

Original article



Teaching media system for the stimulation of communication in learners with alarm signs of autism spectrum disorder

**Sistema de medios de enseñanza para la estimulación de la comunicación
en educandos con señales de alarma del trastorno del espectro autista**

**Sistema de meios de ensino para a estimulação da comunicação em
educandos com sinais de alerta do transtorno do espectro autista**

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ABSTRACT

Autism spectrum disorder, or some of its early warning signs, presents a significant challenge for families, teachers, and specialists, who seek guidance to help them understand and address the situation. However, teachers are not always adequately prepared to meet the needs of these students, and teaching resources are often limited in variety and appeal. Therefore, the objective of this study was to develop a system of teaching resources to stimulate communication in students exhibiting warning signs of autism spectrum disorder. Theoretical and empirical methods were employed, including historical-logical analysis, a systemic-structural approach, participant and direct

observation, in-depth interviews, and digital tools for creating educational pictograms. The result was the design of a system of teaching resources to stimulate communication in students exhibiting warning signs of autism spectrum disorder. In general, it was considered that for these students, the appropriate, timely, and individualized use of teaching media improved their communication skills to express their emotions and understand those around them, which boosted their interaction, autonomy, development, adaptation, and social inclusion.

Keywords: early stimulation; language; early childhood; teaching media system.

RESUMEN

El trastorno del espectro autista o algunas señales que denotan su alarma temprana, se convierte en un gran desafío para la familia, los docentes y los especialistas, quienes reclaman orientaciones que les ayuden a entender y tratar lo que ocurre; sin embargo, los docentes no siempre tienen la preparación suficiente para dar respuesta a las exigencias de estos educandos y, en ocasiones, los medios de enseñanza no son variados y atractivos; por lo que se propuso como objetivo socializar un sistema de medios de enseñanza para la estimulación de la comunicación en educandos con señales de alarma del trastorno del espectro autista. Se emplearon métodos del nivel teórico y empírico como: histórico-lógico, enfoque sistémico estructural, observación participante y directa, entrevista en profundidad y herramientas digitales para la creación de los pictogramas educativos. Como resultados, se diseñó un sistema de medios de enseñanza para estimular la comunicación de los educandos con señales de alarma del trastorno del espectro autista. De manera general, se consideró que para el mundo de estos educandos el uso adecuado, oportuno e individualizado de los medios de enseñanza mejoraron las habilidades comunicativas para expresar sus emociones y comprender las que le rodearon, lo que impulsó su interacción, autonomía, desarrollo, adaptación e inclusión social.

Palabras clave: estimulación temprana; lenguaje; primera infancia; sistema de medios de enseñanza.

RESUMO

O transtorno do espectro autista ou alguns de seus sinais de alerta precoce, representa um desafio significativo para famílias, os professores e os especialistas, que reclamam orientações que os ajudem a entender e lidar com o que ocorre; no entanto, os professores nem sempre têm preparação suficiente para responder às exigências desses educandos e, por vezes, os meios de ensino não são variados e atrativos. Por isso, propôs-se como objetivo socializar um sistema de meios de ensino para a estimulação da comunicação em educandos com sinais de alerta do transtorno do espectro autista. Foram empregados métodos do nível teórico e empírico, como histórico-lógico, abordagem sistêmica estrutural, observação participante e direta, entrevista em profundidade e ferramentas digitais para a criação de pictogramas educativos. Como resultados, foi projetado um sistema de meios de ensino para estimular a comunicação dos educandos com sinais de alerta do transtorno do espectro autista. De maneira geral, considerou-se que, para o mundo desses educandos, o uso adequado, oportuno e individualizado dos meios de ensino melhorou as habilidades comunicativas para expressar suas emoções e compreender as que os rodeavam, o que impulsionou sua interação, autonomia, desenvolvimento, adaptação e inclusão social.

Palavras-chave: estimulação precoce; linguagem; primeira infância; sistema de meios de ensino.

INTRODUCTION

Education is a human right, a key driver of development, and one of the most effective tools for reducing poverty, improving health, and achieving gender equality, peace, and stability. In addition to generating high and consistent income returns, it is a crucial factor in ensuring equality and inclusion.

