of age) was administered at this institution. Based on the results of this scale, 35 Ecuadorian students with HIA were identified within a total population of 360 students [18]. Although these students show outstanding performance in various types of reasoning (logical, mathematical, perceptual, memory, visuospatial, creativity), the data reveal that average levels predominate in verbal reasoning (in mode and median). In other words, despite their high intellectual abilities, the group shows an average level of verbal reasoning.

Based on these findings, and to contribute to a possible techno-pedagogical solution to this problem, the design of innovative educational activities using VR was proposed, aimed at enhancing the development of verbal reasoning in primary school students. These activities were created by students in the Experimental Sciences – Educational Computing program at the University of Guayaquil, who, as pre-service teachers, integrated immersive strategies for this purpose. This study seeks to analyze these pre-service teachers' perceptions of the use of VR as an educational resource to strengthen verbal reasoning at the primary level, as well as to gather their opinions on the value of the Delightex platform within their teacher training and as an educational resource. These perceptions are interpreted in light of the

© 2026 ITMA. All rights reserved.

literature reviewed above on VR-based teacher training, computational thinking, and language-skill development.

2. Methodology

The design corresponds to an educational case study, focused on the academic work carried out by 44 students in the Experimental Sciences – Educational Computing program at the University of Guayaquil. The students developed educational applications on the Delightex platform (trial version) as the final project for the course "Use of Virtual Reality in Education." The sample was selected intentionally, as these students had been trained in the use of this VR tool during their classes. Participation in the survey was voluntary and anonymous, and students were informed of the academic purpose of the study before completing the questionnaire.

Students worked in teams of up to five members over a two-week period. During this time, they developed educational resources using VR, with the aim of strengthening verbal reasoning in primary school students. The project instructions were to design an interactive and immersive resource integrating visual, auditory, and textual elements, aimed at developing verbal reasoning. To this end, activities such as sentence completion, reading-comprehension exercises, inference, and identification of synonyms and antonyms, among other similar tasks, were proposed. Finally, each resource had to incorporate at least one assessment activity to gauge users' verbal reasoning. Once the deadline had passed, the applications were shared through videos posted in a forum within the course's virtual classroom. In the video (maximum five minutes), students had to explain how to use the educational resource they had created, its contribution to the development of verbal reasoning, and the verbal-reasoning assessment(s) it included. To grade the work, the instructor used a checklist with the following indicators (each worth two points, for a maximum of ten):

- Educational value: the resource contributes to the development of verbal reasoning in primary school students.
- Design: the scenarios and characters are appropriate for primary school students.
- Multimedia: the resource includes audiovisual stimuli and texts.
- Interactivity: the users can interact with the resource.
- Assessment: the resource includes at least one verbal-reasoning assessment.

This checklist gave equal weight to these criteria so that a visually attractive resource without pedagogical content would not score higher than a simpler one focused on verbal reasoning. With this balance, the research team could determine which resources met all the criteria and identify the resources that had drifted away from the main content area: verbal reasoning.

Subsequently, the university students were given a questionnaire that included five-point Likert-scale items (1 strongly disagree, 2 disagree, 3 neutral, 4 agree, 5 strongly agree), open-

© 2026 ITMA. All rights reserved.

ended questions, and closed-ended questions. The questionnaire was designed as an ad hoc instrument tailored to the objectives of the study. It consisted of four dimensions: 1) educational application, which seeks to understand students' perceptions of the usefulness and motivation that their educational resource would generate in primary school students; 2) verbal reasoning, to understand the type of activities carried out to reinforce verbal reasoning in primary school students; 3) the Delightex platform, to understand the value of this tool in university students' teacher training and its value as an educational resource; 4) final project, to determine the usefulness of the final course-project activity in applying VR to real educational contexts and problems. This questionnaire was administered through a Microsoft Forms form, and the responses were analyzed descriptively to identify patterns of perception.

