PERCEPTIONS OF PEDAGOGICAL EFFECTIVENESS OF THE WORKSHOP ON THE USE OF TAPTANA CAÑARI FOR MATHEMATICS TEACHING: A COMPARATIVE ANALYSIS IN DIFFERENT EDUCATIONAL CONTEXTS

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ABSTRACT

Objective: The aim of this study is to analyze perceptions of pedagogical effectiveness regarding the workshop on the use of Taptana Cañari for teaching mathematics in diverse educational settings.

Theoretical Framework: In Ecuador, mathematics teachers have employed traditional approaches in their teaching in recent years. The incorporation of Taptana Cañari as a playful strategy in the educational process can promote an interactive approach to learning this subject.

Method: The study relied on a non-experimental ex post facto research methodology, with a quantitative approach, featuring an exploratory and descriptive-correlational scope. Data were collected through structured questionnaires to assess the perception of 135 teachers from different educational backgrounds regarding the effectiveness of the workshop on the use of Taptana Cañari in teaching mathematics. Statistical analyses were employed to examine differences between groups and explore relationships between variables, utilizing a significance level of $p < 0.05$.

Results and Discussion: The study evaluated the perception of a mathematics teaching workshop using Taptana Cañari. A generally positive perception was found regarding pedagogical effectiveness, but areas for improvement in relevance and adaptability were identified. Differences in perception were observed between urban and rural participants, as well as between mathematics teachers and those from other areas. These results highlight the need to adapt educational workshops to the specific needs of participants and explore how these differences may affect students' academic performance.

Research Implications: The findings of this research have significant implications for educational practice. The generally positive perception of the pedagogical effectiveness of the workshop indicates its potential to enhance mathematics teaching. However, the areas for improvement identified in relevance and adaptability underscore the need to adjust the workshop design to better meet participants' specific needs. Additionally, differences in perception between urban and rural participants, as well as between mathematics teachers and those from other areas, emphasize the importance of considering contextual and professional characteristics when implementing educational interventions. These considerations are crucial for maximizing the impact of workshops and promoting effective learning in diverse educational environments.

Originality/Value: This research contributes originality by exploring participants' perception of the Intaka mathematics teaching workshop using Taptana Cañari, an uncommon approach in the educational field. Its value lies in identifying specific areas for improvement in the adaptability of the workshop, as well as in highlighting differences in perception between urban and rural participants, and between teachers from different areas. These findings offer unique insights for designing more effective and contextualized educational interventions, with the potential to significantly enhance the quality of learning in diverse educational communities.

Keywords: Educational Context, Pedagogical Effectiveness, Mathematics, Taptana Cañari.

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Perceptions of Pedagogical Effectiveness of The Workshop on The Use of Taptana Cañari For Mathematics Teaching: A Comparative Analysis in Different Educational Contexts

PERCEPÇÕES DA EFICÁCIA PEDAGÓGICA DO WORKSHOP SOBRE O USO DA TAPTANA CAÑARI PARA O ENSINO DE MATEMÁTICA: UMA ANÁLISE COMPARATIVA EM DIFERENTES CONTEXTOS EDUCACIONAIS

RESUMO

Objetivo: O objetivo deste estudo é analisar as percepções da eficácia pedagógica do workshop sobre o uso da Taptana Cañari para o ensino de matemática em diversos contextos educacionais.

Referencial Teórico: No Equador, os professores de matemática têm empregado abordagens tradicionais em seu ensino nos últimos anos. A incorporação da Taptana Cañari como uma estratégia lúdica no processo educativo pode promover uma abordagem interativa no aprendizado desta disciplina.

Método: O estudo baseou-se em uma metodologia de pesquisa não experimental ex post facto, de abordagem quantitativa, com um escopo exploratório e descritivo-correlacional. Os dados foram coletados por meio de questionários estruturados para avaliar a percepção de 135 professores de diferentes contextos educacionais sobre a eficácia do workshop sobre o uso da Taptana Cañari no ensino de matemática. Foram utilizadas análises estatísticas para examinar as diferenças entre grupos e explorar relações entre variáveis, utilizando um nível de significância de p < 0,05.

Resultados e Discussão: O estudo avaliou a percepção de um workshop de ensino de matemática utilizando a Taptana Cañari. Foi encontrada uma percepção geralmente positiva na eficácia pedagógica, mas áreas de melhoria em pertinência e adaptabilidade. Foram observadas diferenças na percepção entre participantes urbanos e rurais e entre professores de matemática e outras áreas. Esses resultados destacam a necessidade de adaptar os workshops educacionais às necessidades específicas dos participantes e explorar como essas diferenças podem afetar o desempenho acadêmico dos alunos.