In such a turbulent and ever-changing world, teachers face complex educational, pedagogical, and psychological challenges, demonstrating a deep love for their profession and a strong sense of social responsibility. To find effective and satisfactory solutions to this reality, education must be understood as an inclusive process, regardless of any limitations that may exist.

In Cuba, the school forms the central axis and core of education, both in the community and in the family; therefore, its role as an institution is framed in two directions: to train and prepare, to achieve the development and integration of the individual for the society in which he or she will develop.

Accordingly, the Cuban early childhood education system constitutes the first subsystem of the National Education System, and is not compulsory; its study plans and programs are updated and restructured as a result of the Third Improvement of the Cuban Educational System, with the purpose of expressing equality and equalization of opportunities, which allows educational attention to be conceived as adapted to the individual pace of each student, assuming differences as an added value.

This study focuses on students diagnosed with Autism Spectrum Disorder (ASD) who exhibit warning signs. It emphasizes the importance of early intervention for teachers and recognizes the significant challenge it presents for families, who seek guidance to help them understand and address the situation. The study emphasizes the importance of early and timely recognition of ASD symptoms as a crucial factor for intervention, improving quality of life, and initiating specialized interventions to enhance long-term outcomes (Rivadeneira & Pardo, 2024).

The specifics of clinical-educational care for students with warning signs of ASD are interdisciplinary, based on the scientific contribution of professionals from different areas such as medicine, psychology, sociology and pedagogy, who have made important contributions in this field, where the appropriation and development of verbal and non-verbal communication takes on particular importance.

Much progress has been made in developing the educational process for students with ASD, including improved collaboration between the teacher and their teaching assistant, alignment between the program's developmental goals and the designed activities, effective lesson planning, appropriate physical space for the content and skills to be developed at this stage, and parental involvement in the program. However, teachers are not always adequately prepared to meet the educational demands from the earliest warning signs, and sometimes the teaching methods are not varied or engaging.

It is considered that using teaching methods that link the traditional and modern (Vivanco & Quizhpe, 2024), based on the use of Information and Communication Technologies (ICT), offers many possibilities for the development of communication in students with warning signs of ASD, since it

makes it possible to address different areas of the linguistic aspect, from the expressive to the receptive; for example, to create pictograms, boards and schedules, among others.

From the perspective of the development of language and semantic skills in students with ASD, there are numerous investigations, including those of: Díaz *et al.* (2025); Martínez (2023); Moreira and Mendoza (2024); Vivanco and Quizhpe (2024), focused on its early detection (Rivadeneira & Pardo, 2024), and oriented towards family support (Campo *et al.*, 2024).

To achieve this, digital and educational resources are needed to improve the teaching-learning process (Cobena *et al.*, 2024; Reynaga *et al.*, 2024; Rodríguez *et al.*, 2024), and these resources must be contextualized to stimulate communication in students with early warning signs of ASD (Alcañiz, 2022; Fernández & Montenegro, 2025; Miranda *et al.*, 2025). Therefore, the objective was to disseminate a system of teaching materials for stimulating communication in students with early warning signs of ASD.

MATERIALS AND METHODS

The general theoretical foundation of this research was based on Marxist-Leninist theory and the application of its dialectical-materialist method as the guiding method of knowledge, since the dialectical relationship between philosophy, science, and scientific research was assumed. At the same time, different general theoretical methods were employed:

Historical-logical, for the reconstruction of the historical scenario of conceptions regarding ASD, the stimulation of communication and the treatment of warning signs, in the early stages of life; systemic structural approach, for the structuring of the teaching media system and establishing the most important relationships that characterized it for the stimulation of communication of students with early warning signs for ASD.

The following logical thought processes that support the methods were used, such as: analytical and synthetic, to delve deeper into the bibliography that served as a guide to address the subject matter of study and, in this way, arrive at conclusions and generalizations; inductive and deductive, in the Information processing and interpretation of results, which allowed the proposed solution to be applied to the teaching media system for stimulating communication in students with early warning signs of ASD in order to deduce progress and arrive at conclusions.

