Chapter # 30

EFFECTS OF A TUTOR BASED INTERACTIVE-COMPUTERIZED INTERVENTION PROGRAM FOR PROMOTING COMPREHENSION SKILLS IN FIRST GRADE AT-RISK ARABIC STUDENTS

Bahaa' Makhoul[1], Elite Olshtain[2], & Raphiq Ibrahim[3]
[1]Oranim Academic College of Education, Tivon, Israel
[2]School of Education, Hebrew University of Jerusalem, Jerusalem, Israel
[3]Edmond J. Safra Brain Research Center for the study of Learning Disabilities, University of Haifa, Haifa, Israel

ABSTRACT

The study investigated the effects of an interactive, individualized computer-based intervention program for advancing comprehension skills among children at risk of low literacy. Participants were forty Arabic-speaking first-grade students at literacy risk: 20 assigned to the intervention program, and 20 assigned as control group. In the intervention group, each student was paired with a tutor and was categorized in one of 4 sub-groups: high student and tutor motivation, low student and tutor motivation, high student motivation/low tutor motivation, and low student motivation/high tutor motivation. Students' comprehension achievements and progress were measured before, during and after the program. Findings showed that the intervention program succeeded in advancing students' skills beyond motivation level, although the greatest improvement was found in the sub-group where both students and tutors had high motivation. Findings demonstrate the need for a specialized intervention to efficiently close the gap in comprehension skills among students at literacy risk and the importance of motivation of both students and tutors in the learning process.

Keywords: Arabic, literacy risk, comprehension, motivation, individualized learning, computer-based intervention.

1. INTRODUCTION

A prominent issue in public agenda is the reading level of Israeli children. The required level of literacy, which is the written expression and reading comprehension both in one's native language and in other languages (Levin, 2003), continues to rise. However, there are significant failures in national reading tests, as well as gaps in achievements among low SES students and Arabic-speaking students compared to Jewish students (Ministry of Education, 2012).

A possible explanation for this gap is diglossia in the Arabic language, which is the linguistic gap between spoken and literary forms of the language. This, along with other linguistic and orthographic characteristics of Arabic, make the acquisition of reading and writing more difficult. Moreover, before entering school, an Arabic-speaking child is mainly exposed to the spoken language, a fact that complicates reading acquisition (Ministry of Education, 2001). The low socioeconomic status of Arab society compared to the Jewish society is considered another risk factor that impedes proper literacy development among Arabic speakers in Israel.

Considering the different risk factors that influence reading acquisition, evidence points to the importance of early intervention: Early identification of children who are having difficulty, combined with early intervention, increase the chances that a reader will bridge the gap and succeed in integrating into the normal teaching-learning process (Clay, 1972; 1986; 1991). The scientific literature points to the advantages of individualized learning in general and in the use of computer programs to effect it (Demirer, & Sahin, 2013; Howell, Erickson, Stanger, & Wheaton, 2000; Regan, Berkeley, Hughes, & Kirby, 2014). Thus, the learning environment created for this study integrates the principles of an interactive model (Adams, 1991) with the principles of individualized, computerized tutor-based learning. The reading tutoring program built by the researchers seeks to circumvent the difficult outcome of lack of attention to language development in a distressed population, specifically Arabic children of low SES, by focusing on fostering phonological awareness and comprehension to improve children's progress in the acquisition process. In light of these, three research questions were developed:

1. Will there be a difference between the intervention and comparison groups – before and after the execution of the intervention program?

2. Will the intervention program succeed in advancing the skills of students in the intervention group throughout the intervention?

3. What will be the effect of the interaction between student motivation for learning and tutor motivation for teaching on advancing students' comprehension skills throughout the intervention program?

2. BACKGROUND

Reading refers to the ability to decode a written word or text quickly and precisely in order to extract meaning from it. Reading difficulties, especially in early school years, can impede linguistic development in the school and outside of it. In addition to reading difficulties caused by congenital disabilities, the professional literature maps out educational-environmental causes, factors and steps that influence reading acquisition. The first factor relates to the cultivation quality of pre-literacy skills in preschool and kindergarten children, before the transition to formal education (Aram & Levin, 2001; Bus, Van Ijzendoorn, & Pellegrini, 1995; Clearfield & Nimann, 2012; Pressley, 1998; Scarborough & Dobrich, 1994; Sénéchal, LeFevre, Thomas, & Daley, 1998). The second factor focuses on the stages of early reading and building fluency via methods of reading and writing instruction used at the beginning of elementary school (National Reading Panel, 2000; Snow, Burns, & Griffin, 1998). The third factor, relevant to mature reading, is cultivation of reading comprehension and book-reading habits that will continue throughout many years of study (Stanovich & West, 1989; Stanovich, West. Cunningham, & Cipielewski, 1996).

