

Use of Technology in Childcare Centers for Ages 0 to 3 in Northeastern Mexico: Results of Quality Measurement

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Abstract

This article presents the results of a study that evaluates the quality of early childhood education in the state of Tamaulipas, northeastern Mexico, using the ITERS-R scale (Infant and Toddler Environment Rating Scale). The rating scale consists of 39 items organized into seven subscales. For the purposes of this article, reference is made to the Activities subscale containing item 23: Use of televisions, videos and/or computers. The results of the study show that the quality regarding the use of information and communication technologies in the educational centers observed is in the minimum to good range. These results show the areas of opportunity for the integration of technology in early childhood education as a factor that can favor child development and improve the quality of early education centers.

Keywords

Early Childhood Education, Information and Communication Technology, Childhood.

1. Introduction

Thanks to the existence of compelling scientific data and sustained advocacy efforts, governments and society at large have recognized that investing in the early years of children's lives is essential [1]. For this reason, at the international level, early childhood education is being given special attention with a focus on respecting the best interests of boys and girls, as well as addressing factors that contribute to reducing existing inequalities. Education, particularly in the context of early childhood, is considered a key aspect in diminishing these gaps.

Internationally, early childhood education is positioned as an indispensable element for intervention. Increasing attention is being directed towards this population, specifically children in their early years and even during prenatal stages. Agencies responsible for promoting children's rights are advocating for new and improved global policies. In the case of Latin America, policies emphasize the care and education of early childhood as the foundation for comprehensive development and learning of boys and girls. This is seen as a fundamental condition to ensure educational quality and equity [2]. The rights to care and education imply not only access to institutionalized services [3] but also a focus on ensuring that these services are of high quality. Therefore, the assessment of childcare is crucial for reducing long-term inequalities.

In this sense, early childhood education has placed special emphasis on respecting the best interests of boys and girls, as well as anything that helps reduce existing inequality gaps. Considering that education is a key aspect in diminishing these gaps, it is crucial for governments to have tools to measure the quality of care provided by centers, focusing on dimensions of quality that are critical in their relationship with positive outcomes in children's development [4].

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Furthermore, providing education at early ages contributes to a better quality of life for these infants. However, the effectiveness of such education is determined by other factors [5] that demonstrate how receiving Early Childhood Education positively influences performance in higher grades of education. This creates a virtuous circle of educational and emotional development, promoting equality of opportunities. Nevertheless, the effectiveness of Early Childhood Education is directly linked to educational quality, which involves a set of conditions to provide the best learning opportunities, including having enough qualified personnel.

In Mexico, in compliance with national principles and the outlined guidelines of the National Development Plan 2013-2018, the Sectoral Education Program, under Objective 3, states, "Strengthening Early Childhood Education, especially among less privileged groups, is essential for building solid foundations for equity, gender equality, and inclusion."

In the framework established in section 1, International and National Context of Early Childhood Education of the Early Childhood Education Program, this education:

- Fosters the development of abilities by recognizing children's potential and creating learning environments for its implementation.
- Provides learning experiences and emotional support that enhance language acquisition, exploration, the development of their thinking, discovery, and creativity through play.
- Recognizes the child as a rights holder, bearer of culture, and competent learner.
- Is a strategy to address educational lag that promotes children's learning from their early years, where scientific research has highlighted the enormous developmental potential and the negative consequences of not addressing it.

In Mexico, only 1.1% of the school-age population from 0 to 3 years, equivalent to early childhood education, attends institutionalized educational institutions, which amounts to 95,706 girls and boys, as seen in Figure 1.

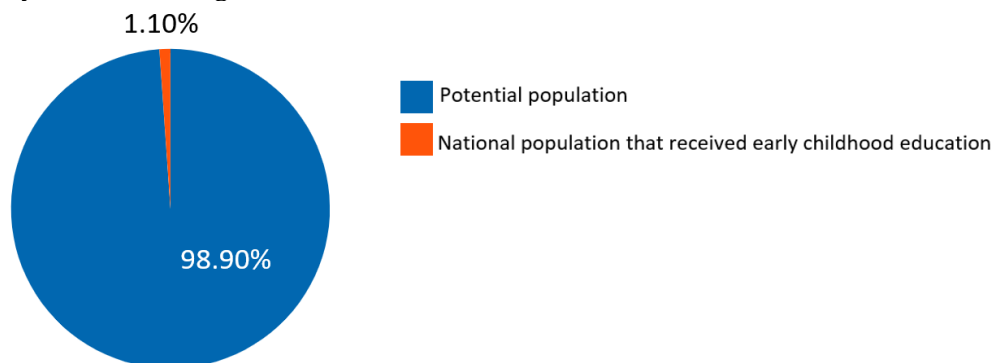


Figure 1. National population that received early childhood education in México 2019.

