# INFORMATION AND COMMUNICATION TECHNOLOGIES: RESEARCH ON THE CONTRIBUTIONS OF LEARNING OBJECTS IN THE PROCESS OF LITERACY

*TECNOLOGIAS DE INFORMAÇÃO E COMUNICAÇÃO: INVESTIGAÇÃO SOBRE CONTRIBUIÇÕES DE OBJETOS DE APRENDIZAGEM EM PROCESSO DE ALFABETIZAÇÃO E LETRAMENTO*

*TECNOLOGIAS DE INFORMACÍON Y COMUNICACIÓN: INVESTIGACION SOBRE CONTRIBUCIONES DE OBJETOS DE APRENDIZAJE EN PROCESO DE ALFABETIZACIÓN Y LETRAMIENTO*

Andressa Cristina Dadério de MELO[1]
Ana Claudia Câmara PEREIRA[2]
Silvio Henrique FISCARELLI[3]

**ABSTRACT**: In recent decades, Brazil has proposed and implemented a set of public policies in the field of education that propose actions aimed at improving the process of literacy, and establish goals aimed at improving the quality of education. The results obtained through the application of large-scale assessment tools show that one of Brazil's great challenges is to improve levels of proficiency in reading, writing and mathematics, since even after three years of schooling 22% of students only developed elementary skills. The use of technology as a playful, motivating element has proven to be an efficient resource capable of promoting the cognitive development of children. Thus, we have developed Learning Objects, as a resource to support the literacy process, in order to verify their possible contributions through a systematic analysis of practices in 1st and 2nd grade classrooms.

**KEYWORDS**: Public policies. Learning objects. Assessment.

*RESUMO: Nas últimas décadas, o Brasil tem proposto e implementado um conjunto de políticas públicas no âmbito da educação que propõem ações voltadas para o aprimoramento do processo de alfabetização, e estabelecem metas voltadas para a melhoria da qualidade na educação. Os resultados obtidos através da aplicação dos instrumentos de avaliação em larga escala mostram que um dos grandes desafios brasileiros é o de melhorar os níveis de proficiência em leitura, escrita e matemática, pois mesmo depois de três anos de escolarização 22% dos estudantes só desenvolveram habilidades elementares. O uso da tecnologia como elemento lúdico, motivador tem demonstrado ser um recurso eficiente e capaz de promover o desenvolvimento cognitivo das crianças. Assim, desenvolvemos Objetos de Aprendizagem,*

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[1] São Paulo State University (UNESP), Araraquara – SP – Brazil. Master's student in the Postgraduate in Scholar Education. ORCID: https://orcid.org/0000-0002-0794-6873. E-mail: andressadaderio@yahoo.com.br
[2] São Paulo State University (UNESP), Araraquara – SP – Brazil. Master's student in the Postgraduate in Scholar Education. ORCID: https://orcid.org/0000-0002-5330-1283. E-mail: anacla.cp@uol.com.br
[3] São Paulo State University (UNESP), Araraquara – SP – Brazil. Assistant Professor in the Department of Didactics. PhD in Scholar Education (UNESP). ORCID: http://orcid.org/0000-0001-9451-7198. E-mail: silvio.fiscarelli@unesp.br

*como um recurso de apoio ao processo de alfabetização, com objetivo de verificar as suas possíveis contribuições por meio de uma análise sistematizada das práticas em salas de aula de 1° e 2° ano.*

**PALAVRAS-CHAVE***: Políticas públicas. Objetos de aprendizagem. Avaliação.*

**RESUMEN***: En las últimas décadas, Brasil ha propuesto e implementado un conjunto de políticas públicas en el campo de la educación que proponen acciones dirigidas a mejorar el proceso de alfabetización y establecen metas destinadas a mejorar la calidad de la educación. Los resultados obtenidos a través de la aplicación de herramientas de evaluación a gran escala muestran que uno de los principales desafíos de Brasil es mejorar los niveles de competencia em lectura, escritura y matemáticas, porque incluso después de tres años de escolaridad, el 22% de los estudiantes solo desarrollaron habilidades elementales. El uso de la tecnología como un elemento lúdico y motivador ha demostrado ser un recurso eficiente capaz de promover el desarrollo cognitivo de los niños. Por lo tanto, desarrollamos Objetos de Aprendizaje como un recurso para apoyar el proceso de alfabetización, con el objetivo de verificar sus posibles contribuciones a través de un análisis sistemático de las prácticas em las aulas de 1° y 2° grado.*

**PALABRAS CLAVE***: Política públicas. Objetos de aprendizaje. Evaluación.*

**Introduction**

Currently, public policies in the field of education propose actions aimed at improving the teaching and learning process, and establish goals aimed at improving quality in education.