Both the bibliography on the subject and the documentary and testimonial bibliographic sources were subjected to criticism, as part of the work of identifying, classifying and analyzing the sources, through empirical methods such as:

- Participant and direct observation, with the purpose of verifying the current state of communication of the selected sample, as well as the presence of warning signs for ASD.
- In-depth interview with educators, specialists from the Hermanos Saíz Special School and the XI Festival Children's Center, as well as methodologists and teachers, with the aim of gathering information and thus gaining an initial understanding of the problem from a qualitative perspective. Technology was used to reach specialists in other locations. Semi-structured interviews were conducted, using a series of questions that served as a thematic guide for the interviewees.

ARASAAC, a Spanish portal with a large database of pictograms in multiple languages, was used as a digital tool for creating educational pictograms. It is free, adaptable, includes a sentence and activity generator, and is freely accessible (Miranda *et al.*, 2025). The sample consisted of a 4-year-old child from the XI Festival Children's Circle in the municipality of Pinar del Río, who presented warning signs of Autism Spectrum Disorder (ASD).

RESULTS

The application of participant and direct observation, with the informed consent of the family, proved crucial for the initial assessment of warning signs, as the student did not behave according to the physiological developmental standards for his age. The main results were:

- He did not use objects in the game to represent others (absence of imaginative function).
- He did not respond to attempts at imitation or to simple verbal instructions (undeveloped verbal comprehension).
- He focused repeatedly on a single object (fixation and stereotyped behavior).
- He did not participate in group games or respond to group calls (low level of verbal comprehension).
- He cried in response to loud noises, which suggested sensory hypersensitivity (associated with ASD).

After observing these behaviors, which were somewhat deviated from the established parameters according to the physiological development of early childhood learners, the educator was asked to be interviewed to compare criteria regarding what had been observed; based on this, the following was established:

- The student did not participate in group games or respond to group calls (little development of verbal comprehension).
- He repeated phrases without communicative context (presence of echolalia).
- He did not formulate spontaneous phrases, nor did he use language to regulate the behavior of others, nor did he ask for help or use coherent facial expressions.
- She cried in response to loud noises, which suggests sensory hypersensitivity.

The family was asked for a space to conduct an interview, with the aim of knowing in depth the behavior of the educant. It addressed general issues such as the state of gestation, birth and development achieved to date

The family expressed high levels of concern, according to both parents. Compared to other children in the family, the community, and the daycare center, they noticed developmental differences. Due to this concern, they requested an appointment with the pediatrician at the Family Doctor's Office, but this appointment had not yet taken place. The in-depth interview revealed the following:

- The student began speaking single words at the age of three, without progressing to functional phrases (echolalia present, non-functional language).
- It did not communicate through gestures nor did it seek to share interests (the proto-declarative gesture was not developed).
- He exhibited rigid routines and a rejection of changes or physical contact (indicator of sensory disturbance).
- He cried at loud noises.
- He did not respond to attempts at imitation or to simple verbal instructions (undeveloped verbal comprehension).
- He focused repeatedly on a single object (fixation and stereotyped behavior).

The data obtained allowed us to conclude that the student presented a low level of development, with a predominance of repetitive behaviors, a lack of meaningful social interaction, and severe

difficulties in functional communication. These results were considered consistent with internationally recognized warning signs of ASD; therefore, it was recommended that the case be referred for specialized evaluation and that a personalized and inclusive educational intervention be planned.

The daycare center also informed the Diagnostic and Guidance Center (CDO) to assess and guide the child's educational needs while the child was being evaluated by the autism committee. The case was then presented at the Hermanos Saíz Special School in the provincial capital for evaluation. Following the visit of the child and their family to this school, follow-up and the exploration of educational alternatives were proposed, in coordination with the child's own school. These alternatives included the use of didactic resources to develop the child's attention, with the aim of establishing a collaborative effort between both schools to stimulate and develop the child's communication skills.

The proposed teaching media system was based on the diagnosis carried out and was conceived as the set of educational tools, logical and structurally organized, that allowed the best performance of the professional work of the specialists and teachers of the XI Festival Children's Circle, in the municipality of Pinar del Río, for the work focused on stimulating the communication of the child with warning signs of ASD studied, on the fundamental premise of reaching the proposed levels of physical, psychological, pedagogical and social development, and achieving the objectives set.

