"Let's Read Together" a Computerized-Tutored Intervention Program for At-Linguistic Risk Arab Children

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Abstract

"Let's read together" is a computerized-tutored intervention program for enhancing and fostering reading and writing acquisition in Arabic amongst At-Linguistic Risk first graders who come from low socio-economic background. The intervention program is the fruit of the author's doctorate in 2006 and nowadays, after minor modifications, the NCJW (The Research Institute for Innovation in Education) in the Hebrew university is continuing to develop and spread it between at-linguistic risk Arab populations in Israel. The development of the original program began at 2003 and was modified and updated based on the research results and the field needs. Both the research and the program are based on Adams' Interactive Model (1991) for reading and writing acquisition.

The program aims to acquire reading and writing skills in literary Arabic amongst at-linguistic risk children, develop vocabulary in literary Arabic and develop motivation for reading.

The current paper aims to present two studies: the study behind the original program and the new study after the modifications done by the Hebrew university staff, the building principals of such program that compound between research and field, environmental teaching scheme and the components of the intervention program, demonstration, testing principals of the program and its impact. In addition, it presents features of the Arabic language and the Diglossic phenomenon (the gap between written and spoken Arabic), reading acquisition, challenges facing Arab children and challenges facing researchers and educators.

Keywords: Arabic, Reading Acquisition, First Grade, At-Linguistic Risk, computer assisted instruction, tutoring.

Theoretical Background

Arabic: A challenging sematic language

Arabic has its uniqueness that make it a challenging language to acquire. One of the prominent features is "*Diglossia*" which refers to the existing gap between spoken and written Arabic in various and broaden fields (Vocabulary, grammar, syntax, linguistic and expression forms) (Saeigh –Haddad, 2005; Khamis-Dakwar, & Froud, 2007). Consequently, written Arabic acquisition is delayed and negatively affected in comparison to languages in which the relation between spoken and written systems is direct and transparent (Abu-Rabia, 2000; Feitelson, Goldstein, Iraqi, & Share, 1993; Saiegh-Haddad, 2003, 2004, 2005). For daily communication, Arab children use spoken Arabic, they are exposed to written Arabic only in school and when they return to their homes, they use again the spoken system. Arising number of research pointed out that spoken Arabic is the Arab child first Language while Written Arabic is the second language and this is despite the combined use of the two systems (Maamouri, 1998; Ibrahim, & Aharon-Peretz, 2005).

Arabic orthography is complicated; it consists of 34 phonemes (28 consonants and six vowels), diacritical signs add to the orthographical complexity of Arabic (such as "*Tanwi:n*"-nunation and "*Madda*"-elongation) and Arabic script can be vowelized (especially for novice readers), or non-vowelized (for skilled readers). Although, vowelized script considered being shallow orthography, yet non-vowelized script considered being a deep orthography because of the ambiguity of grapheme-phoneme correspondence.

The shapes of the letters change according to their positions in the word (Abd El-Minem, 1987): initial (e.g. بـ), medial (e.g. ـبـ), final (e.g. ـب) or separated (e.g. ب). Some letters share the same shape, and differ only in the number of dots or\and in the dots position (e.g. ج _ خ _ ح). The Arabic script is written from right to left, in a connected style (e.g. "جميلٌ" = beautiful). The Arabic Orthography loads on the visual memory, this affect negatively reading fluency and reading comprehension (Ibrahim, & Aharon-Peretz, 2002). Researchers agree that proper visual memory needed in reading vowelized script (Meyler, 1993; Meyler, & Breznitz, 1998; Shatil, & Share, 2003).

There are more features (see Saiegh-Haddad, & Henkin-Roitfarb, In Press) but for this paper, we settle for and submit that Arabic poses difficulties in the children's way to acquire written Arabic. In order to develop orthographical skills and acquire reading and writing, children must cope with the challenges mentioned above.

Reading and writing acquisition

Reading is defined as a process of written signs transformation into spoken ones (Perfetti, 1997) and its ultimate purpose is to understand the words that are read .Success in reading does not always end up in understanding the text, and therefore reading comprehension is partially related to efficient words deciphering. Thus, decipherability is important but it does not guarantee 'reading comprehension' (Perfetti, 1985, 1999; Stuebing, Fletcher, LeDoux, Lyon, Shaywitz, & Shaywitz, 2002; Stanovich, 1982, 1991).