Implicações da Pesquisa: Os achados desta pesquisa têm importantes implicações para a prática educacional. A percepção geralmente positiva na eficácia pedagógica do workshop aponta seu potencial para melhorar o ensino de matemática. No entanto, as áreas de melhoria identificadas em pertinência e adaptabilidade ressaltam a necessidade de ajustar o design do workshop para atender melhor às necessidades específicas dos participantes. Além disso, as diferenças na percepção entre participantes urbanos e rurais, assim como entre professores de matemática e outras áreas, sublinham a importância de considerar as características contextuais e profissionais ao implementar intervenções educacionais. Essas considerações são fundamentais para maximizar o impacto dos workshops e promover uma aprendizagem eficaz em diversos ambientes educacionais.

Originalidade/Valor: Esta pesquisa traz originalidade ao explorar a percepção dos participantes sobre o workshop de ensino de matemática Intaka utilizando a Taptana Cañari, uma abordagem pouco comum no campo educacional. Seu valor reside em identificar áreas específicas de melhoria na adaptabilidade do workshop, bem como em destacar as diferenças na percepção entre participantes urbanos e rurais e entre professores de diferentes áreas. Esses achados oferecem insights únicos para projetar intervenções educacionais mais eficazes e contextualizadas, com o potencial de melhorar significativamente a qualidade da aprendizagem em diversas comunidades educacionais.

Palavras-chave: Contexto educacional, Eficácia pedagógica, Matemática, Taptana cañari.

PERCEPCIONES DE LA EFECTIVIDAD PEDAGÓGICA DEL TALLER SOBRE EL USO DE LA TAPTANA CAÑARI PARA LA ENSEÑANZA DE LAS MATEMÁTICAS: UN ANÁLISIS COMPARATIVO EN DIFERENTES CONTEXTOS EDUCATIVOS

RESUMEN

Objetivo: El objetivo de este estudio es analizar las percepciones de la efectividad pedagógica del taller sobre el uso de la Taptana cañari para la enseñanza de las matemáticas en diversos contextos educativos.

Marco Teórico: En Ecuador, los docentes de matemáticas han empleado enfoques tradicionales en su enseñanza en los últimos años. La incorporación de la Taptana cañari como una estrategia lúdica en el proceso educativo puede promover un enfoque interactivo en el aprendizaje de esta asignatura.
Perceptions of Pedagogical Effectiveness of The Workshop on The Use of Taptana Cañari For Mathematics Teaching: A Comparative Analysis in Different Educational Contexts

Método: El estudio se basó en una metodología de investigación no experimental ex post facto, de enfoque cuantitativo, con un alcance exploratorio y descriptivo-correlacional. Se recopilaron datos mediante cuestionarios estructurados para evaluar la percepción 135 docentes de diferentes contextos educativos, sobre la efectividad del taller sobre el uso de la Taptana Cañari en la enseñanza de matemáticas. Se emplearon análisis estadísticos para examinar las diferencias entre grupos y explorar relaciones entre variables, utilizando un nivel de significancia de p < 0.05.

Resultados y Discusión: El estudio evaluó la percepción de un taller de enseñanza de matemáticas utilizando la Taptana Cañari. Se encontró una percepción generalmente positiva en la efectividad pedagógica, pero áreas de mejora en pertinencia y adaptabilidad. Se observaron diferencias en la percepción entre participantes urbanos y rurales, y entre docentes de matemáticas y otras áreas. Estos resultados destacan la necesidad de adaptar los talleres educativos a las necesidades específicas de los participantes y explorar cómo estas diferencias pueden afectar el rendimiento académico de los estudiantes.

Implicaciones de la investigación: Los hallazgos de esta investigación tienen importantes implicaciones para la práctica educativa. La percepción generalmente positiva en la efectividad pedagógica del taller señala su potencial para mejorar la enseñanza de las matemáticas. Sin embargo, las áreas de mejora identificadas en pertinencia y adaptabilidad resaltan la necesidad de ajustar el diseño del taller para satisfacer mejor las necesidades específicas de los participantes. Además, las diferencias en la percepción entre participantes urbanos y rurales, así como entre docentes de matemáticas y otras áreas, subrayan la importancia de considerar las características contextuales y profesionales al implementar intervenciones educativas. Estas consideraciones son fundamentales para maximizar el impacto de los talleres y promover un aprendizaje efectivo en diversos entornos educativos.

