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Training Phonological Awareness in Children through Pedagogical Technologies: An App for Learning Italian as a Foreign Language

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Abstract

This article analyses the role of phonological awareness (PA) in developing reading and writing skills in young learners, studying Italian as a Foreign Language. Its main objective is to identify and describe original didactic strategies supporting students in training PA, the metalinguistic strategy that allows them to reflect and manipulate the phonemic units composing words (Nijakowska, 2010). Research on PA shows a direct correlation between training this linguistic ability and improving learners' linguistic competencies, either in their native language or in a foreign one (Bus & van IJzendoorn, 1999; Ehri et al., 2001; Snow et al., 1999; Ganschow & Sparks, 1995; Lesaux & Siegel, 2003; Chiappe et al., 2002; Gottardo et al., 2001). In particular, PA is directly involved in the process of learning how to read and write. Which are then the most suitable didactic tools to help students in improving PA? Digital technologies seem to constitute effective means, proposing challenging activities, creating pseudo-real communicative scenarios and stimulating different sensorial channels at the same time. Even if similar tools have been developed for children with learning disabilities, it doesn't exist yet, according to our best knowledge, a specific instrument for the

study of Italian as a foreign language by non-impaired learners. Starting from the observation of a classroom of the Elementary School "Colegio Leonardo da Vinci" in Bogotà, the prototype of an app for training PA has been developed, specifically based on their linguistic needs, provided with examples of usage, exercises, explanations, and a series of indications[1].

Keywords: Second language acquisition, Language learning strategies, Mobile learning, Learner autonomy, Phonological awareness

[1] Dr. Peppoloni is responsible for the definition of the theoretical background of the article, and for the detailed analysis of the relationship between technologies and foreign language teaching/learning (Par. 1-2-3-4). Dr. Bonesso conducted the preliminary testing phase with Colombian students and concretely developed the exercises of the app, under the supervision of Dr. Peppoloni (Par. 5).

1. Introduction

PA development is a crucial aspect in learning a language as it affects the learner's communicative process as well as the processes of learning how to read and write (Bilancia, 1999; Tressoldi et al., 1993; Bortolini, 1989). Limited phonological instruction can affect learners' language development, since it is related to the growth of the required skills to communicate in the foreign language; thus, promoting PA at school has become a primary target for teachers.

The aim of this paper is to analyse the role of phonological awareness in the study of Italian as a foreign language (FL) by Colombian children attending the elementary school, and to discuss the effectiveness of didactic technologies in widen and deepen phonological training. Starting by these considerations, we propose the development of an app, that enables young learners to train phonological awareness in an autonomous way.

Learners of Italian as a FL have often difficulties in developing the production skills in the target language, particularly reading and writing. This issue becomes even more difficult, when in the classroom phonology training has not been given as much attention as it is required by the teachers. In the context of Colombia it has been observed that there is the propensity towards the reduction of explicit phonology training. This is probably due to the fact that often in a foreign learning context, teachers are non-native speakers themselves too. However, even when they are native speakers, they constitute the unique linguistic input for their students, that overlaps to school lectures. The enhancement of language production skills has been hindered by the decrease of phonology training activities; as this area is under developed, it is becoming more and more less comprehensible. The question is therefore, how phonological awareness influences the acquisition of the Italian as a FL at an elementary level?

During the early literacy period, PA is indicated as a prerequisite and one of the key precursor skills for learning to read and write (Hu & Schuele, 2005; Bortolini, 1990, 1995; Orsolini et al., 2003; Martini, 1995; Martini et al., 2003). In other words, children who fail to acquire phonological awareness will show difficulties in mastering orthographic representations. Previous studies have significantly supported the causal and predictive relation between phonological awareness and children's ability of decoding and spelling; therefore, it is important to design activities targeted on phonological awareness in the language classroom. Didactic technologies can help teachers and learners in the process of phonology training, since: they offer specific activities contextualized in pseudo-real communicative situations, they are available also outside the classroom, they are usable in an autonomous way to reinforce the work done in the formal and structured context of the school. Students who lack the ability to analyse the sound structure of words, display deficiencies in decoding Italian words. These deficiencies can affect significantly FL learners' reading and writing ability (Shaywitz, 1996). There are a lot of countries worldwide, where students of the elementary school (that is to say, aged 7-12) start to learn Italian, with its alphabet and phonics, from the first grade. However, few of the curricula, childhood education, and learning contexts have sufficient instructions regarding phonological awareness. Many language instructors do not

have a strong sense of the role that phonological awareness should play when structuring lesson plans centred on students' cognitive development. These considerations arose by observing that even though teachers try to implement general pronunciation practices by group or individual assignments, oral repetition, comparing and contrasting sound, giving examples of homophones words and practicing the most common mistakes like the past verb forms and plurals, there was a noticeable shortage of exclusive Italian phonological training sessions. It lacks a systematic and structured didactic proposal about phonological training; as a matter of facts, most of times this training is intended as an integrative part of writing and reading teaching activities, and not as a separated task. Based on this premises, a sample of 42 Colombia children attending the first class of the elementary school at the "Colegio Leonardo da Vinci" in Bogotà was analysed, leading to the proposal for integrating and deepening phonological training in the lesson planning, through the usage of didactic technologies.