While acquiring the spoken language is considered spontaneous due to built-in cognitive structures, acquiring the written language is not spontaneous; there are no cognitive structures intended for this purpose. Thus explicit teaching methods are needed in order to acquire the written language (Lieberman, 1992) .

In the context of Arabic, several national and international data show on meaningful failures in reading tests and on clear disadvantages among children from different backgrounds, and among Arabs than Jews (The national feedback of the ministry of

education, 1996). PIRLS (Progress in International Reading Literacy Study) findings in 2001 pointed out that the Arab speakers' achievements in Israel placed them in the 31th (out of 35 countries) (Olshtein & Zozovsky, 2003). Similar findings were on PIRLS in 2006; the achievements averages of Arabic-speaking children placed them in 40th place (out of 45 countries) (Ministry of Education, 2007). Arab Israeli pupils' achievements were higher than other Arab countries. PIRLS 2011 shows similar results, while the Jews pupils' achievements place them at the second place (out of 45 countries), the Arab pupils were at 35th place (Mullis, Martin, Foy & Drucker, 2012).

On the light of the above, the nature of the language poses many difficulties for Arab children when they arrive at first grade and begin to acquire reading skills. Before entering the school, Arab children are exposed to the spoken language this will affect negatively the process of acquiring reading skills and poses a difficulty in reading comprehension (Ministry of Education, 2001). Thus, early exposure to written language positively affects linguistic skills and literacy in written Arabic, although basic processes in written language do not come to a proper and satisfactory level (Saiegh - Haddad, 2008).

The Impact of literate background on reading acquisition

Linguistic Risk can be related to individual factors, as well as to collective factors as socio-economic and demographic ones (Assink, 1994). According to this definition, whole groups as well as individuals could begin their road at school with low literacy, because of their belongingness to families with low-income which face difficult socio-economic situations and live in distressed neighborhood (Gough & Tunmer, 1986; Watson, 2001).

At Linguistic Risk Children have normal physiological development. However, due to insufficient exposure to literacy in their environment during their first years of life, they lack sufficient experience and pre-literacy knowledge and skills. As a result, they experience developmental delay in comparison with their peers (both cognitive and linguistic delay, especially in phonological awareness). These children are likely to have low level of spoken language, and according to this, their ability to succeed in acquiring reading could be negatively influenced (Lombard, 1995; Assik, 1994; Rush, 1999). A significant gap exists in the ability to acquire academic reading skills, when comparing low to high socio-economic groups (Lombard, 1995) .Rush (1999) found that parents from low socio-economic background contributed to this gap by un-drawing their child's attention to the phonological aspects of the language and initiating less opportunities for common reading and linguistic fostering.

Motivation as a learning booster

Low motivation for learning (or losing it during the process) is one of the problematic characteristics of pupils with difficulties. In addition, they lose self-esteem and pleasure from independent reading (Snow, Burns, & Griffin, 1998).

Some learning environments have an impact on motivation. For example, the ability of computerized programs for words recognition on raising the motivation level was validated by several studies (see Roth, & Beck, 1997; Cobb, 2001). Those researchers concluded that motivation is necessary for developing reading achievements.

Other researchers pointed out, that pupils who have experienced repeated failures in reading, should work in a new environment in order to raise their motivation (see McCormick, 1994; Mayer, & Rose, 1998; Wright, 1998; Roth, & Beck, 1997).

Computerized-tutored environment features

The tutorship is defined as a social situation, composed of a dyad- the tutor and the pupil. During the tutorship, the tutor helps the pupil to exercise and foster his achievements in different domains. They have to reach a situation in which their goals become similar (Davis, Snapiri, & Golan, 1984).

Many researchers pointed out that tutorship is an educational environment that contributes to improvement in reading (Cohen, Kulik, & Kulik, 1982; Juel, 1996; Leslie, & Allen, 1999), mainly when the children are at linguistic risk. Such environment has advantages on reading acquisition.

Computer-based programs has its advantage and this is related to the manner of introducing the information via two paths- visual and auditory (Bowman, 1998). This integrated presentation expands the exposure to sound-letter correspondence, which has a great influence on developing phonological awareness, word recognition, and letter naming (Leitner, 1997). Additionally, Computer provides a friendly working frame; it enables us to add, delete and switch letters in easy ways. These features can be used to develop morphological awareness too (Enbar and Ravid, 1995).