3. Results

Fourteen educational resources were developed, with a design aimed at primary school students and an average rating of 8.8/10 points. Twelve of them had educational value oriented towards the development of verbal reasoning. Only two projects strayed from the topic of verbal reasoning and focused on other areas, such as Geography and History. The 3D settings students chose for their virtual worlds included stories, books, the Old West, enchanted forests, fairs, educational campuses, and cities. As an example, Figure 1 shows the interface of the application created by one of the working groups.



Figure 1. Interface of the application created by a group of students (https://edu.delightex.com/HPH-WSL). The on-screen dialogue (originally in Spanish) reads: "Get ready to solve riddles, discover meanings, and challenge your imagination"; "I'm very curious to find out what's in there"; and "I'm so excited to go in!!"

All projects included multimedia elements such as images, videos, audio, and 3D objects, whether native to the platform or imported. Interactivity was present in all educational

© 2026 ITMA. All rights reserved.

resources, allowing users to interact with the content through 3D objects and characters. Finally, questions were included to assess users' verbal reasoning, thus meeting all the criteria on the checklist. In general, most of the projects were very good or outstanding. However, some of them need to be polished in terms of spelling, accessibility, and navigability.

A total of 40 out of the 44 university students responded to the survey, representing 90%. Of these, 27 participants identified themselves as women (67.5%), 12 as men (30%), and 1 person preferred not to answer (2.5%). The average age was 25, with a minimum age of 21 and a maximum of 44. The survey results are described below.

3.1. Dimension: Educational Application

A total of 95% of students consider that their project has an educational objective related to verbal reasoning. Additionally, 87.5% consider that their application is complete and functional. Although some projects were left unfinished, according to the students' own assessment, the resource would be 100% motivating, for five recurring reasons, illustrated below with representative comments.

Being ludic and interactive:

- "It is an interactive game that allows students to learn more quickly."
- "The resource allows them to interact in real time, moving freely through each scene of the story."

Being attractive:

- "It is very visual and full of colors."
- "The inclusion of images, text, animations, and sound makes it more interesting."

Awakening curiosity and creativity:

- "Students can learn while having fun. It allows them to have experiences that awaken their curiosity and encourage them to express themselves and think better."
- "The resource helps develop key skills such as logical reasoning, creativity, problem solving, motivation, and awakens their curiosity as it is an innovative and fun way to learn."

Developing cognitive skills:

- "The resource helps improve reasoning and captures attention through visual, dynamic, and interactive resources."
- "It is a very interactive and interesting way to understand verbal reasoning."

Using educational innovation:

- "For innovation and the use of 3D digital educational resources."
- "It is something innovative where students will explore new things and encourage interest in learning to use the educational resource."

© 2026 ITMA. All rights reserved.

3.2. Dimension: Verbal Reasoning

Reading comprehension was the activity most frequently carried out by students, mentioned by 32 of the 40 students. This was followed by solving puzzles (27 mentions), recognizing synonyms and antonyms (21 mentions), analogies (16 mentions), completing sentences (13 mentions), and spelling correction (9 mentions). According to 97% of the students, these activities would help improve the verbal-reasoning skills of primary school students (see Figure 2).