2. Theoretical framework

2.1 Definition of the Concept of Phonological Awareness

Morais (1991) states that metalinguistic activities are varied and can cover various aspects of language such as textuality, vocabulary, syntax, semantics, pragmatics, and phonology; this last level of analysis includes phonological awareness. Phonological awareness is defined by various authors as the metalinguistic activity that allows speakers to reflect and manipulate phonemic units that make up words (Morais, 1991; Torgesen et al., 1994; Tunmer & Rohl, 1991; Bortolini, 1996).

The expression *phonological awareness*, however, has different acceptions depending on the time and the author of reference. Lewkowicz (2001) states that PA is a generic term and defines it as the cognitive ability to distinguish any of the oral language segments. Treiman (1991) underlines the fact that PA, should not be understood as a single, homogeneous entity; therefore, when necessary, it could be appropriate to specify whether you are referring to syllabic, inter-syllabic or phonemic awareness. Other authors, instead, prefer to distinguish from the generic concept of PA other skills that would have specific distinctive features. Morais & Mousty (1992), for example, distinguish between phonological awareness and phonemic awareness, indicating with this second term various abilities (segmenting, redial, manipulate) applied to the phonemes of a word. While Morais et al. (1987) introduce the term segmental awareness, thus referring to the ability of distinguishing the single phonemes making up words.

In this paper we intend PA as the set of skills that allow speakers to manipulate the phonetic units of a language, specifying, when necessary, to which of them we are referring to. According to this definition, PA is one of the so called metalinguistic activities, which, for Corrà and Paschetto (2011), differ from the epi-linguistic ones, since the former involve a conscious reflection on language, while the latter derive from a non-mediated by reasoning linguistic reflection. These two different language mechanisms help to distinguish what can be defined as PA from other skills that, despite playing an important role in language development, act without speakers' awareness. In line with these assertions, Marotta affirms

that:

To speak and understand spoken language, we must not be aware of each single phoneme, or word, or of the relations occurring between the words making up a sentence, unless we deliberately reflect on those components, thus activating a control process to analyse the structural constituents of the utterance (Marotta, 2008, p. 16).

A child, for example, will distinguish soon that the word *cane* (dog) is different from the word *rane* (frog), at least at a lexical level, but only at a later stage he will be able to understand that the two words differ for the first phoneme.

Therefore, the ability to analyse intentionally the phonological information of a language, is given by the PA. However, this metalinguistic reflection also depends on the phonological working memory and on the ability of the speaker to retrieve phonological information from his long term memory (rapid naming or phonological recoding); the combination of these three components is called *phonological processing* (Passenger et al., 2000; Torgesen et al., 1994) and it is a broader concept than the single PA, which is included in it. Another important term that is related to PA, but should not be confused with it, is *phonics* (Armbruster et al., 2001), that indicates the ability, or the activities, that allow to recognize the relationship between phonemes and graphemes, critical to the early literacy process.

2.2 The Role of Phonological Awareness in Second/Foreign Language Acquisition

According to the *Linguistic Coding Differences Hypotesis* (Ganschow et al., 1998), the skills available to the speakers in their mother tongue, regarding phonological, orthographic, syntactic and semantic components, are also the basic units for learning a Second/Foreign Language. Potential problems in any one of these elements in the mother tongue will bring then negative consequences in the acquisition of a foreign language. Since phonological skills are among those components that move from the native language to a foreign one, we can expect that this will also happen with PA. This hypothesis is supported by various studies:

a) Durgunoğlu et al. (1993), starting from a study on Spanish-speaking children studying English as a FL, found a positive relationship between the PA level of the speakers in Spanish and their ability to read words and pseudo-words in English;

b) according to a study on native English children, taking part in intensive French lectures conducted by Comeau et al. (1999), the relationship between PA and reading skills in French should be equivalent to that existing between this latter ability and PA in English;

c) Hu (2007), studying Chinese children has found that the phonological processing capacity, in the L1 as well as in the L2, is tightly associated with the ability of learning new words.

What can be inferred from these studies is that PA is a transferrable skill, moving from the L1 to the L2; but it is crucial to point out that what is transferred is a general ability of reflecting on phonological segments of a language, and not the capacity of recognizing and transferring specific phonemes of a language to another one (Durgunoğlu et al., 1991). In conclusion, scholars agree, from different points of view, that PA plays an important role in learning a

foreign language.

2.2.1 Theories on Phonological Awareness development and its didactic implications in teaching a Second or a Foreign Language

Considering the existing relationship between PA and reading skills, two opposing theories have been developed, implying from one side that PA is a consequence of the general cognitive development of the child, and from the other side that it is due to a specific educational intervention. A similar debate is also retraceable with regards to the teaching of a foreign language, leading to a discussion on the opportunity and the effectiveness of exposing non-native learners to specific exercises to train PA.

Krashen & Hasting (2011) argue that it is not necessary to train PA, neither for the L1 or for the L2. This statement is based on the following considerations derived from previous studies:

a) in general, children attending the 3rd grade class obtain good results in PA tests, even without having received any specific training on it;

b) there is a lack of strong evidences showing that a specific training on PA positively influences the ability of understanding while reading;

c) PA ability develops by itself, without requiring specific pre-requisites, both in the L1 and in the L2.