Originalidad/Valor: Esta investigación aporta originalidad al explorar la percepción de los participantes sobre el taller de enseñanza de matemáticas Intaka utilizando la Taptana Cañari, un enfoque poco común en el ámbito educativo. Su valor radica en identificar áreas específicas de mejora en la adaptabilidad del taller, así como en destacar las diferencias en la percepción entre participantes urbanos y rurales, y entre docentes de distintas áreas. Estos hallazgos ofrecen insights únicos para diseñar intervenciones educativas más efectivas y contextualizadas, con el potencial de mejorar significativamente la calidad del aprendizaje en diversas comunidades educativas.

Palabras clave: Contexto educativo, Efectividad pedagógica, Matemáticas, Taptana Cañari.

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1 INTRODUCTION

According to Alquinga (2018), education plays a fundamental role in the development and progress of societies, being the primary vehicle for the transmission, reproduction and creation of knowledge. Without an efficient education system and the timely intervention of the actors involved in the educational process, it is unlikely that countries can meet the demands and aspirations of their inhabitants in terms of quality of life, opportunities and personal and work progress (Avalos et al., 2016). Therefore, educational quality plays a fundamental role in the search for an accessible education for all (Gallego & Rodríguez, 2015). It is crucial to recognize that, in this search, scientific literacy must be promoted and critical thinking promoted, essential aspects to enable individuals capable of discerning, analyzing and applying
scientific knowledge in their daily lives, thus promoting a broader and sustainable development of society (Cadena, 2022).

The inclusion of indigenous cultural practices in the educational process has gained interest in recent years (Comboni & Juárez, 2020). Incorporating aspects related to cultural characteristics, knowledge systems, and world perspectives not only improves educational quality, but also enriches and diversifies curricula in various disciplines (Corbetta et al. 2018). Restrepo et al. (2023) suggests implementing educational approaches that allow students to connect directly with their cultural and natural environment, as well as with the craft skills developed by local communities. In this context, the Taptana Cañari has emerged as a potentially valuable resource to improve the understanding of mathematical concepts among students (Alquinga, 2021; Quishpe, 2007).

Through the project "Educational Innovation: Taptana Cañari pedagogical proposal and the value of solidarity", funded by the Ecuadorian Corporation for the Development of Research and the Academy (CEDIA), this proposal was disseminated through workshops conducted by the National University of Education (UNAE), the Amazonian Regional University Ikiam and the Central University of Ecuador, in zones 2 and 6 of the country. The main objective of these workshops was to train teachers of basic education of the Ecuadorian Educational System through the development of workshops with the purpose of strengthening the competences in comprehensive training of teachers and evaluate the effectiveness of the proposal.

The present study focuses on exploring perceptions of the pedagogical effectiveness of the workshops taught by the three universities on the use of the Taptana Cañari in the teaching of mathematics, through a comparative analysis in different educational contexts, from urban schools to rural communities. By better understanding teachers' perceptions of the use of the Taptana Cañari in mathematics teaching, this study will help inform pedagogical practices in Ecuador and offer ideas to improve mathematics education in the country. In addition, it will provide valuable information on the effective integration of local cultural practices into the school curriculum, thus promoting the valuation and preservation of Ecuador's cultural heritage within the education system.

1.1. OBJECTIVES AND ASSUMPTIONS

To analyze the perceptions of the pedagogical effectiveness of the workshop on the use of the Cañari Taptana for the teaching of mathematics in various educational contexts.
In order to achieve this objective, the following specific objectives are set:

- To evaluate the teachers' perception of the pedagogical effectiveness of the workshop on the use of the Cañari Taptana.
- To investigate the relevance and adaptability of the proposed approach in different educational contexts.
- Analyze the clarity and compatibility of the workshop with existing educational practices in teachers from different disciplinary areas and geographical regions located in urban and rural areas.
- Explore the attractiveness and motivation generated by the workshop among the participating teachers.

Since the objectives of the study are focused on analyzing the perceptions of the pedagogical effectiveness of the workshop on the use of the Cañari Taptana in different educational contexts, the following hypotheses can be proposed:

- The teachers perceive positively the pedagogical effectiveness of the workshop on the use of the Cañari Taptana in the teaching of mathematics, expressing a favorable assessment towards this methodology as an effective tool for the learning of this discipline.
- The perception of relevance and adaptability, as well as clarity and compatibility, and the attractiveness and motivation of the workshop, show variations according to the educational context of the teachers. It is possible to observe significant differences in these perceptions between urban and rural areas of educational institutions located in the regions of Sierra and Amazonia.