2.1. Reading Acquisition in the Shadow of Diglossia

Reading is based on a rich vocabulary, control of grammar and syntax, knowledge of language as communication, sensitivity to the element of tone, and sociocultural knowledge connected to language (Perfetti, Landi, & Oakhill, 2005; Perfetti, 2011). It is a language-based skill and as such is influenced by deficiencies in spoken language (Halliday, 1989; Kamhi & Catts, 2011). Children who have a risk factor for language development tend to display a reduction in verbal ability, which in turn impairs normal reading acquisition (Assink, 1994; Hackman, Farah, & Meaney, 2010; Jednoróg et al., 2012; Rush, 1999).

In contrast to other languages, Arabic is a diglossic language in which the spoken language ("amayyah") and the literary language ("poscha") have different vocabulary,

grammar, syntax, linguistic structures and forms of expression (Khamis-Dakwar & Froud, 2007; Saiegh-Haddad, 2005; Saiegh-Haddad & Henkin-Roitfarb, 2014). Before entering school, an Arabic-speaking child is mainly exposed to the spoken language, a fact that complicates reading acquisition in general and reading comprehension especially (Ministry of Education, 2001). Research suggest that Arabic speakers acquire literary language later than speakers of other languages in which spoken and literary language are more connected (Abu-Rabia, 2000; Bentin & Ibrahim, 1996; Feitelson, Goldstein, Iraqi, & Share, 1993; Ibrahim, Eviatar. & Aharon-Peretz, 2007; Wagner, 1993).

Most current models assume that reading is a combination of processes that exist simultaneously and support one another (Perfetti et al., 2005). Due to the multiplicity of characteristics related to the nature of Arabic and that influence reading acquisition, the model that drives the current research is Adams' interactive model (Adams, 1991), which views reading as a process that demands synchronization between four linguistic processes: phonological, orthographic, semantic, and contextual. This model has been found to be helpful in mastering reading in Arabic (Abu-Rabia, 1999; 2002; 2003; Makhoul, Olshtain, & Ibrahim, 2015).

2.2. Socioeconomic Status, Linguistic Risk and Reading Acquisition

Socioeconomic status (SES) is a key factor that influences literacy development, and it has implications for academic functioning throughout the school years. Children from low SES tend to grow up in literacy-poor environments. Thus, their exposure to and experience with literacy is limited, creating differences in cognition and literacy between them and other children in their age group.

The lack of sufficient experience, knowledge and pre-literacy abilities in the early years puts these children at linguistic risk. Research suggests that children from low SES display difficulties in phonological awareness, limited vocabulary, and difficulty decoding words and writing (Clearfield & Nimann, 2012; Shonkoff & Phillips, 2000). In the 2001 PIRLS study (Mullis et al., 2003), the number of household members, parents' level of education, and number of books in the home were found to be related to academic achievement. The PIRLS study recommends intervention to compensate for the home environment by creating a school environment supportive of literacy, thus minimizing the effect created by the children's home environment.

2.3. The Current Study

The current study aims to test the effectiveness of a tutor-based computerized intervention program made to strengthen reading comprehension skills among first-grade Arabic students from low SES. The intervention focuses on phonological awareness as well as creating a beneficial interactive personalized learning environment. It has been found that integration between treatment in phonological awareness and instruction in identifying writing symbols led to a significant improvement in reading skills (Felton, 1993; Hurford et al., 1994; Makhoul, 2006; Smith, Christensen, Goodale, Ingebrand, & Steele, 1993; Snow et al., 1998). A meta-analysis completed by the National Reading Panel (Ehri et al., 2001) found a high correlation between training interventions in phonological awareness and level of phonological awareness among different populations, both normative and at risk.

The intervention program in the current study focused on creating a learning environment that composed of an interactive, computerized method and principles of individualized learning, in light of scientific literature pointing to the benefits of integrating tutoring with a computerized environment to increase the advantage of tutoring (Demirer, & Sahin, 2013; Howell et al., 2000; Regan et al., 2014).

3. METHOD

3.1. Participants

Arabic literacy tests were given to 60 first-graders (aged 6-7) of low SES from an Arabic elementary school in Northern Israel. 40 students experiencing the most difficulty were selected to participate in the study, half of them were randomly assigned to the research group while the remaining 20 constituted a comparison group. All students in the research group were assigned individual tutors (aged 20-23) who accompanied them throughout the intervention. The tutoring took place as part of an internship for students from a teacher training college.

Based on the level of motivation of both the tutors (according to the evaluation of their college instructors) and the students (according to their school teachers), four subgroups were created with each group including five student-tutor pairs: high student motivation\high tutor motivation, high student motivation\low tutor motivation, low student motivation\high tutor motivation, and low student motivation\low tutor motivation.

3.2. Research Procedures

At the beginning of the year, comprehension tests were given to 60 students individually. During the school year, the children in the study group participated in the "Tutoring-Reading" intervention program alongside regular instruction in class, with the students in the comparison group studying in class only. Towards the end of the school year, the comprehension tests were administered again to assess the progress of the students in both groups.