Krashen & Hasting conclude their reasoning on PA, stating that its training cannot be considered as a prerequisite for learning how to read (either in the L1 or in a foreign language), nor a useful exercise for the purpose, due to an obvious fact: millions of people learned to read before the concept of PA was discovered by researchers (Krashen & Hastings, 2011).

Other scholars have a diametrically opposite point of view, affirming that PA also affects reading comprehension (RC). Engen & Høien (2002) investigated the possible relationship occurring between PA and RC in a study involving 1.300 Norwegian children attending the 1st grade class. The research aimed at comparing the results of these students in PA tests (words count in a sentence, counting syllables and phonemes of a word, identifying the initial phoneme of a word etc.) and RC tests (picture-written word association, sentences comprehension, reading and coloring according to the information given in the text etc.), and concluded that PA is tightly associated with other critical skills for RC, such as vocabulary, short-term verbal memory and metacognitive awareness, being therefore an important factor for developing this skill. Assuming that the language skills proper of a native speaker in his L1 are the same mechanisms used for the further learning of an L2, then the reflection of Engen & Høien on PA, will be valid also for the acquisition of a foreign language.

Yoshikawa & Yamashita (2014), instead, observed the presence of an indirect relationship between PA and RC, starting from a study on Japanese adults learning English as a FL. The study, based on a population of 71 Japanese native speakers students, aged between 18 and 24 years, compared the results obtained by these informants on four tested areas: PA, vocabulary,

decoding of words and pseudo-words and RC. The outcomes showed that PA has a positive effect on the ability of reading pseudo-words, which, in turn, has a direct relationship with RC as well as with vocabulary acquisition. According to the authors, the indirect relationship between PA and RC shows that the first supports foreign learners in processing and understanding the information given in a written text of the target language.

As evidenced by the over mentioned studies, the relationship between PA and RC, both in L1 as in L2, is indirect, thus making hard to uniquely affirm that PA training supports the reading process. Furthermore, this relationship is also mediated and moderated by contextual and demographic variables (such as the educational level of parents), by variables proper of each single learner (such as the age of acquisition, the number and type of experiences referred to the L2), and by the type of measures and classifications used by researchers (Grant et al., 2011).

The relevance of PA in learning a FL is confirmed by a study carried out by Sun et al. (2015) on 80 Chinese students of English as a FL, attending the first grade class, with an average age of six years and a half. A first group was exposed to a specific 30-minutes workout on PA for 10 weeks, while the other one followed the traditional English course and was used as a control group. Comparing the results obtained by the two groups in conducting activities on PA, reading and English word and non-words recognition tests, researchers noted that the group trained on PA showed higher levels of PA knowledge and increased non-words reading skills with respect to the control group. Thus the authors concluded that it is possible to enhance foreign learners' PA and that this has positive effects on the ability of reading.

All these studies demonstrate the didactic validity of PA training, according to the following reasons:

- PA is one of the most important basic processes supporting reading skills;

- PA is a strong predictor for defining learners' reading ability level. Teachers can help students in enhancing this skill, by recurring to specific activities;

The indirect relationship occurring between PA and the reading ability is confirmed by a wide scientific bibliography and by the several studies conducted in this field. These linguistic bonds have been observed both in native speakers and in foreign learners approaching the study of a FL, especially in the first elementary school classes.

3. The Educational Training for Phonological Awareness

As Hu & Schuele (2005) pointed out, poor phonological awareness might slow non-native acquisition of vocabulary, due to the difficulty in building unedited phonological representations for new words. As evidenced in their research, children with a solid PA acquired new reading vocabulary in a faster and more stable way, than those with poor PA. Short-term memory, word blending and segmentation, letter naming, and producing rhymes are key factors for improving phonological awareness.

Although PA is a key element in the development of oral skills in a foreign language, the role it plays in school language curriculum, including time, tasks and effort dedicated to it, seems

to depend on the choices made by each single teacher. Making of phonological awareness a standard part of the curriculum and classroom activities in educational programs to teach FLs seems necessary in theory, but difficult to achieve in the practice. Studies by Brown (1992), Fraser (2000) and Yates (2001) suggest that teachers face some difficulties in meeting the pronunciation learning needs of their students. Curriculum gaps, poor methodology, lack of teacher formation and of suitable material, all contribute to inadequacies in PA training in our schools.

3.1 How Phonological Awareness Improves Learners' Reading Proficiency

Students who are unaware of words consisting of a series of discrete sounds have difficulties in reading and writing. A scarce ability in analysing the sound structure of words leads to deep lacks in decoding new words in other languages. These deficiencies could greatly affect L2 reading ability (Shaywitz, 1996).

It is an important issue that phonological skills are essential to the novice readers. Without a solid phonological awareness, readers cannot decode words and find an interrelationship between letters and sounds; therefore, it is necessary for readers, particularly FL readers with limited target language exposure, to receive sufficient training and instruction through phonological awareness activities in the classroom, e.g. phonological discrimination, phonological awareness, memory, and retrieval. Moreover, storytelling, rhyming, word blending training are also suggested to enhance students' phonological awareness. Children with low phonological awareness are recommended to receive a consistent PA instruction so that their phonological abilities and word recognition skills can be enhanced. Direct phonological awareness instruction could be an effective didactic strategy with those students affected by learning disabilities in reading, such as developmental dyslexia.