2 THEORETICAL FRAMEWORK

2.1. TAPTANA CAÑARI IN MATHEMATICAL EDUCATION

The Taptana is a modern adaptation of an ancient calculation instrument called "Contador Cañari", it is a sample of the creative, practical and complex mathematical mind of the ancient inhabitants of present-day Ecuador (Alquinga, 2021). This resource, used as a means to perform mathematical operations is rooted in Cañari ethnomathematics, its base 10 numbering system is applied in various arithmetic operations (López et al, 2024). Its effectiveness has been demonstrated by applying simple algorithms that allow solving with accuracy different arithmetic calculations (Tuna & Chasiquizab, 2014). Durán & Vásquez,
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(2022) report that, in 1980, the Research Center for Indigenous Education reintroduced the Taptana as an innovative teaching material, later adopted by the Bilingual Intercultural Education System.

Despite these innovations, mathematical education in Ecuador faces significant challenges, such as difficulty in understanding and analyzing theoretical references and solving problems (Quizhpi, 2019). However, experiences such as the teaching-learning process of basic operations with the Taptana have proven to be significant, arousing interest and facilitating the assimilation of abstract concepts (González, 2019; Tenezaca & Yadaicela, 2023). Its use as a didactic resource has aroused interest in ancestral knowledge and has fostered holistic learning that promotes values such as human solidarity (Troya et al, 2022).

According to Alquinga (2021) “the learning of Mathematics manifests itself as a problem that needs to be observed, studied and approached from multiple perspectives in order to understand the phenomenon and act on it”. The National Institute of Educational Evaluation INEVAL (2023), mentions in its national results reports Being a Student that, more than half of students of basic elementary, middle and higher levels, present difficulties in understanding and applying the concepts and skills related to learning standards in Mathematics, these findings point to the need to take immediate measures to provide additional support and ensure that students acquire the necessary skills in the subject.

For some years now, mathematics teachers have been applying traditional methods for their teaching, mostly using repetitive memoristic and mechanical strategies that make mathematics an unattractive and boring area (Guamá, 2024). The implementation of playful strategies constitutes a valuable contribution to the educational system, educators and students, since it promotes an interactive approach in the process of learning mathematics (Sánchez et al, 2023). Therefore, the use of the Cañari Taptana is considered a playful methodology that facilitates the study of the various operations within the mathematical calculation, the adoption of this methodology can contribute to the development of true experiential learning.

The diverse educational contexts in Ecuador present a heterogeneous and challenging reality that requires specific and adapted approaches to ensure educational equity and quality for all students. In this sense, workshops focused on the Taptana have been implemented, such as the one mentioned by Auccahuallpa (2021) entitled "Uña Taptana in the Development of the Numerical Sense in Early Childhood", which received a positive assessment by teachers. They stressed that the Taptana is an innovative resource that facilitates the learning of numbers and mathematical operations through play.
After the research carried out by teachers and students of the National University of Education (UNAE) on the use of the Taptana Cañari for interdisciplinary teaching, the "Taptana Cañari Pedagogical Proposal and the Value of Solidarity" originated. Its objective is for students to acquire mathematical knowledge using resources that represent Andean culture, incorporating aspects of Cañari culture, promoting the appreciation of ethnic diversity and encouraging teamwork (Vásquez & Duchi, 2021).

3 METHODOLOGY

3.1 RESEARCH DESIGN

To address these objectives, a non-experimental ex post facto research study has been conducted, with a quantitative approach. The scope of the research is exploratory and descriptive-correlational. A cross-sectional design was used to collect data from a representative sample of participants from different educational contexts, including urban and rural areas, as well as different types of educational institutions. The data were collected through structured questionnaires designed specifically to evaluate the participants' perceptions of the workshop's pedagogical effectiveness on the use of the Cañari Taptana for the teaching of mathematics, as well as other relevant variables, such as relevance and adaptability, clarity and compatibility, attractiveness and motivation. Descriptive statistical analyzes were used to examine the characteristics of the sample and the variables of interest, while comparison tests of means and effect size measures were used to analyze the differences between groups and explore the relationships between the variables.