Early childhood education in Mexico aims to promote the physical, cognitive, emotional, and social development of children under four years old. It includes guidance for parents or guardians on the education of their children or wards. The information above is outlined in Article 40 of the Federal Education Law. The Key Learnings for Comprehensive Education in Mexico establish the principle of providing quality educational services. In this regard, the evaluation of the quality of Childcare Centers responds to the need to determine the current state of critical dimensions regarding the care of babies and young children.

According to experts, six elements should define the quality in childcare centers for children aged 0 to 3 [4]:

1. The provision of nutritious food, in optimal conditions of hygiene, sanitation, and safety.
2. The number of children per caregiver, which should not exceed six children per adult in the 12-36 months age group and should be even lower for babies.
3. The quality of interactions between caregivers and children, including their frequency and intensity.
4. The existence of a **system that regularly monitors quality** in all centers.
5. Efforts for **training and professional development for caregivers and teachers.**

6. Stimulating activities, play materials, and spaces.

The above implies that children require and need child well-being, as stated in Article 4 of the Political Constitution of the United Mexican States. It establishes that all decisions and actions of the State must comply with the principle of the Best Interest of the Child to fully guarantee their rights. Subsequently, this principle will guide the design, execution, monitoring, and evaluation of public policies aimed at children.

Various research studies reveal the importance of the first three years of life and the need for those responsible for infants in this age group to establish positive relationships and experiences that allow the child to develop optimally in later stages of life. Hence, the primary focus is on directing efforts towards childhood. In this regard, the "Un Buen Comienzo" program [6] states that it was not until the 1980s that early education took on an educational rather than an assistive role, recognizing that the first 5 years of life are crucial for the proper development of children.

The framework of "Caring and Sensitive Care" [1] proposes 5 strategies that can be used and directed to design and implement policies for early childhood, as well as to improve the practices employed. The 5 strategies are: providing leadership and investment, focusing on families, strengthening systems, monitoring progress, and using data and innovation. Considering the latter element and linked to the issue of service quality, innovation in Childcare Centers can be associated with the use of Information and Communication Technology (ICT), as early use can be more effective for the purposes of childhood.

1.1. Technology in Early Childhood Education

The use of Information and Communication Technologies (ICT) is an aspect addressed in the quality assessment of Childcare Centers and contributes to the evaluation of activities where learning opportunities are observed in each area of the classroom, including fine motor skills, art, music and movement, blocks, sand and water, dramatic play, nature and science, mathematics and number, computer video use, and diversity.

There is evidence of the contribution that ICT in early childhood education can make, establishing that when used appropriately, they are productive tools to support infants' learning and development by fostering collaboration, cooperation, and positive learning experiences [7]. The use of computers and other technological resources for activities within the preschool classroom can be supported by constructivist theories that imply that boys and girls learn through a process of awareness, exploration, manipulation, and questioning, supported by others [8]. In this sense, ICT can favor these implications given the wide variety of alternatives available that correspond to various categorizations and uses they can take on as learning support tools.

These categorizations and classifications of the uses of ICT are described by Coll [9], who proposes ICT as tools of mediation in the inter and intrapsychological processes of teaching and learning. They serve as mediators between the elements interacting in the process, such as students and content.

Considering that infants interact with a variety of technologies from early years, it is essential to note that children must have opportunities to develop different understandings of technology in different contexts [10]. In the classroom setting, children can explore, learn, and acquire experiences and skills that will help them become part of today's society, highlighting the need to have ICT as part of the activities in the preschool room [11].

Similarly, within the literature, there are some principles that have long served as a guide in the use of Information and Communication Technologies in early childhood education, such as the concept of developmentally appropriate, which allows teachers to develop their skills to recognize and apply the most appropriate ICT in their practice. The framework called DATEC (The Developmentally Appropriate Technology in Early Childhood) identifies general criteria to determine the relevance of ICT in early childhood education [12]:

1. Applications should be educational.
2. They should promote collaboration.

3. Integration and play through ICT.
4. The child should be in control.
5. Applications should be transparent and intuitive.
6. Applications should not contain violence or stereotypes.
7. Awareness of health and safety issues.
8. Parental involvement in education.