In various studies, researchers observed pupils who participated in computer-based reading programs. They found that these pupils doubled their performance rate in both reading comprehension and word deciphering, in comparison with their peers (Mioduser, Tur-kaspa, & Leitner, 2000; Baker, Gerstem, & Keating, 2000, Casey, 2001; Karchmer, 2001).

In addition, a positive effect of tutored-computerized environment on reading was found amongst preschoolers who suffered from disabilities and were expected to fail in reading acquisition. The results pointed out that there were significant improvements in their performances in phonemic awareness, spelling and word recognition, after 16 weeks (Howell, Erickson, Stranger, & Wheaton, 2000).

Thus, tutored-computerized environment bridges gaps between different groups and backgrounds, accelerates motivation for learning and fosters achievements.

The Program "Let's Read together"

The current program is a systematic one that consists of 26 meetings (13 texts divided on two meetings). It is a balanced- therapeutic program, which is based on Adam's *interactive model* (1991). The contents of the program are fitted to the necessities of first graders and works on strengthening the interactive model processors, which are involved in reading acquisition process: the phonological processor (the ability to distinguish and recognize the sounds of the language before referring to the words meanings), the orthographic processor (enables phoneme-grapheme matching and reflects the reader’s ability to use orthographical sequences in order to access the lexicon without phonological mediation), the semantic processor (processor of word-meaning) and the contextual processor (help the reader to read accurately by relying on the whole idea expressed in the text) besides to decipherability skills.

The learning in the program is directed to bridge the gaps of linguistic background, and to stimulate the phonological awareness, constructing meaning and reading-deciphering skills in order to fostering linguistic skills. Developing reading skills is done by systematic learning using external scaffolding (the tutors). The program is based on a fixed step strategy: every two meetings were built around one narrative text. The learning process is fixed and divided into 3 phases: pre-reading skills, during- reading skills and post- reading skills.

The program emphasized direct teaching of reading and writing skills in the first stages of the acquisition process, exercising and developing an infrastructure of fluent

reading skills besides developing reading comprehension abilities (Stahi, DuffyHester & Sthi, 1998).

The special features of Arabic and its rich semantic structure were taken into account too; these features lead researchers to choose the interactive model to teach it (Abu-Rabia, 1999; 2000a; 2000b; 2002; 2003; Olstien & Makhoul, 2010; The Curriculum, 2009). Also, the program treats differences in literate knowledge of the children, which influences reading and writing acquisition. It is necessary to establish the basis for reading and writing by practicing the alphabetical principle, because it is considered the infrastructure of reading and writing acquisition. It includes recognizing the alphabetical script, the alphabetical code and sounds of letters and their names. It is important to adopt the method of gradual teaching, which should take into consideration the differences between children, especially their literate background that they come with.

Thus the current intervention Program for At-Risk Children helps us coping with: learning features at first grade, Diglossic situation, developing phonological, semantic, contextual and orthographical abilities in an integrative way, motivation for learning, linguistic and orthographic features of written Arabic and their influence on reading and writing acquisition, fostering reading and listening comprehension for achieving mature reading and choosing reading and writing teaching methods in Arabic for early reading stages and fluency construction.

Figure 1. presents the learning environment components scheme and interactions between them at first grade.