In the National Education Plan (PNE Lei 130005/14 effective 2014-2024) in article 2 are established as guidelines "eradication of illiteracy and improvement of quality in education".

According to Oliveira e Araújo (2005) cited by Abdian and Hernandes (2012, p. 145):

> the search for the quality of students' learning is being measured, mainly from numerous tests and tests, published in indicators of the development of basic education.

In this measurement of the quality of students' learning, evaluation instruments applied on a large scale are used, in which we can highlight: The ANA, the Prova Brasil (ANRESC - National Assessment of School Performance) and the National High School Exam (ENEM).

The results obtained from these evaluations, measured through these indexes, aim to guide actions with a view to achieving the goals proposed for the improvement of the teaching and learning process of students, goal 5 of the National Education Plan (PNE Lei 13005/14 effective 2014-2024) "proposes to literacy all children, maximum up to the 3rd of elementary

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school", but from the analysis of the results of ANA the data indicate that (DIRED, 2016, p. 136):

> the urgent and indisputable Brazilian challenge is to improve the levels of proficiency in Reading, Writing and Mathematics, because even after three years of schooling 22% of students only developed elementary skills.

According to the National Common Curriculum Base (BRASIL, 2017, p. 57), "in the first two years of elementary school, pedagogical actions should focus on literacy", and emphasizes that "during this process we must conceive and put into practice situations and procedures to motivate and engage students in learning".

Information and Communication Technologies, through data obtained from research conducted in the area of literacy, has been shown to be one of the instruments that enable the situations and procedures in which they motivate and engage students in learning, among them we highlight the Learning Objects (OA), in particular digital games, as a pedagogical resource that enables actions for the development of school content. As has been pointed out by the literature in this area, the use of these digital games can contribute to the cognitive development of children, helping to understand concepts, construction of skills and acquisition of skills expected for this age (PALFREI, 2011).

In the structure of the National Common Curriculum Base (BRASIL, 2017) are described the skills and competencies that students should develop throughout basic education. These skills are organized in an increasing of difficulty and some of them go through more than a year of cycle so that this knowledge is consolidated, for the monitoring of the learning process are provided the instruments of large-scale evaluation of basic education with the objective of measuring the improvement in the quality of education, we will briefly describe how the implementation of this instrument was in basic education, i answer to the results of the ANA, in which from the analysis of the results obtained subsidized the elaboration of the OA Repository.

**Large-scale assessment tools**

The large-scale evaluation instruments, as previously reported, have the objective of verifying and measuring whether quality improvement in education is occurring and guide strategies and actions for this purpose, we will briefly discuss their implementation in basic education, which according to Werle (2011, p. 775):

> in 1995 the large-scale evaluation goes through a new profile starting to be called the Evaluation System of Basic Education (Saeb), this evaluation starts to occur every 2 years with the characteristic of being a sample evaluation applied for the 4th and 8th grades of elementary school and 3rd year of high school.

However, until this moment, large-scale assessment instruments were applied in the final series of each basic education cycle, but there is a need to follow the literacy processes that occur in the initial grades, and according to Werler (2011, p. 787):

> in meeting the proposal included in the Commitment All for Education referring to "literacy of children up to a maximum of eight years of age, measuring the results by specific periodic examination", in 2008, Provinha Brasil is instituted, which constitutes another evaluation instrument, now focused on the initial grades of elementary school.

And in 2012, ANA was instituted through the publication of Ordinance No. 867 of July 4, 2012, through article 9: "IV- universal external assessment, from literacy level to the end of the 3rd year of elementary school, applied by INEP." (BRAZIL, 2012).

This evaluation aims to make a broad diagnosis of literacy, in addition to testing the levels of proficiency in Portuguese and mathematics intends to evaluate how the teaching process is being in Brazilian schools.

The Federal Government, through the analysis of the results obtained from the application of the various large-scale evaluation instruments, implemented some guiding actions, in order to seek to achieve improvement in the quality of basic education, among these actions, programs were created in which the guidelines were based on the continued training of teachers, using different strategies and resources and, sending financial and pedagogical resources to school units.