3.2 CONTEXT AND PARTICIPANTS

The study was carried out with the participation of 135 teachers, of which 109 came from educational institutions in the urban area and 25 from the rural area. In addition, 109 teachers were selected from educational institutions in the Ecuadorian highlands and 25 from the Amazon region. Within this sample, 24 teachers are specialists in mathematics, while 110 work in other disciplinary areas, such as art, language and literature, and natural sciences. The study focused on the development of the Intaka workshop, designed to explore the use of Cañari Taptana in interdisciplinary science teaching.
As part of the research, workshops were held over a period of two to three days according to the availability of the educational institution, a crucial phase in which participants immersed themselves in an experiential learning process. During these workshops, a comprehensive instruction was given about the Cañari Taptana and its potential as a tool in the interdisciplinary teaching of science. Time was devoted to acquiring basic skills in the management of the Taptana, and teachers were encouraged to explore its construction with recycled materials. In this collaborative environment, each group of participants embarked on the creation of their own Taptana, an act that not only fostered creativity, but also strengthened ties between educators. In addition, as an integral part of this immersion, teachers were encouraged to develop narratives with themes related to their respective geographical regions (urban, rural, mountain and Amazon), thus establishing connections between the use of the Taptana and various curricular disciplines. This practical and contextualized approach allowed educators to directly experience the promising pedagogical nature of the Cañari taptana in an interdisciplinary and culturally relevant framework.

3.3 DATA COLLECTION TOOLS

For the collection of information, a structured questionnaire was designed composed of a total of 12 questions, carefully elaborated to address the various dimensions of interest related to the pedagogical effectiveness of the workshop on the use of the Cañari taptana in the teaching of mathematics. Of these, four questions were intended to assess participants' perception of the workshop's pedagogical effectiveness, while three questions focused on the relevance and adaptability of the proposed approach. In addition, two questions were included to explore the clarity and compatibility of the workshop with existing educational practices, as well as two questions related to the attractiveness and motivation generated by the workshop among the participating teachers. This questionnaire was carefully designed to capture the various facets of the participants' experience and provide quantitative data to complement qualitative findings derived from other phases of the study. Table 1 presents the different questions and dimensions set.
Table 1

Questions and dimensions of interest related to the pedagogical effectiveness of the workshop

<table>
<thead>
<tr>
<th>N°</th>
<th>DIMENSIONS</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pedagogical effectiveness</td>
<td>The use of the Taptana reaffirms the mathematical contents worked in an abstract (symbolic) way</td>
</tr>
<tr>
<td>2</td>
<td>Relevance and Adaptability</td>
<td>The use of the Taptana is relevant for the teaching of the subjects taught in different learning scenarios</td>
</tr>
<tr>
<td>3</td>
<td>Pedagogical effectiveness</td>
<td>The Taptana stimulates the learning of established mathematical contents such as arithmetic operations</td>
</tr>
<tr>
<td>4</td>
<td>Clarity and Compatibility Attractiveness and Motivation</td>
<td>The application of the Taptana guarantees the appropriation of complex mathematical concepts</td>
</tr>
<tr>
<td>5</td>
<td>Clarity and Compatibility</td>
<td>The Taptana used in the workshop is playful</td>
</tr>
<tr>
<td>6</td>
<td>Pedagogical effectiveness Attractiveness and Motivation</td>
<td>The mathematical processes involving the use of the Taptana are clear</td>
</tr>
<tr>
<td>7</td>
<td>The results provided by the use of the Taptana in mathematics teaching are significant</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Clarity and Compatibility Attractiveness and Motivation</td>
<td>The use of the Taptana attracts me to teach mathematics according to the educational reality of my students</td>
</tr>
<tr>
<td>9</td>
<td>Relevance and Adaptability</td>
<td>The implementation of the Taptana is adapted to the degree/educational level in which I teach</td>
</tr>
<tr>
<td>10</td>
<td>Relevance and Adaptability</td>
<td>The Taptana resource is adapted to the conditions of the group in which I work</td>
</tr>
<tr>
<td>11</td>
<td>Attractiveness and Motivation</td>
<td>Working with my students with the Taptana is motivating</td>
</tr>
<tr>
<td>12</td>
<td>Pedagogical effectiveness</td>
<td>The use of the Taptana allows to transfer the learning from the concrete to the abstract in a coherent way with the educational reality</td>
</tr>
</tbody>
</table>

Source: own

3.4 VARIABLES AND STATISTICAL ANALYSIS

The data collected was organized into a Microsoft Excel spreadsheet and analyzed using the SPSS statistical analysis program. Descriptive and inferential statistics were used, taking as a dependent variable the perception of teachers on the pedagogical effectiveness of the workshop on the use of the Cañari Taptana in the teaching of mathematics. The independent variables included the geographical location of the educational institution (urban vs. rural), the geographical region (highlands vs. Amazon), the area of specialization of the teacher (mathematics vs. other subjects), as well as the different dimensions of the workshop evaluated: pedagogical effectiveness, relevance and adaptability, clarity and compatibility, attractiveness and motivation.