The structure of the teaching aid system for stimulating communication in students with early warning signs of Autism Spectrum Disorder (ASD) at the XI Festival Children's Center in the municipality of Pinar del Río had the general objective of contributing to the development of communication through various forms of social interaction. The following specific objectives were derived from this:

- Identifying elements of everyday life through sensory perception, in accordance with the level of development and motivation.
- Understanding messages conveyed through verbal and non-verbal signs using different sensory systems, according to different communicative contexts.
- Construct simple oral and graphic messages with verbal and non-verbal signs by progressively employing communicative procedures in a dialogic and monologue manner.
- Expand the student's interpersonal relationships with other children and adults in their environment.

- To foster the need for communication, based on the cultural norms of our nation, and in this way contribute to its integral development.
- extrasituational communication, in order to perceive the relationship between objects, beyond their context, and to take an interest in the phenomena of social and natural life.

Methodological guidelines were offered that constituted a guide for the creation and application of the teaching media system for the stimulation of communication in the student with warning signs of ASD, and their level of development, psychological characteristics, needs and interests were taken into account.

The teaching resources system was applied throughout the educational process, in both scheduled and independent activities. It was organized according to the complexity of the proposed models and took into account the program's objectives, content, and methodological guidelines. Evaluation was systematic, conceived as both a process and a result. It assessed the correct and independent completion of the task, the adult's guidance in achieving it, its full or partial completion, and the final outcome. The evaluation scale used was 5, 4, 3, 2, 1.

Working with a student exhibiting warning signs of ASD to foster their communication development required a specialized approach. Consequently, the proposed teaching aid system was conceived as a tool to enhance their communication skills, integrated into their daily routine to maximize its effectiveness. It was designed for use with the student included in this study, but it can be modified and adapted to the individual needs of others with a similar condition.

Once the zone of actual development was diagnosed, it became possible to work on the zone of potential or proximal development. In this regard, a variety of resources were included, such as images and pictograms to represent words, phrases, or comprehension activities, and toys and sensory materials as tools to stimulate the senses and encourage interactive play. Modeling language involved using clear and simple speech and repeating key words or phrases to help the learner become familiar with new grammatical structures, such as turn-taking and communication.

The media system included, for example, the game of hide-and-seek with objects, where toys of the child's preference were used, thus promoting the development of his spatial language and the practice of questions and answers, given the need to ask for help to find them.

The use of picture books led to discussion of the images and the association of image and word within each comprehension context; this stimulated their imagination and provided a varied source of vocabulary and grammatical structures. For example, the images were used as a starting point to establish the theme addressed in the story, ask questions about the image and the colors used, relate them to their lived experience, and make predictions and associations to encourage them to think and speak.

To encourage their language development, the responses did not have to be perfectly correct, as continuous stimulation was conceived as an external activity that was internally reconstructed; therefore, it was considered effective to apply it routinely until the recognition of the concept and independence of its use were achieved.

In this regard, positive reinforcement involved rewarding or praising the learner's efforts and achievements in their correct use of language. This motivated and encouraged better practice and promoted the use of new words or phrases, initially imperfectly, until they were adapted to the sounds, concepts, and contexts. Verbal praise was used, such as "Very good!", "You said 'ball'!", "I'm very proud of you!", as well as tangible rewards like stickers or extra time to play with their favorite toy. The use of scaled pictograms, integrated into the media system, was suggested based on the learner's reaction.

Integrating communication opportunities into daily activities, such as mealtimes, proved highly effective. For example, the student was asked to name foods, their colors, or indicate what they wanted to drink; similarly, cards with utensils or food items were used so that when mealtimes arrived, they could recognize and even request a specific type of food and utensil.

Another game integrated into the proposed media system was picture bingo, where the learner had to name what they saw on the card, thus expanding their vocabulary and descriptive skills. One or more additional card sets incorporating other words were added to this medium, always using the learner's motivation and preferences to expedite the process. The interactive games involved playful activities that encouraged turn-taking and communication among participants, making language learning and development a fun process that facilitated socialization and spontaneity.

Collaboration between parents, teachers, and specialists was crucial in creating a consistent learning environment using the same methods, fostering confidence in the student, and ensuring coherence

in their development. In general, language modeling should have provided clear, unhurried, repetitive examples with natural intonation of words and phrases that developed the ability to use them in different communication contexts. For example, during a play activity, a tower was built, and emphasis was placed on the word "tower" and its associations with adjectives such as tall, towering, and gigantic, as well as on identifying the colors used.