To understand a little of this process we carried out a brief research on the programs that aim to achieve the improvement of quality in basic education and literacy processes, we use as a database, for the realization of research, the portals of the National Fund for The Development of Education (FNDE), the National Institute of Educational Studies and Research Anísio Teixeira (INEP /MEC) and the Ministry of Education (MEC), from the results obtained through these researches we find the following programs in which the descriptors presented actions focused on improving the quality of basic education and literacy processes:

> ✓ Connected Education Innovation that aims to support the universalization of internet access at high speed and foster the pedagogical use of digital technologies in basic education. (BRAZIL, 2017).

✓ More Literacy that aims to strengthen and support schools in the literacy process of students from all classes of the first and second years of elementary school (BRASIL, 2018).

✓ New More Education that aims to improve learning in Portuguese and mathematics in elementary school, through the expansion of the school journey; (BRAZIL, 2017).

✓ National Pact for Literacy in the Right Age which is an integrated program whose objective is literacy in Portuguese and mathematics, until the third year of elementary school for all children; (BRAZIL, 2012).

Among the actions described in the programs listed above with a view to achieving quality improvement in education, we will highlight the strategy of pedagogical use of educational technologies, with emphasis on Information and Communication Technologies (TIC) in particular the use of OAs as one of the resources to assist in literacy processes.

**Information and Communication Technologies in literacy processes**

The use of TIC in literacy processes has been shown to help students become more active in the learning process. The OAs, in particular digital games, act facilitating student engagement and providing the creation of an environment of action and reflection as advocated by Piaget (1998). According to this author, this process of "action-reflection-action" allows better results during literacy processes, due to its characteristics of ludicity, interactivity, visualization and manipulation.

According to Wiley (2000) cited by Aguiar and Florês (2014, p. 13), a Learning Object [...] "it's any digital resource that can be reused to support learning", in our case we will highlight the use of digital games.

According to Bizelli (2013, p. 120): "by looking at technologies as an instrument/learning tool", among them the OAs, "an active process is unveiled that will allow the student to achieve effective and meaningful participation in life in society".

At the time of producing the OAs, which according to Fiscarelli, Morgado and Uehara (2017, p. 146), "have proven to be a valid tool to improve students' learning", according to Nascimento (2014, p. 135) some aspects need to be taken into consideration among them:

> the identification of learning objectives, attention to the nature of the content to be explored, the selection of a relevant and motivating context for the student, interactivity, forms of support and feedback to the student throughout the activity, and the application of the principles that help in the learning process.

In the National Education Plan (PNE Lei 130005/14 effective 2014-2024), one of the actions to achieve goal 5 "to literate all students by the end of the third year of elementary school", in submission 5.4 encourages the "development of educational technologies and innovative pedagogical practices that ensure literacy". We understand here that the production of OAs as a technological resource will enable methodological diversification, and has the potential to be another instrument that can help in the course of the literacy process in order to effectively achieve the quality of education.

For the child to be considered fully literate, it is not enough to master the alphabetic writing system, but the child must develop the ability to make use of this system in various communicative situations (BRASIL, 2012).

AAs as a tool/instrument can contribute to children developing the skills necessary to make use of the alphabetical writing system in various communicative situations, but for this contribution to become effective we start the elaboration of a Repository of Learning Objects.

## Learning Object Repository

According to Rodrigues, Bez and Konrath (2014, p. 102), The Repositories of Learning Objects are the spaces that allow the storage, research and reuse of OA, part of these repositories are hosted on free access sites that can contain animations, exercises and practice, simulations and games.

The need to develop a Repository of Learning Objects arose from the interviews conducted with the literacy teachers, in which they pointed out that the OAs available for use in free access repositories did not meet the demands related to the objectives, contents and skills that should be developed during the literacy process.

For this reason, research on how children learn and develop skills and competencies using the resources of educational technologies, in particular OAs, is currently extremely important, according to Palfrei (2011, p. 284):

> We are in a transitional period. Digital tools will find their place in schools and libraries. We've dealt with the transition of this kind before. The difficult part, during the transition, will be to discern what to preserve from traditional education and what to replace with new digitally mediated processes and tools. Sometimes this will mean teaching children to use computers; sometimes computers will have no place in the room. We need to learn a lot more to separate the two. Only then can we explore what we know about the way children are learning in the digital age.

According to research data during the use of OA, children demonstrated increased motivation, autonomy, reduced fear of error and wet self-esteem to develop the proposed activities. However, there are few Repositories of Learning Objects with games suitable for the development of skills and competencies that must be developed in literacy processes.