The principles enable the assessment of various applications designed for young children, ensuring the delivery of secure and developmentally suitable experiences for infants. Nevertheless, for both the principles and strategies to be effectively implemented, it is necessary for educators to apply appropriate practices with the use of specific methodological approaches. Practices are defined as what caregivers effectively do for children. These actions aim to ensure the survival of the infant, promote their growth, psychosocial development, and knowledge learning. Once induced, these actions enable the child to recognize and interpret their environment, as well as to use and limit times, adjustments, and proposals [13].

The analysis related to pedagogical practices has diverse approaches. However, it is essential to note that behind the practice lies a daily and concrete reality that allows the existence of a combination of elements interacting with each other. This implies an understanding of meanings and reciprocal interaction among actors, as it can unfold in a physical, institutional, historical, and cultural context and has an impact on learning achievement [14], especially in the early stage of children's lives.

In the context of pedagogical practices, it is also important to analyze the significance of teacher training in educational technology to avoid myths and misconceptions that may arise around the implementation of ICT in the classroom [15].

On the other hand, it is also necessary to consider the cultural processes that can be routinized and situated in the local context when "transported" to classrooms or rooms of childcare centers. They undergo a process of re-situating and re-routinizing without becoming part of a reflective process by educational actors [16].

1.2. The ITERS-R (Infant/Toddler Environment Rating Scale, Revised Edition)

The results of the observations on the quality of Childcare Centers were obtained using an instrument designed and validated for this purpose, namely, the Infant/Toddler Environment Rating Scale, Revised Edition. This scale assesses the quality in programs for children under 30 months of age, considered the most vulnerable group physically, mentally, and emotionally [17].

The scale contains items that evaluate the environment in terms of the safety and protection of children, appropriate stimulation through language and activities, as well as warm and supportive interactions [17]. Item 23: Use of televisions, videos, and/or computers is part of the items in the Activities subscale. Each item consists of indicators whose values are rated from 1 (inadequate) to 7 (excellent), with the option to assign a score of NA (not applicable) for certain indicators.

Intermediate scores are assigned when the item being evaluated positively meets all requirements and only some of the following. The observation instrument's subscales are described below:

Subscales:

- Space and Furnishings: This area focuses on evaluating internal and external areas, room arrangement, organization, displays, furniture, and equipment.
- Personal Care Routines: This area focuses on practices related to daily routines such as greeting and farewell, meals, nap time, bathroom time, and health and safety practices.
- Listening and Talking: This area addresses formal and informal communication, language, and reasoning opportunities in the classroom.

- Activities: This area analyzes learning opportunities in each area of the classroom, including fine motor skills, art, music and movement, blocks, sand and water, dramatic play, nature and science, mathematics and number, video and computer use, and diversity.
- Interactions: This area covers child supervision, discipline, interactions between staff and children, and interactions among children.
- Program Structure: This area addresses classroom operations and schedule, including groupings, transitions, and flexibility.
- Parents and Staff: This area covers program support for parents and staff, including opportunities to assess and communicate information related to children, family involvement, and professional development opportunities.

2. Methods

The study adopts a quantitative approach with a cross-sectional descriptive design, as it allows analyzing the existing relationships of the proposed study object. For the research development, a total of 24 observed classrooms for analysis were considered, from 10 Childcare Centers in the northwest region of Mexico, divided into the northern, central, and southern zones, which were selected based on accessibility criteria in the first quarter of 2020.

The validity and reliability of the scale have been extensively tested in various countries, including Latin America. To determine the validity of the observations, the Cohen's Kappa coefficient (Kw) was calculated (Table 1), weighted to determine the degree of agreement between the ratings obtained by two observers in the same classroom. The obtained value was 0.891 with a significance of $p=.000$, which statistically represents a high degree of agreement between the ratings obtained by both observers. It is important to note that, to calculate the coefficient, simultaneous observations were made in a classroom by two observers.

Table 1
Kappa coefficient of level of agreement of observations

| Weighting | Kappa | Asymp. Std. Error | Z | P Value |
|-----------|-------|----------------------|-------|---------|
| Linear | 0.891 | 0.053 | 7.734 | .000 |

To determine the internal consistency of the scale, the Cronbach's Alpha coefficient (α) was calculated, obtaining a coefficient of .932, indicating a high level of consistency and agreement. This revealed a high degree of reliability of the instrument used to measure the quality of childcare rooms in the observed context.