3.2 Why PA training should be Part of the Foreign Language Elementary School Curriculum?

Receiving phonological awareness instruction at an early age has been recently recognized as an important issue for avoiding future problems of language comprehensibility. According to Venkatagiri and Levis (2009, p. 276) "[phonological] awareness may be an important factor in predicting whether an L2 speaker is likely to be easier or more difficult to understand". Mattingly (1972, p. 37) defines phonological awareness as "individual's awareness of the sound structure, or phonological structure, of a spoken word"; other authors talk about phonological awareness as a "multilevel skill of breaking down words into smaller units" (Hoien et al., 1995).

In consideration of these definitions, we can state that phonological awareness is the skill, developed by learners of any foreign language, which allows sounds discrimination from complex to simple language units. As mentioned above, phonological awareness deals with three different levels of awareness that needs to be achieved during the acquisition of a language. The first level is syllable awareness which requires awareness related to the division of words into syllables; the second level refers to onset rhyme awareness which is measured during rhyming tasks where words share common ending sounds; finally, phoneme

awareness explains that a word can be broken down into individual sounds or phonemes "that are the smallest unit of sound that influence the meaning of a word" (Gillon, 2004). It is then important to emphasize that being trained with PA specific activities, will help learners to recognize the sounds of a word and to use them correctly in order to manipulate language. All these aspects, so important in language acquisition, are tightly related to phonological awareness; that is why its integration into the elementary school curriculum is essential.

3.3 Possible Phonological Awareness Training Activities at the Elementary School

As stated in the previous paragraphs, when dealing with instruction for students learning a foreign language, strategic phonological activities are particularly needed, including multiple exposures to the printed word reading and relevant training activities. After being received these in-class motivating activities, young learners can quickly pick up the sounds and get much familiar with the sounds, e.g. playing songs with similar tunes and repeated words occurrences may enhance long-term memory in FL learners (Fazio, 1997). Moreover, using analogy to read words requires onset-rhyme segmentation and blending skills. Children need to learn how to apply analogy to read when encountering unknown or unfamiliar words in the foreign language they are studying.

In order to assess and train speakers' phonological awareness, it exists specific exercises, that demand different levels of analysis and difficulty. Shown below, a list of the most effective activities, as proposed by many important authors (Armbruster et al., 2001; Marotta et al., 2004, 2008; Lucca et al., 1991), helpful in recognizing the relationship between graphemes and phonemes, in improving the reading process, and in launching an effective literacy process, both when acquiring an L1 or a FL.

1. Can you rhyme?

This game encourages students to listen to sounds and contextual clues to generate a rhyming word that fits in a rhyme phrase. To introduce this game, the teacher asks students to pronounce several rhyme phrases aloud. Then, students are challenged to complete each rhyme by telling a rhyming word. For example, *The king with a ring likes to* _____. *(sing)*

2. Word blending

The teacher divides students in groups of two. Each student rolls a dice, and they have to blend the initial sound and the rhyming sound together, according to the extracted numbers. The teacher assigns a point to the one who pronounces the word in the quickest and most accurate way. For example, number ③ *m* plus ⑤ *op* makes the word *mop*.

① b	② c	③ m	④ p	⑤ r	⑥ s
① -at	② -ed	③ -en	④ -ig	⑤ -op	⑥ -un

3. Substitutions

According to the recommendation from Hines et al. (2007), rhymes and onset should be taught before phoneme segmentation; therefore, learners are asked to transfer their prior knowledge about familiar sounds to the uninstructed rhyme patterns of novel words, e.g., a child could identify the common rhyme with known word *cat* and substitute the initial /*h*/ sound for /*c*/ to decode the novel word *hat*. Students can play tongue twister, such as

"*a big black bug bit the big black bear, but the big black bear bit the big black bug.*" and sing nursery rhymes, e.g,

"Ring around the rosie,

A pocket full of posies,

Ashes, ashes,

We all fall down! "

/d/ ***d***ing around the ***d***oise

/p/ ***p***ing around the ***p***oise

/cl/, /scr/....

In addition, reading stories for children is also an effective way to help them to cultivate phonological awareness ability.

4. Sing short vowels (CVC pattern) rap

Students are requested to listen and fill-in the blanks. For example,

"*The f**a**t c**a**t s**a**t on the m**a**t.*

*The f**e**t c**e**t s**e**t on the m**e**t.*

*The f**i**t c**i**t s**i**t on the m**i**t.*

*The f**o**t c**o**t s**o**t on the m**o**t.*

*The f**u**t c**u**t s**u**t on the m**u**t.*"

5. Technology-based games

With the advance of informatic technology, numerous software applications (apps) for developing phonological awareness, such as *Phonics Studio, Endless ABC*, are continuously invented. These apps not only focus on individual cognitive learning styles and personal learning pace, but also enrich the content of curricula and students' learning outcomes in phonological awareness activities.