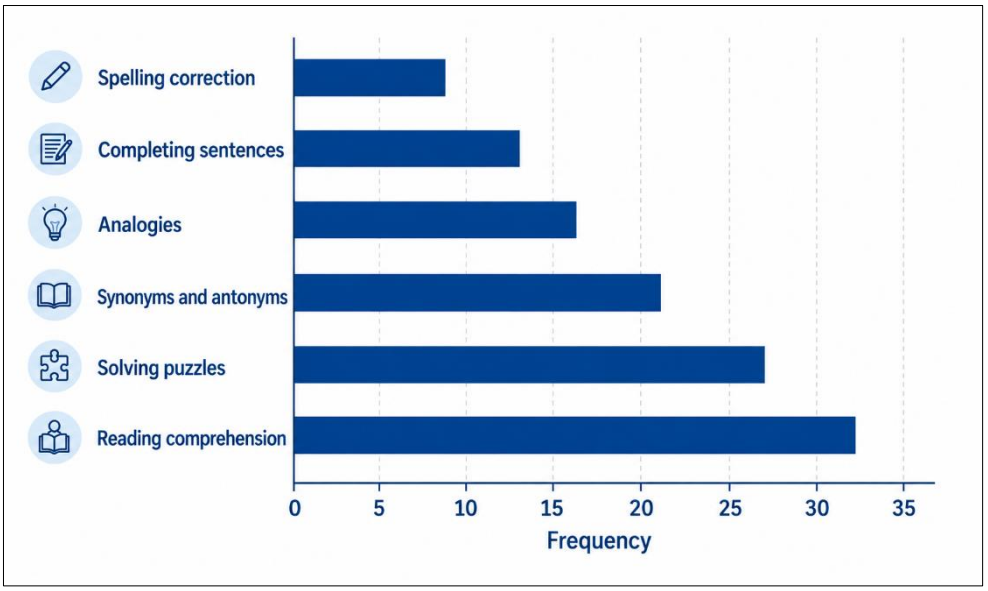


Figure 2. Frequency of Verbal Reasoning Activities.

3.3. Dimension: Delightex Platform

A total of 77.5% of students consider it manageable to develop VR resources with Delightex. This means that the tool is perceived by most students as easy to use and without a steep learning curve. However, four students (10%) found the level of difficulty to be less manageable, suggesting that additional training should be provided to help these students overcome their difficulties.

In addition, 85% of students consider that using CoBlocks (a visual block-based programming language) within Delightex favored the development of their computational thinking. This is a very valuable skill for them, since they will be working as future computer-science and programming teachers. The same percentage (85%) expressed a desire to continue exploring Delightex for future educational projects, including once they are teaching. However, just over half (57.5%) will use the tool for their degree project. This relates to the question about their preference for choosing another tool to develop the same final course project. Less than half of the students (45%) said they would choose the same tool. 47.5% mentioned that they would choose different alternatives, such as Unity, Scratch, or PlayCanvas, among others. The remaining 7.5% did not mention any tool or said they did

© 2026 ITMA. All rights reserved.

not know. This reveals a gap between the tool's perceived pedagogical value and students' willingness to keep using it on their own, a decision likely associated with the perceived limitations of the trial version used.

Although the results show that Delightex is not one of the students' favorite tools, the perception of its use was positive. Participants noted that they liked its ease of use, the ability to express their creativity when designing interactive scenarios, and the ability to work with the platform's own 3D elements. They also indicated that block-based programming was intuitive, allowing them to program without prior knowledge of that language. On the other hand, participants also mentioned technical difficulties with the network, limitations when uploading large 3D objects, and slow loading of elements on some devices. Some students found programming complex at times, a situation made worse by the lack of tutorials on how to use the platform. They also indicated that they dislike the fact that the tool is paid.

3.4. Dimension: Final Project

Students are convinced that the use of VR can meet real educational needs. This is indicated by the 92.5% of students who agreed or strongly agreed that the final-project activity allowed them to understand the usefulness of Delightex.

The final project allowed students to apply the pedagogical knowledge they had acquired during their studies. This is stated by 97.5% of students. Likewise, 95% of students believe they were able to apply their programming knowledge to the project. This shows that the tool allowed them to link computational thinking and coding skills in a real educational context.

A total of 95% of students agreed or strongly agreed that teamwork allowed them to create a quality product. Collaborative work allowed them to integrate different ideas, diversify possible solutions, and support one another in achieving a common goal, which students associated with the quality of the resource created.

Just over half of the students (57.5%) said they would use another tool to develop their degree project; this may be because some students were already working on their degree projects and were unable or unwilling to switch tools. One student summarized this tension directly: "I didn't know this tool existed; I could have used it for my thesis." Despite this, 85% said they will use Delightex in future educational projects, suggesting that the tool sparked genuine interest for future teaching scenarios, even where it was not the one chosen for the students' own immediate academic work.