Table 2
Crossed Data OBSERVER1*OBSERVER2

| Count | | OBSERVER2 | | | | | Total |
|-----------|------|-----------|------|------|------|------|-------|
| | | 1.00 | 2.00 | 4.00 | 6.00 | 7.00 | |
| OBSERVER1 | 1.00 | 5 | 0 | 0 | 0 | 0 | 5 |
| | 2.00 | 1 | 4 | 0 | 0 | 0 | 5 |
| | 4.00 | 0 | 0 | 13 | 0 | 2 | 15 |
| | 6.00 | 0 | 0 | 0 | 3 | 1 | 4 |
| | 7.00 | 0 | 0 | 0 | 1 | 6 | 7 |
| Total | | 6 | 4 | 13 | 4 | 9 | 36 |

Data analysis was performed using tools such as Microsoft Excel to capture observation results in a template designed for this purpose, and specific tools for generating descriptive analysis and representative graphics, such as IBM SPSS® version 22.

For the study, infant (0 to 2 years) and toddler (2 to 3 years) rooms were selected based on convenience criteria. Trained observers, previously familiarized with the use of the scale, remained in the room for at least 3 hours, as recommended by the authors of the instrument. Aspects that could not be observed during the direct observation session were inquired about through an interview with the educational agent to complement ratings for various items (as indicated in the scale execution). Ratings were recorded on an individual scoring sheet for each center according to the scale's instructions.

It is worth noting that some indicators such as Sand and Water Play, Provisions for Disabled Children, and Promotion of Diversity Acceptance did not represent significant observations.

To conduct the observations, a minimum time of three hours was established within the classroom or outdoors when required, following the scale's instructions. This period included arrival, feeding hours, care and hygiene routines, and naps. The rooms to be observed were not predetermined, and these observations were carried out with the presence of the Lead Educational Agent, along with the informed consent of the center's director. The activities of auxiliary agents, if any, were included in the observation. Observers entered the rooms with authorization, through non-participant observation, and refrained from interfering with the daily routine of the classroom.

3. RESULTS

3.1. Overall Results of the Activities Subscale for all centers

Below are the observed items and the averages obtained for the indicators that make up the Activities subscale, following the rating system of the scale:

Table 3
Overall results of the activities subscale for Childcare Centers

| SUBESCALE | AVERAGE ON THE SCALE FOR INFANTS | AVERAGE ON THE SCALE FOR TADDLER ROOMS | AVERAGE |
|---|----------------------------------|--|---------|
| Activities: This area analyzes learning opportunities in each area of the classroom, including fine motor skills, art, music and movement, blocks, sand and water, dramatic play, nature and science, mathematics and number, video and computer use, and diversity. | 3.66 | 4.47 | 4.07 |

The **Activities** item presented the lowest ratings in the observations, with the indicators Physical active play, art, dramatic play, nature and science, and the use of televisions, videos, and computers scoring in the 'minimum' range. In this case, the Sand and Water Play indicator was removed due to a significant number of situations where it did not apply due to the regional context. In the precision of activities related to art, there were activities that scored to a lesser extent, emphasizing the implications of not developing an early approach to the arts, which can translate into sensitivity to the environment. This is an element that adds to the comprehensive focus of their educational formation and is reflected in the study programs of the Mexican Educational System.

The following table shows the ratings for Toddler rooms, and likewise, rooms where items are generally rated at a minimum level can be observed.

Table 4
Results of indicator 23: Use of televisions, videos and/or computers

| CENTER | CODE | ACTIVITIES | RATING ACCORDING TO ITERS-R |
|----------------|------|------------|-----------------------------|
| CEI01 | M01 | 6.67 | Good |
| CEI02 | M02 | 5.11 | Good |
| CEI03 | M03 | 5.78 | Good |
| CEI04 | M04 | 4.80 | Minimum |
| CEI05 | M05 | 3.67 | Minimum |
| CEI05 | M06 | 2.80 | Inadequate |
| CEI06 | M07 | 5.00 | Good |
| CEI07 | M08 | 5.67 | Good |
| CEI08 | M09 | 2.10 | Inadequate |
| CEI09 | M10 | 3.11 | Minimum |
| CEI10 | M11 | 3.44 | Minimum |
| CEI11 | M12 | 5.44 | Good |
| AVERAGE | | 4.47 | Minimum |

For analysis purposes, it is noted that only toddler rooms are considered since, according to the scale [17], the use of televisions, videos, or computers is not mandatory. Therefore, this can be rated as NA (Not Applicable), being a flexible element for the type of care provided to infants.