4. Benefits of Training Phonological Awareness through Didactic Technologies

4.1 The Contribution of New Technologies in Language Teaching

The use of new technologies in didactics does not simply offer a marginal addition if

compared to the previous tools: their strength, if well used, is likely to provide a real leap in the quality of teaching, to the benefit of a more complete, interesting and effective way of sharing knowledge.

Teachers should be aware of how to use effectively new technologies, first of all because it would be uselessly anachronistic to refuse something that daily surrounds students and which is an integral part of their lives: you cannot push school away from life. But it is also important to underline that new technologies should be considered as teaching tools and not as learning objectives.

The usage of new technologies doesn't imply the simple abandonment of traditional lessons: teaching "in person", direct communication between teacher and students and the teacher's ability to involve learners in the educational dialogue, still remain key aspects of the lectures. Certainly, new technologies expand the range of options that can be flanked to the lecture or integrated with it, allowing teachers to overcome all or part of the major limitations linked to the traditional way of teaching.

The purpose of multimedia didactic technologies is to bring in the language classroom the world as it is, with its sounds (by means of audio media or the computer laboratory) and its images (through the use of the light/LIM board or of the video/TV): human communication is not only made of verbal messages but also of the so called extra-linguistic components, that through multimedia technologies can be presented in an authentic way to the students. To know a language doesn't simply refer to the mere possession of a linguistic competence (phonological, morphosyntactic and lexical), that allows students to produce grammatically correct sentences; it rather indicates the development of a broader communicative competence, that corresponds to the ability of formulating context fitting sentences, suited to the circumstances and to the communicative purpose: communicative competence therefore includes linguistic, paralinguistic, sociolinguistics, cultural and textual skills at the same time. As a matter of facts, one of the educational objectives of teaching a language is also to put learners in contact with different cultural models proper of the target language: in this sense, the use of new technologies makes it possible to accentuate this dialogical aspect of didactic communication, allowing to multiply the voices and the information given to learners, but also giving different linguistic points of reference in addition to those provided by the single language teacher. In light of these theoretical assumptions, multimedia technologies turn out to be an indispensable tool for language learning-teaching, mainly because foreign languages are usually learned- taught in an abstract context, far removed from the reality in which they are spoken and used.

The use of new didactic technologies in the daily teaching practice definitely makes the learning of a language a more attractive and motivating process, especially for the generation of digital native learners. Most of the multimedia products are essentially flexible, open and editable in some way, and, therefore, adaptable to the needs of the different users. Didactic technologies make the learning process no longer rigidly predetermined and hierarchically arranged, but customizable as configured by the users who exploits their potential according to their knowledge, their cognitive purposes and personal interests. This is what we call

interactivity. In addition, it disappears that kind of repetitiveness that sometimes made the study of a language boring and unattractive, and that was responsible for the bad outcomes of learners.

4.2 The Role of Multimedia Technologies in Phonological Awareness Development

Facing new educational challenges posed by the Internet, PCs, tablets, video games in language teaching-learning, requires a considerable commitment for the teacher. Since nowadays the reading process takes place largely in a digital form, even our literacy strategies should make use of these innovative tools provided by new technologies. In addition, teachers cannot ignore the preference of digital natives for the digital media, because of their familiarity and naturalness with these tools. Moving from these considerations and given the goal of improving learners' PA, this study wants to check if the training of these skills can take place through the usage of educational technologies. In this regard there are several studies, presented below, that seem to confirm this hypothesis.

Van Daal & Reitsma (2000), conducted a study on 21 pre-scholastic children and 14 children attending the first elementary class, with reading and writing difficulties. They studied the effects of the Leecircus program, which consists of a set of activities (among which those for PA reinforcement) developed for learning how to read. The training results using this program (from 1.5 to 6 hours) showed an improvement in letters recognition and words and pseudo-words reading, comparable to that achieved with 30 hours of classroom lectures. It has been also noticed an improvement in spelling and a greater motivation in facing writing activities through the computer, rather than by hand.

Another study conducted by Kazakou et al. (2011) on five children with reading problems, showed a good degree of motivation of the participants in performing PA exercises using a multimedia program called Phonological Awareness Educational Software. The program presents a series of exercises that children are able to run by themselves, without the help of an adult, thus confirming the possibility of using educational technologies as useful additional supports to classroom instruction.

Tijms (2004), through a study on 131 Dutch children aged between 10 and 14 years, presenting reading and writing difficulties, noted remarkable improvements in writing speed, as well as in orthographic precision, after a training conducted using the software LEXY.

As demonstrated by these researches, the usage of didactic technologies support the development of those PA abilities, that are fundamental for children in their literacy process, both in their L1 and in an eventual L2. Among the benefits of using didactic technologies there is the possibility for learners of repeating their exercises as many times as they need, receiving each time a feedback by the software, without perceiving any external pressure or judgement. Another aspect is the possibility for each student to go through the exercises according to his own rhythm, avoiding externaldeadlines. Singleton (1994) affirms that the usage of didactic software increases learners' motivation and concentration, thus making students more autonomous in the acquisition of new linguistic knowledge.