When we started the preparation of our Repository of Learning Objects, we first checked what is the definition of competencies that is present in the National Common Curriculum Base:

> Competence is defined as the mobilization of knowledge (concepts and procedures) and skills (practices, cognitive and socio-emotional), attitudes and values to solve complex demands of everyday life [...] (BRASIL, 2017, p. 8).

In order to define what were the knowledge and skills that needed to be mobilized in children in order to develop the skills necessary to be considered fully literate in Portuguese and mathematics by the end of the 3rd year of elementary school, we performed the documentary analysis about the results obtained in the ANA, which in addition to evaluating the levels of proficiency of students also intends to verify the learning conditions.

In ANA proficiency levels are measured from 1 to 4, with level 4 students being the most proficiency student and those at level 1 the students with the lowest proficiency, this scale was adopted in 2013, in which the evaluation was applied in a sample character, in the years 2014 and 2016 was introduced the level 5 of proficiency in writing.

The levels of proficiency present in this evaluation are divided into reading, writing and mathematics, when analyzing the descriptors of the municipality in which the field research will be developed, we are compared with the following results: in 2013, in which the application was of a sample character, 12.91% of the students evaluated were at level 4 of reading proficiency and 34.85% in level 4 of proficiency in mathematics.

In 2014, in which the evaluation began to be applied to all students, no longer having the sample character, the results obtained by the students of the municipality were: 15.95% of the students were at level 4 of proficiency in reading, 20.15% of students at level 5 of writing proficiency and 34.55% in level 4 of proficiency in mathematics.

In 2016, the last year of its application, the results obtained by the students were: 17.90% of the students were at level 4 of reading proficiency, 10. 88% at level 5 of writing proficiency and 38.48% in level 4 of proficiency in mathematics.

After analyzing the results obtained in this evaluation, we observed that the children presented a fall from 2014 to 2016 in the levels of proficiency in writing, from this analysis we

began to think about how the OA can contribute to improve the conditions of the processes of acquisition of reading and writing in Portuguese and in mathematical literacy.

In order to continue the verification of how OAs can contribute to the improvement in teaching and learning processes in the early years of elementary school, we first verified, from the teachers' view, whether the OAs available in the free access repositories contribute to the development of reading, writing and mathematical literacy skills during the literacy process.

For this purpose, we interviewed two teachers working in the literacy cycle more than 10 years ago, asking about the Repositories of Learning Objects that they use periodically during their classes in the computer lab, we questioned whether the OA present in these repositories had resources that allowed students to advance in the reading, writing and mathematical literacy skills listed in the ANA descriptors, and the development of the prerequisites was possible for these skills to be developed later.

From the teachers' speech, it was possible to verify that the digital educational resources available in the open repositories did little to ensure that the children achieved the skills necessary to be considered fully literate at the end of the literacy process, when they finished the 3rd year of elementary school.

Through research conducted by us, in repositories of free access, came to confirm the speech of the teachers. These repositories have a limited number of OA with the characteristics of games, mostly exercise and practice activities, in some we observe some conceptual errors, in others during the development of activities occur an increasing of difficulties that require children concepts that have not yet been developed, requiring a closer look of the teacher at the time of selection.

For this reason, we started the production of unpublished OA with the aim of helping children to understand the principles that constitute the alphabetic system to develop reading and writing skills, to carry out reflections on the sound and graphic relationships of words, to recognize and automate the correspondences sound spelling, and in mathematics the correspondence between the numbers and their respective quantities, the concepts of addition, subtraction and recursive sequences to develop algebraic thinking.

At the time of starting the elaboration of these OA, which composes our repository, we take into account the results obtained in the ANA and the speech of the teachers concerning the structure and contents that should be present in these objects.

According to Prata, Nascimento and Pietrocola (2014, p. 108):

> Producing interactive learning objects (OA) with pedagogical quality for the various areas of knowledge of basic education, has been a great challenge for the Ministry of Education (MEC), and for all who work in this area. We have to consider that it is not only a transposition of textbooks into a digital format enriched with multimedia resources, but the production of interactive activities that can actually enrich face-to-face classes by integrating with the other methodological strategies of teachers.

According to Bizelli (2013, p. 119), "by looking at Communication and Information Technologies (TIC) as a teaching tool, new media should be used to reinforce or make the teacher's work more efficient." We seek, through the organization of our Learning Object Repository to facilitate the work of the teacher when using and select the OAs as another methodological strategy.

The OAs, which make up our repository, were produced in line with the skills that are present in the National Common Curriculum Base (BRASIL, 2017), and they are structured from concepts and content that enable children to develop skills that are initially prerequisites for achieving higher levels of proficiency in reading, writing and mathematics, present in the ANA descriptors, and in line with the competencies that need to be developed according to the National Common Curriculum Base (BRASIL, 2017).