3.5. General Perceptions of VR for Verbal Reasoning

Regarding pre-service teachers' perceptions of using VR to improve verbal reasoning in primary school students, the vast majority (more than 90%) hold a positive perception. Their responses focus not only on verbal reasoning, but also on the application of VR in other subjects and the development of students' digital skills. Regarding verbal reasoning, students highlight that the resources created can help develop language skills, expand vocabulary, and improve reading comprehension. They explain that VR is a motivating resource that captures

© 2026 ITMA. All rights reserved.

attention thanks to its visual, playful, and experiential elements. They note that it is a very useful, innovative resource for modernizing education. However, they clarify that the tool's effectiveness will depend on teacher support. Some of their opinions are quoted below:

- "My perception is very good because this platform helps solve problems in an innovative way."
- "I think virtual reality helps improve verbal reasoning in children because they learn by playing and feel part of the experience."
- "I believe that virtual reality can be very useful for improving verbal reasoning in children, as it allows them to interact in interesting environments that help them develop vocabulary and communication skills in a fun and practical way."
- "It is essential to implement virtual reality in education because it allows them to acquire the computer skills necessary in today's world."
- "Virtual reality can improve verbal reasoning in elementary school students by offering immersive experiences that encourage oral expression, comprehension, and the organization of ideas. By interacting with virtual environments, children describe, interpret, and narrate situations, which strengthen their language skills. In addition, VR allows learning to be adapted to different paces and needs. Its effectiveness depends on teacher support and appropriate pedagogical use."

Students also reflected on the final project as a whole; some of their conclusions were:

- "Virtual reality is a tool that allows us to do incredible things."
- "I conclude that integrating technology in a creative and pedagogical way not only motivates students, but also promotes key skills such as computational thinking, verbal reasoning, and autonomy."
- "Programming can be entertaining and a lot of fun. Through this tool, children can be taught to develop their computational thinking from an early age, creating very enjoyable scenarios for playing and learning at the same time."
- "Virtual reality is a significant contribution to student development. Technology and education are advancing, which requires teachers to be innovative."

4. Discussion

4.1. Virtual Reality as a Teacher-Training Strategy

A total of 92.5% of students agreed that the final project helped them understand the pedagogical usefulness of Delightex, and 97.5% reported having been able to apply prior pedagogical knowledge. These two results reflect precisely the two aspects that Han et al. [10] highlight in their meta-analysis. Understanding the pedagogical usefulness of a tool and being able to apply prior knowledge are signs of greater content knowledge and greater

© 2026 ITMA. All rights reserved.

instructional confidence. This is precisely where that meta-analysis found the strongest effect of VR on teacher training. This study also aligns with evidence that hands-on VR simulation strengthens pre-service teachers' communication skills. Several open-ended survey responses mentioned not only the technical experience of building a VR resource, but also reflecting on how a child would understand and interact with it, a form of pedagogical simulation in line with Zhang et al. [11], although not aimed at simulating a class, but rather at how a student would interact with a technological resource.

4.2. Computational Thinking and the Ease-of-Use/Preference Gap

A total of 85% of participants considered that Delightex's block-based programming language (CoBlocks) favored their computational thinking, a finding consistent with the literature on gamified block-based programming [13,14]. However, only 45% said they would choose Delightex again for their own final degree project, and 57.5% expect to use a different tool. This apparent contradiction is explained by the technical difficulties reported by students themselves: network dependency, file-size limits, slow loading, and the tool's cost. In other words, participants distinguished between Delightex's pedagogical value, which they rated highly, and its practical convenience for individual, high-stakes work (such as the degree project), where accessibility and affordability matter more than pedagogical appeal. This distinction is relevant for institutions deciding which platform to standardize in teacher-training courses. Perceived usefulness and the intention to adopt a tool are not the same thing, and both should be measured separately in future evaluations. The likely reasons for rejecting Delightex are properties of this specific pilot implementation (the trial version used and the institution's infrastructure), not of creating interactive content with CoBlocks.