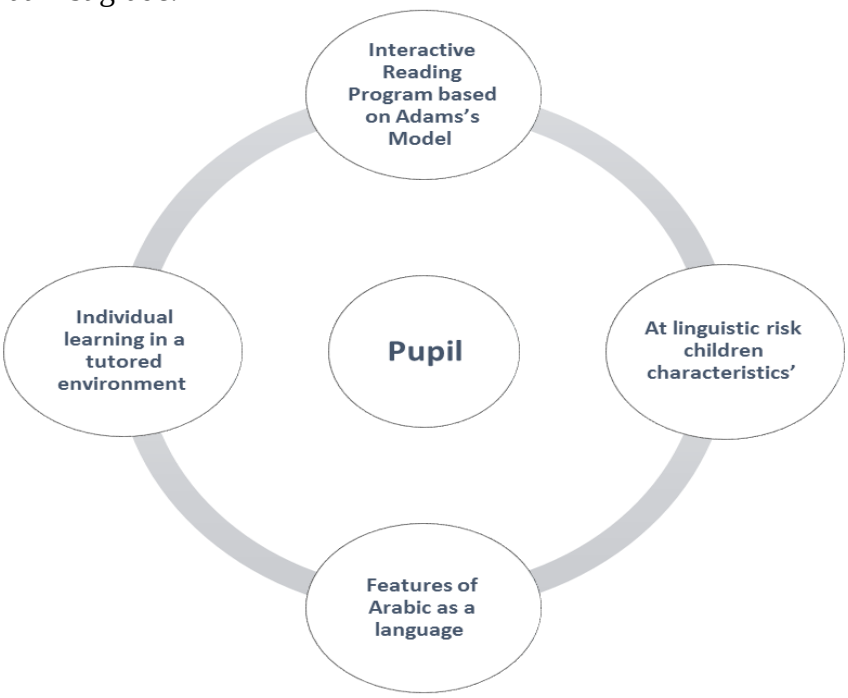

Figure 1. Learning environment component scheme

The program aims are: **(a)** acquiring basic linguistic knowledge (exercising to recognize Arabic letters and sounds and controlling the alphabetical principle through the phonetic-synthetic method for reading and writing). **(b)** Coping with Linguistic and Orthographic Features of Arabic. **(c)** Advancing Reading-listening comprehension, discourse, acquiring linguistic knowledge mainly from context according to the goals of the teaching program. **(d)** Acquiring deciphering skills, developing phonological awareness and

orthographical knowledge acquisition (advancing oral lexicon, semantic and morphological awareness and linguistic knowledge).

Every unit begins with an illustration from the child's world, enables a discourse, a text for listening comprehension, and ends with a discourse and expression. In every unit, the children exercised acquisition of a number of consonants and one vowel (the collections of letters were chosen according to the letters' phonetic and orthographical features: from easy to hard ones). Every letter is taught and exercised in its four shapes: initial, medial and final, in isolated forms and in context (by the text). Also, in the unit the pupil exercising phonological awareness, decipherability and orthographical skills. By every unit, the child broadens his vocabulary. The child's knowledge is constructed gradually by moving from one unit to the next. After every text, the child exercises comprehension skills, linguistic – morphology- syntactic knowledge especially from context. The child rehearse the text in short and long terms, which improves his active memory and improves his naming abilities which are slow among children with difficulty.

All these activities are done in a tutored environment, which make the intervention program fitted to the individual needs. The tutorship principals in this program are consistent and clear; before activating the program, the tutors are qualified for twelve hours, in which they learn the structure of the program, the unique teaching methods of it and how to activate it. In addition, during the activation they have further qualification meetings with the researcher on a weekly basis. In these meetings, the tutors receive briefing notes about the specific unit they are about to work on. After the activation a reflection meetings are conducted. The program is accompanied by a documentation booklet that is designed for documenting the pupil's answers, and in some way to evaluate the tutor's function and the quality of his teaching. One of the tutors' roles is to supply a guided mediation.

The paper objectives

The current paper aim to present the intervention program "Lets' read together" and to assess the pupils' achievement in phonological awareness and comprehension in two studies. The first is an initial study that aimed to assess the affectivity of the program after developing it and it is based on the author's doctorate.

The second study is a wider study that its data was collected after the Hebrew university spread the program amongst 'At-linguistic risk' Arab schools. It is worth to be mentioned the original program was slightly modified in the second study: some contents were substituted, shortened, edited and passed visual processing.

Method

Participants

In the first study participated 40 'At-linguistic risk' Arab first graders from a school in northern Israel in which the economic background of the school population is defined as low, both economically and educationally. Half of the pupils were randomly selected to participate in the intervention program while the other were in control group. The tutors were third year students of education who are specialized in teaching first-second grades.

In the second study, 150 first graders (ten pupils from 15 classes) from four school in southern Israel (Negev). These children came from low socio-economic backgrounds.

Tools

In the first study, two achievement tests were passed at the beginning and in the end of the activation.

(a) **Comprehension test** was built by the researchers as it is accepted by the scientific literature and fitted to the ministry of education criterions (e.g. Van leer institute, 1995) and Arabic curriculum for first graders (1989) requirements. The comprehension test includes short\long term story retrieval (20 points), details detecting questions (two questions, 10 points), sequence and time perception questions (ten points), main idea questions (ten points), drawing conclusions questions (ten points), sorting and generalization (five items, ten points) and Instructions filling (five items, ten points). The overall score was transformed to percent (0-100%).