At the time of production of these OAs, we try to maintain the characteristics of multisemiotic texts, which help at the time of interactivity between image, content, sound and movement, also allow the use of different texts and languages in the same digital resource (BRASIL, 2017).

The use of the structures of multisemiotic texts in the composition of the OA made it possible to make them more attractive and interactive. Por this reason at the time of their production, taking into account the speeches of the teachers, there was a whole criterion to select the letters, the words, the numbers, the images and the sounds that would be present in each activity.

Regarding the didactic strategies adopted concerning the content was from the simplest to the most complex, and the structuring of the game in a playful and interactive way, without failing to achieve the objectives, we also pay for the presentation of the feedback of correct and wrong to the children, and in the disposition of the OA in the repository in a way that children can locate them with a certain autonomy.

Currently 3 classes of 1st year and 3 classes of 2nd years of elementary school are periodically using the OA present in our repository, the observations of these classes and the feedback of the teachers are providing the opportunity to produce new OAs and make the

necessary adjustments in the existing ones, with the aim of better meeting the needs of children and teachers concerning learning during the literacy process.

Thus, according to Bizelli (2013, p. 118), "using TIC as a learning tool is a fundamental competence for those who want to teach and for those who want to learn", and the use of this tool allows children to visualize a particular problem and seek possible solutions in an autonomous and meaningful way, and also allows the teacher to observe the individual evolution of children.

**Final considerations**

The production of OA and the organization of repositories has been shown to be an important factor in the research process so that we can verify how the use of TIC, in particular the use of OAs, can contribute in the process of literacy and literacy, and as an auxiliary consequence for improving the quality of education.

Currently the research is underway, we wait through the observations on the spot and the guidelines and individualized listening to teachers, observe how they introduce in their practice the OAs, and concerning the children, observe the engagement, while using the objects, seeking to observe how their use is collaborating in the teaching and learning process and the possible adjustment that will be necessary to achieve this purpose.

During the research we developed a Catalogue of Learning Objects containing the scripts with guidance for teachers, we carried out an initial training, for the group of teachers of the school unit, presenting this catalog and the Repository of Learning Objects.

The need to elaborate the Catalogue of Learning Objects containing the scripts arose after the interviews initially conducted with the teachers, in which we verified the following difficulties:

- When planning your classes using OA.
- To select the OA aligned with the skills present in the National Common Curriculum Base (BRASIL, 2017).

The criteria adopted for the choice of the items that make up the scripts in this catalogue were those to assist teachers at the time of planning their classes using OA, currently in these scripts are contemplated the following items:

- The name of the OA, to make it easier to find in the repository;

- The area of knowledge, Portuguese language or mathematics;
- For which year it is indicated, based on the skills described in the National Common Curriculum Base (BNCC);
- Number of activities present in OA;
- Learning objectives;
- The playful goal;
- Controls that will be used by children, mouse, keyboard, directional arrows or space bar;
- Feedback for children, hit or error;
- The skills that are being developed according to the National Common Curriculum Base (BRASIL, 2017).
- The answers.

A Catalogue of Learning Objects was given to each teacher participating in the research, and two others were made available for any consultations of teachers who did not participating in the research, but who teach in the school unit. In the course of the research, we intend to update the catalog and scripts as we make changes to the OAs and adding new ones to the repository.

Currently our repository has 29 OA that were developed based on the skills present in the National Common Curriculum Base (BRASIL, 2017), they develop contents related to Portuguese language discipline, among them language practices, linguistic and semiotic analysis (literacy and orthographization), writing, reading/listening, and in the discipline of mathematics develop the contents of the thematic units of numbers and algebra.

At the moment we started the observations of the teachers' classes in the computer lab using the OA, it was possible to verify their good acceptance in the moments of planning and use of the repository, and the enthusiasm and commitment of the children during the classes.

However, it was possible to observe the need to adapt in the OAs the ways in which the feedback of error is presented to the children, to reorganize the repository by learning levels, to restructure the scripts of the catalog in which a guiding text will be introduced to the teacher on how to present the OAs to the children before starting the activities.

We conclude that research on the production of OA needs to continue seeking to understand and improve new knowledge about its possible uses in teaching practice, through continuous dialogue with teachers, so that the use of objects as methodological instruments/strategies can contribute to literacy processes.

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**How to reference this article**