According to the Kolmogorov–Smirnov test, the distribution of the data on interest does not follow a normal distribution in any of the variables (p<0.01). Therefore, non-parametric tests were used for inferential analysis. Subsequently, the independent Student t-test was performed to compare the means between two groups. A significance level of p < 0.05 was established for all statistical tests. The results were interpreted considering both statistical significance and magnitude of differences (Table 2).
Table 2

Normal tests for different workshop dimensions

<table>
<thead>
<tr>
<th>Normal tests</th>
<th>Kolmogorov-Smirnov</th>
<th>Shapiro-Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>LG</td>
</tr>
<tr>
<td>EP Prom</td>
<td>211</td>
<td>134</td>
</tr>
<tr>
<td>Prom PA</td>
<td>200</td>
<td>134</td>
</tr>
<tr>
<td>CC PROM</td>
<td>203</td>
<td>134</td>
</tr>
<tr>
<td>AM PROM</td>
<td>247</td>
<td>134</td>
</tr>
</tbody>
</table>

Source: own

4 ANALYSIS

The descriptive results of the four dimensions evaluated in the workshop on the use of the Taptana Cañari presented in table 3 reveal a variety of perceptions among the participants. As for Pedagogical Effectiveness (PE), the average obtained was 3.4123, with a 95% confidence interval ranging from 3.2999 to 3.5247, suggesting a moderately positive perception in terms of the effectiveness of the workshop for teaching mathematics. On the other hand, Relevance and Adaptability (PA) shows a slightly lower average of 3.2264, with a confidence interval of (3.1021, 3.3506), indicating that participants perceive the adaptability of the workshop somewhat less favorably compared to its pedagogical effectiveness. Regarding Clarity and Compatibility (CC), the average obtained was 3.243, with a confidence interval of (3.123, 3.362), suggesting a generally positive perception in terms of clarity and compatibility of the workshop with existing educational practices. Finally, the Attractiveness and Motivation (AM) dimension revealed an average of 3.4602, with a confidence interval of (3.3503, 3.5701), indicating a favorable perception in terms of the attractiveness and motivation generated by the workshop among the participants. These results provide a detailed view of participants’ perceptions in each dimension evaluated, contributing to a more complete understanding of the workshop’s effectiveness and acceptance in the educational context.

Table 3

Descriptive statistics of participants’ perception of the effectiveness of the workshop

<table>
<thead>
<tr>
<th>Descriptive</th>
<th>Statistic</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP Prom</td>
<td>Average</td>
<td>3.4123</td>
</tr>
<tr>
<td>95% confidence interval for mean</td>
<td>Lower limit</td>
<td>3.2999</td>
</tr>
<tr>
<td>Average trimmed to 5%</td>
<td>Median</td>
<td>3.7500</td>
</tr>
<tr>
<td>Variance</td>
<td>433</td>
<td></td>
</tr>
</tbody>
</table>
The results of the t-test for the equality of means between the dimensions evaluated reveal significant differences in the perceptions of the participants in the workshop on the use of the Taptana Cañari. In relation to Pedagogical Effectiveness (PE), no significant differences were found between the means of the regions when equal variances were assumed ($t(132) = 0.490, p = 0.625$) or when they were not assumed ($t(104.181) = 0.542, p = 0.588$). Similarly,

The results of the t-test for the equality of means between the dimensions evaluated reveal significant differences in the perceptions of the participants in the workshop on the use of the Taptana Cañari. In relation to Pedagogical Effectiveness (PE), no significant differences were found between the means of the regions when equal variances were assumed ($t(132) = 0.490, p = 0.625$) or when they were not assumed ($t(104.181) = 0.542, p = 0.588$). Similarly,
for the dimension of Relevance and Adaptability (PA), no significant differences were observed between regions when assuming equal variances (t(132) = -1.294, p = 0.198) or when not assuming it (t(66.564) = -1.337, p = 0.186). However, in terms of Clarity and Compatibility (CC), no significant differences were found between the means of the regions when assuming equal variances (t(132) = 0.490, p = 0.625) or when not assuming it (t(86.999) = 0.570, p = 0.570). Finally, in the dimension of Attractiveness and Motivation (AM), again no significant differences were observed between regions when assuming equal variances (t(132) = 0.634, p = 0.527) or when not assuming it (t(87.177) = 0.739, p = 0.462). These results suggest a homogeneity in perceptions among the regions evaluated in the study, which may indicate widespread acceptance of the workshop regardless of geographical region.