4.3. Verbal Reasoning and Language-Related Perceptions

A total of 97% of students believed that their resources would improve primary school students' verbal reasoning. This near-unanimous belief is consistent with evidence that VR has a moderately positive effect on productive language skills [12], and with previous reviews describing VR as beneficial for language learning when its implementation is well aligned with pedagogical objectives [7,8]. However, this study measured a perceived impact rather than a verified one. The 44 participants assessed the potential of their own resources, not their actual effect on primary school students' verbal reasoning. This limitation motivates the follow-up phase described in Section 6 Conclusions. The verbal-reasoning activities students chose (reading comprehension, synonyms and antonyms, and analogies) also reflect the lexical and relational operations that Burton et al. [1] place at the core of verbal reasoning. This suggests that, even without formal training in this area, participants' pedagogical intuition converged with this theoretical framework and led them to develop cognitively appropriate tasks.

© 2026 ITMA. All rights reserved.

4.4. Implications for Students with High Intellectual Abilities

The resources designed by the pre-service teachers were aimed at primary school students in general, not specifically at students with HIA. Even so, the findings are relevant to that population, because the study addresses a documented barrier in gifted education: insufficient teacher preparation to implement technology that addresses their need for depth, novelty, and autonomy [16]. Training pre-service teachers to design VR resources focused on verbal reasoning is a necessary first step before this type of intervention can be directed specifically at students with HIA, such as those identified through the WISC-V at the Minerva Educational Unit [18]. That data showed that Minerva's HIA students do not have a general language deficit, but a specific one: verbal reasoning remained at an average level, even though logical, mathematical, perceptual, memory, visuospatial, and creative reasoning were all outstanding. This suggests that a generic tool would not be enough for that profile, and that a later phase will need to design resources specifically targeted at that population. For now, this study is limited to assessing whether pre-service teachers can design verbal-reasoning resources in general, a first requirement before addressing that more specific design.

4.5. Collaborative and Digital Skill Development

A total of 95% of students agreed that teamwork improved the quality of the resource. This is in line with the development of socio-relational competencies [10]. It is also consistent with evidence that gamified, project-based technology can foster collaboration and autonomy [16]. This reinforces that Delightex's contribution went beyond building resources to strengthen verbal reasoning and also generated professional competencies, or soft skills, that pre-service teachers will need. Teams of up to five members had to agree on their ideas, divide specific tasks for content review, programming, and design, and arrive at a final product within two weeks. Several open-ended responses revealed that this team negotiation was, in itself, valuable preparation for the collaborative work these pre-service teachers will have to do with colleagues in their professional lives.

4.6. Practical Implications for Teacher-Training Programs

These findings suggest four practical considerations for programs that prepare pre-service teachers to use immersive technologies. First, evaluating a VR platform for teacher training should separate pedagogical perception from technical usability. A tool can be valuable for teaching while still being rejected for personal use if it proves unreliable or resource-intensive. Second, an initial technical induction phase, focused on the platform's most common failure points (file-size limits, connectivity dependency, device requirements), would likely reduce the frustration reported by students. This would free up instructional time for pedagogical design rather than technical troubleshooting. Third, defining the checklist criterion as "educational value for the development of verbal reasoning in primary school

© 2026 ITMA. All rights reserved.

students," rather than leaving it as a generic criterion, contributed to twelve of the fourteen resources not straying from the main focus. Finally, programs should distinguish between short-term enthusiasm and sustained adoption when evaluating a course project of this kind. A total of 85% of participants wanted to continue using Delightex in their future teaching, but only 45% would choose it again for their own degree project. For this reason, follow-up surveys conducted after graduation, once participants design resources without the incentive of a grade, would provide a more reliable estimate of the lasting value of this type of tool in teaching practice.