(b) **Phonological awareness test** was based on Lapidot, Wahel and Tobol (1996) test which was translated into Arabic and it constitutes 11 sections: rhyme recognition and production (ten items, max. points 10); Rhyme production (ten items, max. points: 10); final syllable recognition (ten items, max. points: 10); initial phoneme recognition (16 items, max. points: 16); final phoneme recognition (16 items, max. points: 16); initial phoneme judging (ten items, max. points: 10); final phoneme judging (ten items, max. points: 10); initial sound isolation (ten items, max. points: 10); final sound isolation (ten items, max. points: 10); initial phoneme omission (ten items, max. points: 10) and final phoneme omission (ten items, max. points: 10). One point for every correct answer. The overall score was transformed to percent (0-100%).

In the second study, multiple number of phonological awareness skills and comprehension dimensions were gathered in three units (the fourth unit, eight and 12 units) that resemble three points in the program activation: at the beginning, middle and at its end. The items changed in each unit as a function of the unit theme, but the building principals of these items are similar and according to the first study building principals. Table 1 presents the two dimension of comprehension and the phonological skills that will be presented in the second study. In Comprehension and phonological awareness, the overall scores were transformed to percent (0-100%).

Table 1. The distribution of the items within the three units according to comprehension and phonological skills.

test	**Dimension\skill**	**Unit 4** Unit genre: narrative	**Unit 8** Unit theme: narrative	**Unit 12** Unit theme: informational
Comprehension	Questions	4	5	5
	Vocabulary*	8	4	8
Phonological awareness	Letters number	6	4	5
	Syllables numbers	6	4	5
	Initial syllable recognition	6	4	5
	Last syllable recognition	6	4	5
	First letter recognition		4	5
	Last letter recognition		4	5
	First letter similarity		4	5
	last letter similarity		4	5
	Rhyme		4	5

* In each unit, vocabulary will be presented at three points: in the first meeting- immediately after the first exposure and after mediation done by the tutor- and in meeting two of the unit (rehearsal mode).

In unit twelve, reading scores of the unit text were gathered. Certificates grades were gathered also from the teachers.

Procedure

In the first study, before and after the activation, the entire sample passed a phonological test and a comprehension test.

In the second study, a follow up was done after the pupils' progress during their work. In three units (every units is two meetings), their specific achievements in phonological awareness skills and in two dimensions of comprehension were gathered.

Results

First study- Comprehension Skills

Table 2 submit the findings of the first study in comprehension among study and control group.

Table 2. Means, standard deviations and t-test for dependent samples between study group and control group, before and after the intervention program activation in comprehension

	Before Activation M(SD)	**After Activation M(SD)**	***Df***	***t***
Study group (n=20)	38.25 (8.89)	86.95 (8.43)	19	-18.92***
Control group (n=20)	37.05 (8.65)	49.50 (13.38)	19	-5.00***
Total (N=40)	37.65 (8.68)	68.22 (21.94)	39	-8.99***

****p<.001*

Table 2 indicates on a pattern of progress within the study group in comprehension test. After the activation, both groups progressed significantly, yet the study group made a bigger progress in comparison to the control group.

Before activation, T-test for independent groups shows no significant differences between the two groups. After activation, significant differences between the study-group and the control-group in comprehension test were found ($t(1,32.03) = 10.59$; $p<.001$); the pupils' progress in the study group was significantly higher than the progress of the control-group pupils. The findings give evidence that exercising comprehension skills in class did not succeed in promoting adequately the control-group at comprehension.

First study- phonological awareness

Table 3 submit the findings of the first study in phonological awareness among study and control group.

Table 3. Means, standard deviations and t-test for dependent samples between study group and control group, before and after the intervention program activation in phonological awareness

	Before Activation M(SD)	**After Activation M(SD)**	***Df***	***t***
Study group (n=20)	25.90 (5.83)	77.05 (5.84)	19	-26.07***
Control group (n=20)	27.25 (6.73)	47.80 (7.72)	19	-14.16***
Total (N=40)	26.58 (6.25)	62.43 (16.28)	39	-13.13***

****p<.001*

Table 3 indicates on a pattern of progress within study group in the phonological awareness test. On average, the achievements of both groups in the test before activation were low. After the activation, both groups progressed significantly, yet the study group made a bigger progress in comparison to the control group.

Before activation, T-test for independent groups shows no significant differences were found between the two groups. After activation, significant differences between the study group and the control-group in phonological awareness test were found ($t(1,38) = 13.51$; $p < .001$); the pupils' progress in the study group was significantly higher than the progress of the pupils in the control group. The findings give evidence that exercising reading skills in class did not succeed in promoting the control-group at phonological awareness.