Results of indicator 23: Use of televisions, videos and/or computers

According to the ITERS-R scale, which scores on a scale from 1 to 7, generally a score in the range of 1-2 is interpreted as a very low level of quality, 3-4 is a minimum level, 5-6 is good quality, and 7 is an excellent quality classroom [18]. Regarding the indicator related to technological resources, toddler rooms were considered in the observations.

Table 5
Results of indicator 23: Use of televisions, videos and/or computers

| CENTER | CODE | OBSERVATION RATING | |
|--------|------|--------------------|------------|
| CEI01 | M01 | 7 | Excelent |
| CEI02 | M02 | 7 | Excelent |
| CEI03 | M03 | 7 | Excelent |
| CEI04 | M04 | 7 | Excelent |
| CEI05 | M05 | 4 | Minimum |
| CEI05 | M06 | 2 | Inadequate |
| CEI06 | M07 | 7 | Excelent |
| CEI07 | M08 | 7 | Excelent |
| CEI08 | M09 | 1 | Inadequate |
| CEI09 | M10 | 7 | Excelent |
| CEI10 | M11 | 7 | Excelent |
| CEI11 | M12 | 7 | Excelent |

As shown, it was identified that in the observed centers that obtained a score of 7, they use technological devices (computers) and materials related to this indicator, and these are used in

learning situations, as indicated by the scale, most materials encourage participation (dancing, singing, or doing exercises following videos, or using software). Similarly, centers with values of 4 on the scale were identified, indicating that the materials used are non-violent, culturally sensitive, and culturally appropriate, that there is at least one (1) alternative activity while children watch TV or videos or use computers (e.g., children are not required to sit in front of the TV and can do another activity), and that the time allowed for children over 12 months to watch TV or videos or use computers is limited (e.g., TV and videos are limited to 30 minutes a day in a full-day program; each turn to use the computer is limited to 10 minutes).

Finally, those centers that obtained a score of 2 and 1 are related to the identification of inappropriate materials or materials, or that no other activity is allowed while children watch TV or videos or use computers (e.g., all children must watch the video at the same time).

The result shows that there is the use of technological elements by educational agents, which, in addition to contrasting with their general data, show ages ranging from 25 to 38 years, a situation that may influence the handling of different devices. Also, it should be noted that in addition to the results, there was a response from the children to the activities recorded in the instrument, with smiles and joy observed in the infants.

4. Discussion and conclusions

Childcare Centers in Northeast Mexico provide education ranging from minimal to good in the Activities item. It is important to note that in the analysis of the results, the presence of technological equipment was evident. This technological support contributed to elevating the assessment results of the Activities item. Without the assistance of these resources in the classroom and in accordance with the evaluation of the ITERS-R scale, the quality measurement in the Activities item might be diminished.

Additionally, conditions of technological equipment were identified, as evidenced using various technological resources and their application with infants and young children. Although the assessment provided a general overview of the quality conditions in Childcare Centers and their integration of technological resources in planning and implementing actions by Educational Agents, it cannot be concluded that these actions are associated with the mastery of technological skills in adults. However, it is crucial for the long-term development of children, as it influences executive brain functions. Further research on the impacts of ICT use on the learning and development of infants in Childcare Centers is necessary.

It is essential to consider that the results may indicate that these children are already exposed to technology and have non-exclusive approaches to school institutions. In today's Mexican families, technology is widespread, especially in the use and availability of mobile devices and other technological gadgets. Therefore, there is potential for strengthening didactic activities that promote comprehensive learning in subsequent educational levels such as preschool, primary, secondary, etc.

Considering this, methodologies could view early childhood education (0 to 3 years) as an opportunity for productive use of ICT. Moreover, there is a need to consider the technological empowerment of educational agents, providing them with the knowledge of the potential contributions of technology to childhood development and awareness of possible harmful effects surrounding infants due to the use of Internet applications. It is crucial to mention that an extreme use of technology can occur, making it conclusive that, even in early childhood, as considered in Mexico using the ITERS-R scale, the identification of technology use in childcare rooms has allowed the recognition of areas of opportunity. Interventions may be necessary through public policy approaches to avoid discriminations in the use and application of technologies in childhood.

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