5. Limitations and Future Work

This study has several limitations that should be considered when interpreting its findings. First, pre-service teachers' perceptions of VR's contribution to verbal reasoning are based on self-report and self-reflection, which can introduce positive response bias, since participants evaluated the resources they themselves had created. Second, the questionnaire was an ad hoc instrument aligned with the study's four dimensions but not statistically validated, which limits the psychometric robustness of the percentages reported. Third, the sample was obtained through intentional, non-probabilistic selection within a single course at a single university, and was predominantly female (67.5%), which limits the generalizability of the findings to other institutions, programs, or demographic profiles. Fourth, the two-week development period, further constrained by the 45-day limit of Delightex's trial version, may have limited both the sophistication of the resources produced and participants' opportunity to overcome the platform's technical learning curve. Fifth, and most importantly, this study measured perceived pedagogical value, not verified impact. No primary school student, let alone one with HIA, used the resources or was assessed on verbal-reasoning outcomes as part of this phase. Finally, the absence of a comparison group and of a pre-/post-test design means that the positive perceptions reported here cannot be separated from a possible novelty effect associated with using unfamiliar technology for the first time. Longer, comparative implementations would be needed to determine whether enthusiasm persists once designing VR resources becomes a routine part of professional practice rather than a one-time final project.

6. Conclusions

This study set out to analyze pre-service teachers' perceptions of using VR, through the Delightex platform, to design educational resources aimed at strengthening primary school students' verbal reasoning. Four conclusions follow:

- Students perceived VR as effective for verbal reasoning: 97% believed their resources would help develop reading comprehension, synonym and antonym recognition, and analogical reasoning in primary school students, a perception consistent with the broader evidence reviewed in this study.

© 2026 ITMA. All rights reserved.

- Working with Delightex's block-based programming (CoBlocks) was associated with the development of computational thinking, although it was not most students' first choice of tool for their own high-stakes individual work, revealing a distinction between pedagogical value and practical convenience that should inform future platform decisions.
- The final project functioned as an effective teacher-training strategy: it allowed students to jointly apply pedagogical and programming knowledge, developed collaboration and digital skills, and is consistent with the broader literature on VR-based teacher training.
- This study evaluated perceived, not verified, impact. The next phase of this research will implement the educational resources created by the university students that, in experts' opinion, are most likely to improve verbal reasoning, with students with HIA at the Minerva Educational Unit, in order to measure their actual effect on verbal reasoning.

Acknowledgments: To all the students who participated in this project for their effort in creating educational resources with VR. We thank them for their commitment in completing the assigned task and participating in this study. We also thank the University of Guayaquil for its support of research project No. FCI-013-2024, titled "High Intellectual Abilities (HIA): Intervention Strategies in Intercultural Educational Contexts." The authors used the artificial intelligence tool Claude (Anthropic) to support the improvement and transcription of the scientific writing, and ChatGPT (OpenAI) for image generation. The authors take full responsibility for the final content.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

References

[1] Burton, N.W.; Welsh, C.; Kostin, I.; van Essen, T. Toward a Definition of Verbal Reasoning in Higher Education. *ETS Res. Rep. Ser.* 2009, *2009*, doi:10.1002/j.2333-8504.2009.tb02190.x.

[2] Euroinnova El Razonamiento Verbal y Su Importancia Available online: https://www.euroinnova.com/docencia-y-formacion-para-el-profesorado/articulos/razonamiento-verbal.

[3] Fominaya, C. 40% of School Failure Is Due to Language Difficulties Available online: https://www.abc.es/familia/educacion/abci-40-por-ciento-fracaso-escolar-debido-dificultades-lenguaje-201804092115_noticia.html.

[4] Torres Troncos, E.R.; Garrochamba Pullaguari, E.P. Habilidades Verbales: El Caso de Estudiantes Universitarios de La Carrera de Lengua y Literatura. *Cienc. Lat. Rev. Científica Multidiscip.* 2025, *9*, 3266–3290, doi:10.37811/cl_rcm.v9i3.17949.

[5] Mayer, R. *Multimedia Learning*; 3rd ed.; Cambridge University Press: Cambridge, 2021;

© 2026 ITMA. All rights reserved.

[6] Creaghe, N.; Quinn, S.; Kidd, E. Symbolic Play Provides a Fertile Context for Language Development. *Infancy* 2021, *26*, 980–1010, doi:10.1111/infa.12422.