5. Methods and Materials

5.1 The Educational Context and the Sample of Informants

In consideration of the little exposure to the Italian language proper of Colombian children, the teacher, in addition to the topics included in the official literacy curriculum valid in Italy, must also pay attention to the development of a series of oral skills (lexical, syntactic, semantic and pragmatic) that 6 years old native children already possess, but that can constitute a crucial lack for foreign learners. This situation causes evident difficulties to these learners: often, for example, the Italian text books contain unknown terms or expressions for them; thus, there is no perfect match between the decoding of a written word and the discovery of the meaning contained in it. This slows down the development of the reading process, making it even more difficult and inaccessible. Common words for the Italian children, e.g. *castagna* (chestnut), *estate* (summer), *mercato* (market), *neve* (snow) etc., are distant from the extra-linguistic lexical universe of Colombian students and can therefore create a parallel distance between them and the written code.

The children observed in this study belong to two first classes of the primary school (school year 2014-15), for a total of 42 students, 20 males and 22 females. The children are all 6 years Spanish native speakers, exception made for a bilingual child (Spanish and English) and a child whose paternal grandfather was Italian and that therefore has a greater familiarity with the Italian than the rest of the class. Children attend primary school after three years of kindergarten, during which part of the activity is carried out by Italian teachers, while another part by Spanish teachers.

In the primary school the learning of Italian as a foreign language still continues through what Marsh (2000) defines *Content and Language Integrated Learning* (CLIL); the contents of the standard school subjects are offered in a foreign language, which in this case is represented by Italian. According to the author, this method has the advantage of allowing students to use another language in a natural and concrete way, since the focus of the lecture is on the contents of the subject and not on the linguistic form used to convey them. Students, simultaneously with the literacy process in Italian, follow other courses in Spanish, their mother tongue. In general, children are able to express in Italian simple requests and to narrate brief facts about their personal life.

5.1.1 Linguistic Difficulties Arising during the Italian Course

Learners, after 6 weeks of a gradual approach to the reading and writing process through a mixed method, both synthetic and analytical, were submitted by the teacher to an individual test for the recognition of the initial or final vowel of a word orally pronounced. 10 children out of 42 showed more or less severe difficulties in phonemes recognition. Two months after this first test, students were asked to read a sentence; 6 of the 10 children who experienced problems with the recognition of the oral voice, now presented problems in reading a written sentence. Five months later, the classes repeated the test; 4 out of those 10 children still continued to have reading problems. Finally, in a sentence writing test, 6 of the 10 children who presented difficulties in phonemes recognition, showed persistent difficulties also in the

writing process (inversions, omissions, substitutions of graphemes).

Table 1. Monitoring of a group of 10 learners with problems in recognizing initial and final phonemes of Italian words

Student	October	December	May (reading difficulties)	May (writing difficulties)
	Difficulties in recognizing oral phonemes	Reading difficulties (first sentence)	Reading difficulties (second sentence)	
Student 1	X			
Student 2	X	X		X
Student 3	X	X	X	X
Student 4	X			X
Student 5	X			
Student 6	X	X	X	X
Student 7	X	X		X
Student 8	X	X	X	
Student 9	X			X
Student 10	X	X	X	

As shown in Table 1, among the 10 children who experienced problems at the beginning of the school year in recognising oral phonemes, at least 8 out of them continued to have difficulties in the process of reading or writing. Data seem to confirm the assumption at the basis of our research hypothesis, that is to say the indirect relationship between PA and RC, especially in the first phase of the literacy process (Bradley & Bryant, 1983; Stuart, 1999; Dixon, 2004).

In the daily scholastic practice it has been therefore observed that children with lower PA skills showed more difficulties in the internalization of the reading-writing process; thus the need of developing helpful didactic strategies, and the choice of recurring to didactic technologies, considering the learning context (Italian as a foreign language) and the age of the learners.

5.2 Guidelines for the Development of a Multimedia Didactic App

On the basis of the collected data and of the studies that constitute the theoretical background of this article, it is our opinion that the development of a multimedia tool to train PA could be an effective response to the educational needs of the observed group, of improving reading and writing skills. We identified as the most appropriate support, with respect to the age and to the learning path of the considered subjects, a multimedia and multimodal app for mobiles or tablets. Table 2 outlines the guiding principles for the development of the exercises

included in it.

Table 2. Basic principles for developing the exercises included in the multimedia app

Principle	Author(s)	Implication for the exercises
- PA can be learned and taught - PA supports children in developing their reading ability - PA helps children in spelling activities	(Armbruster, Lehr, & Osborn, 2001)	The exercises of the app are focused on improving PA knowledge in children
- PA positively influences oral foreign speech comprehension	(Venkatagiri & Levis, 2009)	
- The activities to train PA perform better when the manipulation of phonemes takes place by means of the letters of the alphabet.	(Armbruster, Lehr, & Osborn, 2001)	PA exercises simultaneously present phonemes and graphemes
- The activities to train PA perform better when they focus on one or two types of phoneme manipulation.	(Armbruster, Lehr, & Osborn, 2001)	The exercises will focus on just a few types of PA activities at a time
- The development of PA activity also depends on the type of language studied.	(Herrera & Defior, 2005)	Since Italian shows syllabic isochronism and transparent orthography, the exercises will give more attention to the syllable rather than to the rhyme.
- Phonological awareness is developed starting from the most shallow levels, to reach at a later stage the deeper ones.	(Treinman, 1991)	The exercises will be divided according to increasing levels of difficulty.
- *Digital natives* prefer to learn in a ludic way.	(Prensky, 2010)	The exercises should have a playful and ludic aspect, not being simply the transposition of the traditional ones into a digital format.
- Educational video games are suitable tools to carry out structural and audiolingual exercises, since they give a constant and multimedia input, able to motivate the student, to correct him and to provide an immediate solution.	(Zanoli, 2010)	The exercises should provide multimedia and multisensory input, together with corrective and supportive options.