Songs and rhymes were fun tools for learning new words and phrases. The repetition of choruses and the rhythm helped reinforce language learning. Simple songs like "head, shoulders, knees, and toes" were selected, while pointing to the body parts. This improved vocabulary and the association and recognition of body parts, in addition to the motivation provided by the dance movement.

When activities simultaneously employed media such as stories, children's songs, and dance, their synchronization generated motivation, physical activation, and the use of spontaneous language to connect imagination and everyday words.

The use of puppets and their handling by the student made it possible, from the questions of curiosity to working with colors, identifying parts of the puppet's head and clothing, and above all, the imagination in the use of words and phrases expressed as another, to observe their behavior and interaction.

The use of ICT for students with warning signs of ASD was considered an advantage, because it led to multisensory stimulation, including visual, auditory stimuli and images and written texts, to improve motivation; it allowed for individualized attention, a controlled environment, and the repetition of activities to improve communication skills.

It also helped to structure and organize the interaction environment, facilitate the understanding of the activities, avoid high levels of frustration, create spaces that are understandable for them, work on self-regulation, promote autonomous work, develop self-control skills and provide new learning and interaction experiences in favor of communication.

The teaching aid system for stimulating communication in a student with ASD included the use of pictograms. These were not homogeneous or static; they were conceived as alternative communication tools, visual symbols that graphically represented ideas, actions, or elements and allowed the child to establish meaningful connections between words and images.

They were considered for use as a teaching tool because they reduced cognitive load, strengthened literacy development, encouraged the expression of emotions, needs and desires, and helped maintain attention and interest during activities, making them a versatile and effective resource, each with a specific purpose, applicable according to age, development level and area of knowledge.

In this way, they were used as teaching aids:

- Informative pictograms, based on the use of illustrations without text, which indicated a specific action such as routines and rules of behavior, with the aim of improving the child's autonomy and spatial orientation.
- Descriptive pictograms, represented by words or phrases, accompanied by text, to expand their vocabulary, identify emotions, objects and concepts.
- Narrative pictograms, using sequences of images that represent a story, to promote reading comprehension, interpretation, and empathy.
- Pictograms functional, personalized for basic communication such as eating, bathing, which allowed them to express their basic needs and emotions.

As a digital tool for the creation of educational pictograms, ARASAAC was used, a Spanish portal with a large bank of pictograms in multiple languages, free, adaptable; it includes a phrase generator and activities, free to use and easy to access.

The key to success for the teaching media system for stimulating communication in students with warning signs of ASD was the consistency and personalization of the techniques, adapted to individual needs and preferences, in a learning environment that was both educational and fun.

The use of this adapted teaching media system to stimulate communication in students with early signs of autism spectrum disorder (ASD) required creativity, patience, and collaboration. The integration of technological tools, games, and visual routines made a significant difference in language development. With the right approach and support, it was possible to achieve significant improvements in their language and communication skills.

DISCUSSION

Inclusive education is a right that distinguishes Cuban education and education worldwide. This is why much research in this field demonstrates its interdisciplinary nature and the need to join forces to achieve quality education from the earliest years of life.

The research conducted adopted the design of the teaching resources system based on Vygotsky's (1995) theory of language and its mediating role in children's cognitive and social development, and the zone of proximal development, which refers to the gap between what can be done independently and with the help of an adult or a more competent peer, in order to internalize knowledge and skills from their own culture and others. All of this is aimed at developing linguistic skills, abstract thinking abilities, and problem-solving skills; this approach aligns with that of Gallardo (2024) when discussing oral language development in the early years of primary education.

In her reflection, the aforementioned researcher explains the need for the development of oral language in the early years of education as a multifaceted and complex process that encompasses context, the appropriation of sounds, reading and comprehension, where the coordinated role between the school and the family is necessary for the cognitive and social development of the students.

The role of the family in language stimulation for students with warning signs of ASD is considered crucial. In this regard, the results of Rivadeneira and Pardo research (2024) propose a workshop program to train teachers on the detection and comprehensive care of students with ASD, starting from a diagnostic assessment. The basic needs for preparation demonstrate the need for their treatment and intervention transdisciplinary. Along the same lines, Demósthene and Remón (2024) created a guidance manual for the families of children between two and five years old who have autism, based on their individual characteristics.