[7] Menjivar Valencia, E.; Sánchez Rivas, E.; Ruíz Palmero, J.; Linde Valenzuela, T. Review of the Scientific Production on Virtual Reality between 2016 and 2020 through Scopus and WoS. *Rev. Educ. Mediática y TIC* 2021, *10*, doi:10.21071/edmetic.v10i2.13422.

[8] Aufenanger, S.; Bastian, J.; Bastos, G.; Castelhano, M.; Dias-Ferreira, C.; Fokides, E.; Gavalas, D.; Kasapakis, V.; Agelada, A.; Kostas, A.; et al. Immersive Virtual Reality Learning Environments for Higher Education: A Student Acceptance Study. *Comput. Educ. X Real.* 2025, *7*, 100105, doi:10.1016/j.cexr.2025.100105.

[9] Sousa-Ferreira, R.; Campanari-Xavier, R.A.; Rodrigues-Ancioto, A.S. Virtual Reality as a Tool for Basic and Vocational Education. *Rev. Científica Gen. José María Córdova* 2021, *19*, 223–241, doi:10.21830/19006586.728.

[10] Han, X.; Luo, H.; Wang, Z.; Zhang, D. Using Virtual Reality for Teacher Education: A Systematic Review and Meta-Analysis of Literature from 2014 to 2024. *Front. Virtual Real.* 2025, *6*, doi:10.3389/frvir.2025.1620905.

[11] Zhang, J.; Pan, Q.; Zhang, D.; Meng, B.; Hwang, G.-J. Effects of Virtual Reality Based Microteaching Training on Pre-Service Teachers' Teaching Skills from a Multi-Dimensional Perspective. *J. Educ. Comput. Res.* 2024, *62*, 655–683, doi:10.1177/07356331231226179.

[12] Şimşek, B.; Direkci, B.; Koparan, B.; Gülmez, M.; Akbulut, S.; Şimşek, E.E.; Kayır, G. The Effect of Virtual Reality Applications on the Development of Productive Language Skills: A Meta-Analysis. *Front. Educ.* 2026, *11*, doi:10.3389/feduc.2026.1782286.

[13] Hu, Y.; Chen, C.-H.; Su, C.-Y. Exploring the Effectiveness and Moderators of Block-Based Visual Programming on Student Learning: A Meta-Analysis. *J. Educ. Comput. Res.* 2021, *58*, 1467–1493, doi:10.1177/0735633120945935.

[14] Mellado, R.; Cubillos, C. Gamification Improves Learning: Experience in a Training Activity of Computer Programming in Higher Education. *J. Comput. Assist. Learn.* 2024, *40*, 1959–1973, doi:10.1111/jcal.13000.

[15] Gomez-Arizaga, M.P.; Valdivia-Lefort, M.; Castillo-Hermosilla, H.; Hébert, T.P.; Conejeros-Solar, M.L. Tales from within: Gifted Students' Lived Experiences with Teaching Practices in Regular Classrooms. *Educ. Sci.* 2020, *10*, 137, doi:10.3390/educsci10050137.

[16] Vidal-Fernández, A.; Martínez-Algora, C.; Román-González, M. Digital Tools to Support Personalized Education for Gifted Students: A Systematic Literature Review. *Educ. Sci.* 2025, *15*, 1257, doi:10.3390/educsci15091257.

[17] Wechsler, D.; Raiford, S.E.; Holdnack, J.A.; Hernández, A.; Aguilar Delgado, C.; Paradell, E.; Vallar, F. *WISC-V: Escala de Inteligencia de Wechsler Para Niños-V*; Pearson: Madrid, 2015;

[18] Merchán Gavilánez, M.L.; González Santamaría, V. Teacher Training in High Intellectual Abilities: A Study Based on Focus Groups. In *Formación docente, fundamentos metodológicos y evidencias empíricas*; Ediciones Octaedro: Barcelona, 2024.

© 2026 ITMA. All rights reserved.