These are the contents (Table 2) that form the theoretical and operational background of the developed multimedia exercises/games, with the aim of training PA. Since most children learn Italian as a FL, the following guidelines have also taken into account:

- the words on which children have to work, must be part of a lexicon close to their extra-linguistic reality;

- the exercises aresupported by a dictionary in which the words are presented through animation and phrases;

- words are presented, at the same time, through drawings, audio-recordings and writings, so that even children with reading disabilities can understand them;

- an animated guide is also available, to give instructions and explanations about the exercises, in order to promote the autonomous usage of the app by children.

Among the reasons that led us to the development of an app, there is the fact that similar tools so far available, targeted on the development of PA, usually address to subjects with learning disabilities, such as dyslexia, showing specific difficulties in this ability. As a matter of facts, instead, all the students, especially in the early literacy period, should be explicitly trained in the development of PA, since this fundamental ability doesn't arise spontaneously, but only after the constant exposure to specific stimuli and is a fundamental requirement for learning how to read and write both in the L1 and in a L2. Therefore, the tool that has been developed is generally addressed to students of Italian as a foreign language attending the primary school, aiming at supporting them in the analysis of the sounds composing words and phrases.

5.3 Structure of the Application

In the application there is a start menu from which you can access four areas:

- *Pre-reading*: exercises also suitable for children who cannot still read. The exercises do not contain graphemes and, however, their knowledge and understanding is not necessary to carry out the activities;

- *Reading Learning*: the exercises support the literacy process of reading. Each grapheme is provided with an audio-recording of its corresponding phoneme, in order to help children, in the first phases of their literacy process, in learning how to match in the right way these two linguistic components;

- *Dictionary*: users can find here the words included in the exercises, translated into various languages (English, Spanish, etc.). In addition to the translation, the various words are displayed within short sentences in Italian and provided with images.

The dictionary can be accessed directly from the main menu of the app, or during the development of the exercises, to check the meaning of unknown words.

- *My progresses*: in this section it is possible to verify the number of activities carried out and the percentage of correct answers given by the user.

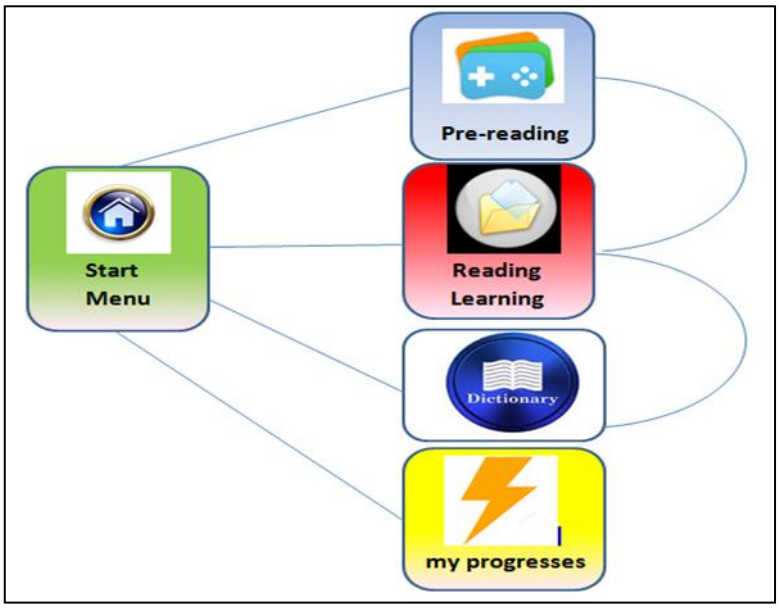

Figure 1. Schema of the internal structure of the app.

5.3.1 Some Examples of the Exercises Contained in the App

This section presents some of the exercises that an application for the development of PA in children learning Italian as FL should contain. Since this app is actually only a prototype, the images, taken from the Web, have, for the moment, only illustrative purposes.

Introductive and explanatory activities

In Figure 2, you can observe the screen with the presentation of a *counting of the words of a sentence* exercise. The "ABC" button, if dragged on to images that the user is not able to name or understand, gives access to the "Dictionary" of the app. The "?" button instead allows the user to listen to the exercise instructions, that are given by a fictive character. These instructions recall more the directives for accomplishing a mission, than the traditional headings of a text-book exercise. The guide-character uses a simplified vocabulary, close to that of children and speaks directly to the user.

In the exercise below (Figure 1), the user will listen to a sentence referred to the image on the screen, by pressing on the image itself, in this case *Il cane corre* (The dog runs). As it is an explanation, the user will see the frog carrying out the exercise at his place, jumping on the three stones, each corresponding to one of the words composing the sentence.

Figure 2. An example of the introductive and explanatory activities foreseen in the app.