It is agreed that, from early childhood, contact with objects and the emission of sounds should be stimulated, revealing the connection between communication, visual and auditory perception, and emotions, for students with warning signs of ASD and difficulties in the development of communication; therefore, a specially intentional education uses gestures, signs, and indications to achieve their interaction and communication, based on interactive games that generate repetitions of pleasant actions and gestures (Martínez, 2023).

In the designed media system, it was proposed to stimulate oral language in students with warning signs of ASD, through playful actions that adapt the resources and game dynamics to the individual needs of each one, based on their integral development, to improve their communication and facilitate their integration into social and educational environments, aspects pointed out and addressed in the study carried out by Moreira and Mendoza (2024).

The study by Vivanco and Quizhpe (2024) is interesting and up-to-date, presenting a language stimulation strategy that moves from a traditional approach to a modern disruptive approach with interactive and innovative mobile applications that use multimedia technology and personalized adaptations to provide educational activities and interactive games that improve language skills in an accessible and motivating way, specifically designed to stimulate communication in students with warning signs of ASD.

The proposal by Rodríguez *et al.* (2024) on teaching aids and open educational resources assumes the concept of technologies for learning and knowledge (TLK), which can and should be contextualized to different teaching methods, as they have become a necessity in the current scenario for stimulating communication, a result of the changes generated in science and technology. Cobeña *et al.* (2024) also focuses on the use of digital and didactic resources to achieve a teaching-learning process. more creative, participatory and proactive, where meaningful learning is fostered, with better academic performance, making the class an interesting and innovative novelty.

However, Reynaga *et al.* (2024) argue the advantages and disadvantages of the use of ICT in the educational field and suggest that, when designing a teaching resource, its motivational function should be taken into account, in addition to planning the purpose, educational level, context, interest, educational needs and learning styles for physical, cognitive and affective development; points of view that were reviewed in detail to develop the teaching media system for the stimulation of communication in students with signs of ASD presented.

Centered In the initial training of students in the Special Education career, in the study by Díaz *et al.* (2025) a website is designed as a tool to address the stimulation of communication and language of students with warning signs of ASD who enroll in the regular school context.

Accordingly, Miranda *et al.* (2025) address the need to implement inclusive strategies for students with warning signs of ASD in middle school. They begin by diagnosing a limited use of visual resources

and inadequate pedagogical adaptation, and therefore design and implement a strategy based on the use of pictograms. This strategy revealed a significant improvement in student comprehension and participation, as well as high acceptance by teachers and specialists. This proposal was then contextualized for the study conducted.

Based on a thorough and up-to-date review of the scientific literature, Alcañiz (2022), Fernández, and Montenegro (2025) delve into the impact of ICT use on students with warning signs of ASD and demonstrate how teachers and families generally perceive the positive impact of technology use in areas such as emotional development, self-regulation, communication, and interaction with others. However, they call for reflection on technological dependence and the need for adult support during its use by students with warning signs of ASD, as well as the need for training for its effective implementation.

In a technical report by the Spanish Autism Center, Grandi *et al.* (2025) delve deeper into the relationship between screen use and autism spectrum disorder (ASD), confirming it as a neurodevelopmental condition. They state that there is no evidence linking screen use to autism, offer specific recommendations regarding screen use, and present validated, evidence-based technology to improve the quality of life for people with autism.

In general, it was considered that, for the world of students with warning signs of ASD, if used appropriately, promptly and individually, the use of ICT can improve communication skills to express their emotions and understand those around them, promote their interaction, autonomy, development, adaptation and social inclusion, so its use was included in the designed media system.

This was done based on a diagnosis, and with the coordination between the school, the specialists and the family, to carry out work focused on stimulating the communication of the student with warning signs of the studied ASD, on the fundamental premise of achieving increasingly better levels of physical, psychological, pedagogical and social development, in order to meet the objectives set.

Therefore, the proposed teaching aid system served as a tool to improve the communication skills of students exhibiting warning signs of ASD, integrated into their daily routine to maximize its effectiveness. It was designed for this purpose in this study, but can be modified and adapted to the individual needs of other students with a similar condition.

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Conflict of interest

Authors declare no conflict of interests.

Authors' contribution

The authors participated in the design and writing of the article, in the search and analysis of the information contained in the consulted bibliography.



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