Second study- Comprehension Skills

The current section presents the percentages of the performances in two comprehensions dimensions that were assessed: comprehension questions and vocabulary.

In comprehension questions, we can see an increase in the pupils' performances betweem the units four and eight. Yet, in unit 12 we see a descease, which could be explained by the increased complexity of the text (see figure 2).

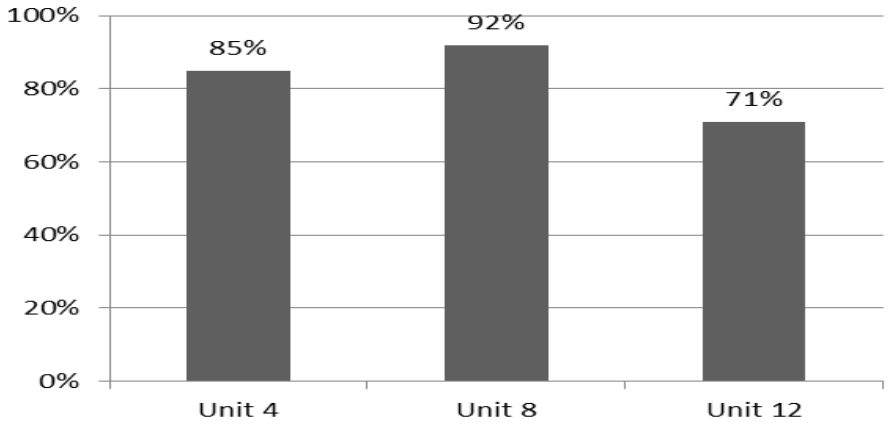

Figure 2. Performances in comprehension questions in three units (percentages)

In the dimension of vocabulary, we can see that the pupils' performances increase after mediation in every unit; mediations that were done by the tutors improved the pupils' performances. In meeting two, we can see a drop in the pupils' performances in the three units, which could be explained by the time passed until meeting two (see figure 3).

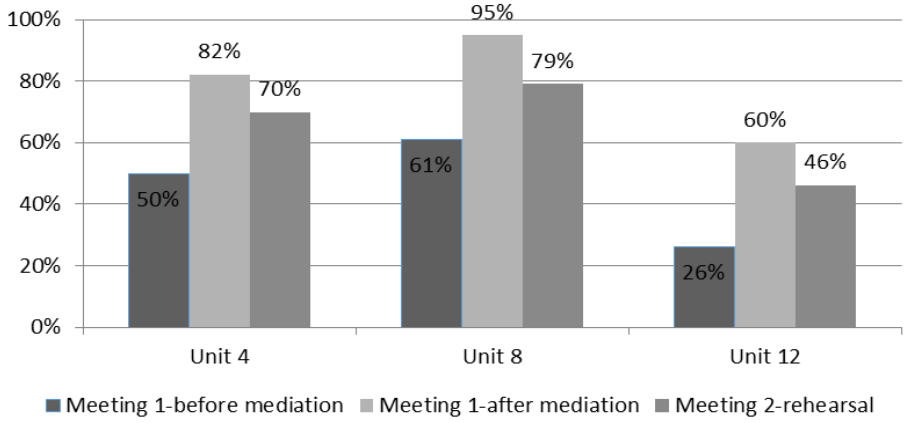

Figure 3. Performances in vocabulary in three units (percentages)

Second study- phonological awareness

Figure 4 and 5 show that the pupils' performances in phonological awareness skills increased as the pupils progressed in the units.

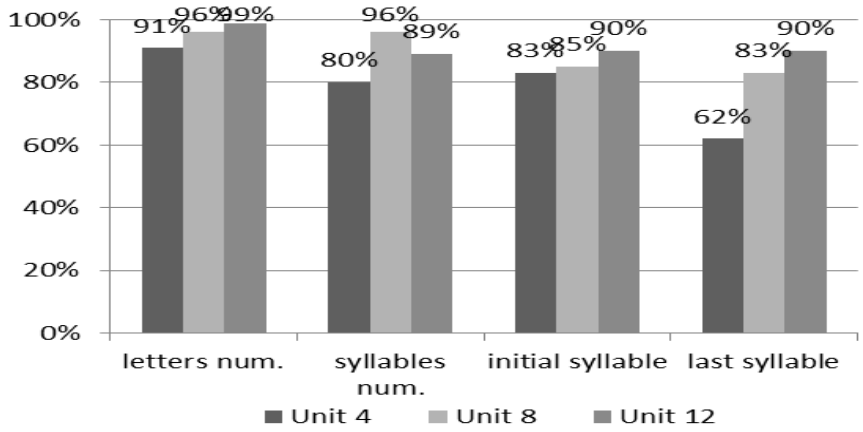

Figure 4. phonological awareness skills in three units (percentages)