Counting words in a sentence

In Figure 3, you can see a *word count exercise*. A character, in this case a frog, explains the exercise. By pressing on the image on the screen, you will hear a phrase, in this case *La bambina gioca a calcio* (The girl plays football); then the user has to put in the pond a stone for each word of the sentence. If the exercise is successfully completed the frog will cross the pond by jumping over the stones. If the child does not solve correctly the exercise, the frog will fall into the water. If an error occurs, the frog will let the user listen to the phrase once again, giving him an extra attempt. The advancement of the activity and the number of the correct or incorrect given answers, is shown in the bar represented by the stars that light up.

Figure 3. An example of the counting words activity.

Syllable or phoneme identification

In Figure 4, is presented an exercise of *recognition of the initial phoneme of a word*, that could also be readjusted for the recognition of a syllable, both at the beginning or at the end of a word. In this activity, the user has to help the wizard in making a magical potion. As some objects start to fall down into the screen, the child has to drop into the cauldron only those starting with the phoneme / a /. Each object appears together with the audio recording of the word that it represents.

As in all the exercises presented in the next sections, the character on the screen will be in charge for explaining the activities and giving feedback about their development.

Figure 4. An example of the syllable/phoneme identification activity.

Syllables count exercises

In Figure 5, it is shown an exercise for learning *how to count the syllables of a word*. The exercise is introduced by an explanation and some examples to make the child aware of how to perform the activity. It is also planned to include different levels of difficulty in the future: in the simplest ones the user will hear the target word already segmented and, in this case, he should only count the syllables. In the hardest ones, he should hear the whole word, segmenting it mentally by himself and thus counting the syllables. The child must first press on the image on the top of the screen to hear the audio-recording of the word to be analysed and then on the cloud with the corresponding number of syllables.

Figure 5. An example of the syllable count exercise.

Syllabic combination activities

In Figure 6, it is presented an exercise about the reconstruction of the *right combination of syllables that compose a target word*. In this case the activity is based on the integration of image, audio and grapheme. The user is helped by the pieces of a puzzle in carrying out the proposed task. Pressing on each piece it is possible to hear the corresponding syllable, and when the entire image is recomposed, the user will hear the sound of the corresponding entire word. Again, it is underlined the ludic aspect of the exercise, that is why the protagonist of the activity is a gnome asking children for help in fixing the Christmas presents that have been broken.

Figure 6. An exercise on the syllabic combination activity.

Phonemic segmentation activities

In Figure 7, it is proposed an exercise to train the ability of *phonemic segmentation*. In this case the user, pressing on a given image, will listen to a word and think to its segmentation into phonemes, in order to subsequently recompose it using the corresponding graphemes

presented on the screen. Pressing on the various graphemes he will hear the corresponding phonemes. This exercise could be adapted also for working on the syllabic segmentation.

Figure 7. An example of the training on phonemic segmentation.

The Dictionary

Figure 8 proposes a sample page of the "Dictionary" function, that constitutes one of the main sections of the application, consultable from the main menu or while performing the different activities (see Figure 1). This function, in addition to a translator tool, aims at showing the words found in the exercises both in the context of a sentence and associated with some explanatory images. The multimodal component is always maintained as a constant key for enhancing the learning process. The “Dictionary” function should support then the user in recognizing Italian words with an unknown meaning or met for the first time, ensuring in the exercises a constant mapping between the phonological aspects and the semantic components related to them. The student, pressing on the images or on the phrases, will hear the corresponding sounds and learn how to pronounce them in association with their meaning. The presence of the images guarantees a persistent storage of the linguistic information related to each single word, since it leads to a deep encoding in the mental lexicon of the user, making it durable and accessible.

Figure 7. An example of the "Dictionary" function of the application.

5. Conclusions

This paper presents the prototype of an app, which supports the development of multilingual phonological skills. The app consists of a number of components which interact to provide phonological resources for the Italian language, learnt as a foreign language in a primary school of Bogot à

The functionality of the app is demonstrated in the article through a series of concrete examples; all the developed activities aim at building a more compact representation in our knowledge both for individual speech sounds and for complete sets of lexical items.

Research supports the benefits of helping students in developing phonological awareness to successfully learn how to read and write in a foreign language. Phonological awareness (the ability of segmenting, blending and manipulating parts of words) occurs at the level of oral language, but it operates in concert with print awareness (i.e. how speakers record oral language on paper). Students need well-structured levels of phonological awareness in order to be able to use this skill effectively, as a source of information when reading and writing. Activities that support wordplay can increase students' phonological awareness. Ongoing experiences with reading and writing texts allow students to see how the sound structure of a language is concretely used. Several suggestions for developing phonological awareness within a balanced elementary school program for the study of Italian as a foreign language, are provided in this article.

The importance of becoming aware of the phonological structure of a language learned in a foreign country is increased by the reduced exposure of students to the phonological input. The unique source is represented by the teacher, that could be a non-native speaker too, and the only occasion for training phonological awareness could be reduced to the language lectures at school.

Didactic technologies, such as the app described in the article, try to meet the need for a deepen and widen phonological training, that could be performed also by the students alone,

without the help or the presence of the teacher. This would enhance linguistic standards and the autonomy of the learners in studying a language.

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