The results of the t-test for the equality of means between teachers of mathematics and teachers of other areas in the workshop on the use of the Taptana Cañari show some significant differences in the perceptions of the participants. In relation to Pedagogical Effectiveness (PE), no significant differences were found between the means of mathematics teachers and those of other areas, both when assuming equal variances (t(132) = -0.820, p = 0.414) and when not assuming them (t(38.355) = -0.368, p = 0.714). However, for the dimension of Relevance and Adaptability (PA), significant differences were observed between the two groups of teachers, both when assuming equal variances (t(132) = -1.801, p = 0.074) and when not assuming them (t(37.980) = -1.989, p = 0.054). This suggests that mathematics teachers perceive the workshop as less relevant and adaptable compared to those in other areas. Regarding Clarity and Compatibility (CC), although the difference does not reach statistical significance, there is a tendency towards a slightly more negative perception by mathematics teachers, both when assuming equal variances (t(132) = -1.558, p = 0.122) and when not assuming them (t(37.276) = -1.695, p = 0.098). Finally, in the dimension of Attractiveness and Motivation (AM), no significant differences were found between the two groups of teachers, either when assuming equal variances (t(132) = -0.832, p = 0.407) or when not assuming them (t(39.284) = -0.941, p = 0.352). These findings suggest that differences in workshop perception between mathematics teachers and those in other areas may be more related to perceived relevance and adaptability than with other dimensions evaluated.
### Table 4

**Test Results Statistics of independent samples**

<table>
<thead>
<tr>
<th></th>
<th>Levene's test of equality of variances</th>
<th>T-test for equality of means</th>
<th>95% confidence interval of the difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
<td>t</td>
</tr>
<tr>
<td>EP Prom</td>
<td>775</td>
<td>.380</td>
<td>-.820</td>
</tr>
<tr>
<td>Prom PA</td>
<td>2,373</td>
<td>.126</td>
<td>-1,801</td>
</tr>
<tr>
<td>CC PROM</td>
<td>3,340</td>
<td>.070</td>
<td>-1,558</td>
</tr>
<tr>
<td>AM PROM</td>
<td>1,451</td>
<td>.231</td>
<td>-832</td>
</tr>
</tbody>
</table>

Equal variances are assumed

No equal variances are assumed
The results of the t-test for the equality of means between participants from urban and rural areas in the workshop on the use of the Taptana Cañari suggest some differences in perceptions. In relation to Pedagogical Effectiveness (PE), no significant differences were found between the means of participants from urban and rural areas, both when assuming equal variances ($t(126) = -1.470, p = 0.144$) and when not assuming them ($t(29.878) = -1.773, p = 0.086$). Similarly, for the dimension of Relevance and Adaptability (PA), no significant differences were observed between the two groups, either when assuming equal variances ($t(126) = -0.588, p = 0.557$) or when not assuming them ($t(25.210) = -0.603, p = 0.552$).

Regarding Clarity and Compatibility (CC), again no significant differences were found between the mean of the participants from urban and rural areas, both when assuming equal variances ($t(126) = -1.068, p = 0.288$) and when not assuming them ($t(26.053) = -1.136, p = 0.266$). However, in the dimension of Attractiveness and Motivation (AM), there was a tendency towards significant differences between groups when assuming equal variances ($t(126) = -1.134, p = 0.259$), although these differences were not significant when not assuming equal variances ($t(31.305) = -1.417, p = 0.166$). These results suggest a homogeneity in perceptions between urban and rural areas, which may indicate a widespread acceptance of the workshop regardless of the geographical environment of the participants.
### Table 5

**Test of independent samples**

<table>
<thead>
<tr>
<th></th>
<th>Levene's test of equality of variances</th>
<th>T-test for equality of means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP Prom</td>
<td>3,443</td>
<td>0,066</td>
</tr>
<tr>
<td></td>
<td>No equal variances are assumed</td>
<td></td>
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<tr>
<td></td>
<td>-1,773%</td>
<td></td>
</tr>
<tr>
<td>Prom PA</td>
<td>0,004</td>
<td>0,949</td>
</tr>
<tr>
<td></td>
<td>No equal variances are assumed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0,603</td>
<td></td>
</tr>
<tr>
<td>CC PROM</td>
<td>0,593</td>
<td>0,443</td>
</tr>
<tr>
<td></td>
<td>No equal variances are assumed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-1,136%</td>
<td></td>
</tr>
<tr>
<td>AM PROM</td>
<td>4,737</td>
<td>0,031</td>
</tr>
<tr>
<td></td>
<td>No equal variances are assumed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-1,417</td>
<td></td>
</tr>
</tbody>
</table>
5 RESULTS AND DISCUSSIONS

Figure 1 presents the results of the workshop on the use of the Taptana Cañari in four dimensions evaluated: Pedagogical Effectiveness (PE), Relevance and Adaptability (PA), Clarity and Compatibility (CC), and Attractiveness and Motivation (AM). It highlights the moderately positive perception in terms of pedagogical effectiveness, with an average score of 3.4123, which highlights the positive assessment of the participants towards the educational impact of the workshop.