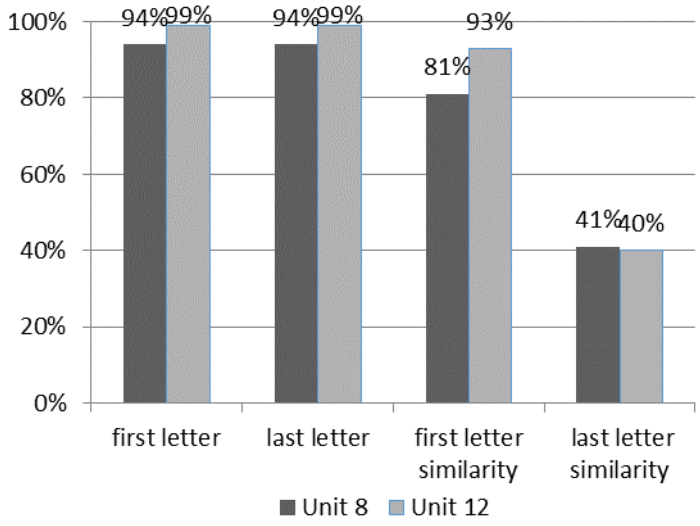

Figure 5. phonological awareness skills in units eight and twelve (percentages)

According to figures 4 and 5, as the pupils progressed in the units, their performances in phonological awareness got better, almost in all the skills presented.

In unit 12, the average of the 150 pupils in reading test is 69%. Reading achievement of pupils participating in the program increased (2%), in comparison to pupils' who did not participate in the program, their achievements even dropped (3%). The grades in the pupils' certificates showed that the achievement of pupils' who participated in the intervention program increased up to 2.4%, whereas the school grades of their counterparts' who did not participate decreased about 3%.

Discussion

The data show a clear advantage of the intervention program on 'At-linguistic risk' pupils' achievements. The first study show a shocking reality: learning in classroom is not sufficient for this population, these children need more. 'At-linguistic risk' Arab children can progress without the intervention program, but this progress is minor in comparison to those who did participate in the intervention program in both phonological awareness and comprehension although they began from the same point (no initial differences were found between the study and control group). These children need to participate in a program that can bridge the initial gaps and deficiencies they come with; they cannot do this alone with their teacher at class.

In the second study, at different schools, the intervention program succeeded in progressing and scaffolding the pupils' performances in phonological awareness and comprehension. This study show the effectiveness of the program among 150 children from different schools. The fruit of the work with these pupils affected their grades at class beside to progressing them in phonology and comprehension.

In this context, after the second study, gathered feedbacks from the field ensure the effectiveness of the program "let's read together". Teachers, school principals and supervisors indicated that the intervention program helped weak pupils to rise their grades, to integrate in the classroom and to increase their self-esteem. In addition, they praised the rich and challenging contents. Furthermore, the teachers were exposed to new tools, which they take back to their classes and the most important thing that the pupils enjoyed participating in the program. The ministry of education feedback indicates that the program is well presented; offering friendly modern media tools and interesting pictures. In addition, the program enables an individual treatment. The visual feedback (√) contribute to the pupils' self-esteem.

From the one hand, the paper shows a clear path between the development stage of the intervention program that was enhanced by the first study, and in the other hand, it presents the application of the program in the field in different schools and involving a number of teaching characters.

The intervention program succeeded assessing the pupils and advancing them, it was built in a way that help teachers to figure strengths and weaknesses of the pupil and advancing him in his pace.

The current intervention program help teachers and educators to cope with the diglossic situation, developing phonological, semantic, contextual and orthographical abilities in an interactive way, Choosing reading and writing teaching methods in Arabic for early reading stages and fluency construction, differences in literacy background, Linguistic and orthographic features of written Arabic and their influence on reading and writing acquisition, fostering reading and listening comprehension for achieving mature reading and Learning features at first grade.

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