In addition, a slightly lower average score in Relevance and Adaptability (PA) of 3.2264 is observed, suggesting the need to consider strategies to improve the adaptability of the workshop to the specific needs of participants. On the other hand, the Clarity and Compatibility (CC) dimension obtained an average score of 3.243, indicating a generally positive perception in terms of clarity and compatibility of the workshop with existing educational practices.

The results obtained in this study are consistent with the existing literature in several aspects. For example, the importance of pedagogical effectiveness and motivation in the teaching-learning process has been widely documented. The positive perception of participants in these areas suggests that the workshop is fulfilling its primary objective of providing an effective and motivating educational experience.
However, slightly lower scores in the relevance and adaptability dimensions could indicate areas for improvement. The literature suggests that the adaptability of educational programs is crucial to meeting the diversified needs of students. Therefore, strategies could be explored to make the workshop more adaptable to different learning styles and educational contexts.

It is important to consider the limitations of this study. For example, the sample may not be fully representative of the target population, which may affect the generalization of results. In addition, study design may limit the ability to establish causal relationships between variables.

For future research, longitudinal studies could be conducted to assess the long-term impact of the workshop on students' academic performance. It would also be interesting to explore in greater depth the reasons behind participants' perceptions, using qualitative methods to gain a more complete understanding of their experiences and opinions.

On the other hand, the detailed analysis of the groups of participants reveals valuable insights on how perceptions about the workshop on the use of the Taptana Cañari vary according to different independent variables.

Figure 2

*Relationship between dimensions and independent variables*

Through Figure 2, we can observe the differences in perception between the groups in each of the dimensions evaluated. For example, participants from rural areas tend to score
higher in all dimensions compared to those from urban areas. In addition, mathematics teachers show a slightly less favorable trend in terms of relevance and adaptability compared to those in other areas.

These differences provide valuable insights into how different groups of participants perceive the effectiveness and usefulness of the workshop, which can guide future adaptations and approaches to maximize its impact. For future research, a more detailed analysis of the specific characteristics of urban and rural areas that could influence the perception of participants would be beneficial. This could involve collecting additional data on access to educational resources, the socioeconomic status of communities, and local education policies.

In addition, it would be valuable to explore how these differences in perception could translate into differences in students’ academic performance, which could provide additional information about the effectiveness of the workshop in different educational contexts. In summary, while the current analysis provides important insights into the perceptions of participants in different groups, it is critical to consider these limitations and explore additional areas of research to gain a more complete understanding of the effectiveness and impact of the workshop on the use of the Taptana Cañari in mathematics teaching.

6 CONCLUSIONS

This study provided a detailed insight into the perceptions of participants in a workshop on the use of the Taptana Cañari. The results highlight the pedagogical effectiveness and attractiveness of the workshop, while also pointing out areas for improvement in terms of relevance and adaptability.

After analyzing perceptions about pedagogical effectiveness, relevance and adaptability, as well as clarity and compatibility between participants from both environments, it is concluded that there are no significant differences. This finding agrees with Kirschner et al. (2006), who argue against teaching approaches that reduce the role of the teacher, stressing the importance of explicit direction and support for effective learning. Likewise, Hattie & Yates (2014) address the importance of effective feedback in the teaching-learning process, highlighting its role in improving student performance and motivation.

There is an inclination towards differences in the dimension of attractiveness and motivation, although it does not reach statistical significance. Boaler and Staples (2008) have explored an equitable teaching approach in mathematics, highlighting the importance of generating relevant and motivating educational experiences for all students.
Finally, these findings suggest widespread acceptance of the workshop regardless of the participants' geographical environment. The moderately positive perception of pedagogical effectiveness indicates that the workshop is fulfilling its primary objective of providing an effective educational experience. However, slightly lower scores on relevance and adaptability suggest areas for improvement to tailor the workshop to the specific needs of participants.

ACKNOWLEDGEMENTS

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