3.3. Description of the Learning Environment and its Functioning
3.3.1. Building the Learning Environment and its Components

Tutoring-reading program in a computer environment. This is a structured program consisting of 26 sessions, operated in a computer environment based on Adams' (1991) principles of the interactive model. The program is tailored to the needs of first-graders and works to strengthen the four processes involved in reading acquisition: phonological, orthographic, meaning-based and contextual, in addition to decoding skills adapted to children's reading selections. The program was developed by the study's researchers over three years of experimentation and evaluation in collaboration with reading instruction experts. The activities in the program were constructed according to existing consensus in the literature (such as Snow et al., 1998) and according to the model of asking comprehension questions – the Harris and Smith model (Harris & Smith, 1976).

Tutors. The tutors were third-year teachers in training, specialized in teaching first- and second grades. They received 12 hours of training prior to the start of the intervention, intended to familiarize with the program, gain knowledge about the principles of individual learning and the characteristics of the student population, as well as teaching methods for comprehension, reading and phonology, and interpersonal communication skills. Training included time for creating lesson plans. During the operation of the program, a training session was held each week before the meeting with the student where the tutor received a briefing on the content of the learned unit and important methodological tips to deal with difficulties arising during teaching. After the weekly session, a meeting was held for a reflective discussion and evaluation of the children's functioning. Tutor training was performed by the researcher.

3.3.2. Characteristics of Individualized Learning in the Tutoring-Reading Program

Interactive balanced learning. During the program, the four basic interconnected processes of reading are activated. Tasks in each week unit are divided into four main goals: developing ability to understand context and meaning, developing orthographic ability,

developing phonological skills, and practicing decoding skills adapted to the first-grade reading and curriculum.

Continuous student activity. The students spend most of their time engaged in various learning activities: thinking, giving answers, discussion, computer activities.

Repetition of material that is learned. Questions that draw on students' prior knowledge and experiences, as well as review questions, are highlighted in all assignments. Each session begins with a review of what was learned in the previous session. This procedure allows the tutor to teach learning strategies and to examine the students' learning process from unit to unit.

Guided mediation. Mediation processes by the tutor are emphasized, in order to help the students learn key skills.

Use of documentation and follow-up. In each session, the tutor documents the student's answers and the means of mediation they use in a booklet given prior to the intervention. The booklet also assesses the tutor's functioning in the individual learning process.

Fixed session structure. Each session begins with an opening conversation and ends with an emotion inducing activity. This fosters interpersonal and intrapersonal communication between student and tutor, promoting the quality of the learning process.

Review and follow-up of program implementation. The researcher, accompanied by a professional special education teacher, observed the tutors' work and ensured that the tutors acted in accordance with the program.

3.4. Instruments

Reading Comprehension Test. The comprehension test was constructed and delivered by the researcher according to accepted norms in the literature and accepted standards in the Ministry of Education's tests for this age (Ministry of Education, 1995), and the skills required by the first-grade Arabic language curriculum (1991, 1989). The test included the following components: *Short term story reconstruction* (20 points) testing students' ability to retell the entire story; *Attention to details* (10 points), testing the ability to identify key details in the story; *Sequence and time concepts* (10 points), testing the understanding of sequence of events and concepts of time; *Cause and effect* (10 points), testing identification of events' results and reasons; *Identifying main idea* (10 points), testing recognition of the main idea of the text; *Drawing conclusions* (10 points), testing success in understanding and interpreting the message of the text; *Classification and generalization* (10 points), tests the classification of five groups according to one clear criterion; V*ocabulary* (10 points), including two synonym exercises, two opposites exercises and one exercise that requires choosing the word that is different; and *Following instructions* (10 points), including one exercise with one instruction, two exercises with two instructions, and two exercises with three instructions. If students did not complete the task, the tutor asked them to choose the correct answer from two options and received half a point for giving the correct answer.

3.5. Data Analysis

An evaluation system was constructed that allowed an in-depth examination of the operating process and the learning environment, including quantitative and qualitative analyses of students' performance during the program. Data were analyzed by degrees of success or failure and degrees of support the student needed.

A total of three measurements were calculated: First measurement (T1) at sessions 1-3; Intermediate measurement (T2) conducted after 11-16 sessions; Final measurement (T3) at the conclusion of the program. Nonparametric tests were used due to small sample size.

4. RESULTS

4.1. Comprehension Skills Between and Within Groups

Figure 1 presents the results of each group at the beginning and at the end of the program. To ensure that the intervention and comparison groups did not differ on comprehension level before the start of the program, group averages in the pre-test were compared using a Mann-Whitney test. Students in the two groups received similar scores, with the average of students in the intervention group being 38.25 ($SD = 8.43$) while that of the comparison group was 37.05 ($SD = 8.56$).

To compare students' progress within the intervention group, the Wilcoxon nonparametric test was conducted. Findings showed significant progress of the students in the intervention group ($Z = -36.92$, $p < .001$), with students' performance at the end of the program ($M = 86.95$, $SD = 8.43$) higher than at the beginning ($M = 38.25$, $SD = 8.90$). A similar trend was observed in the control group ($Z = -3.44$, $p < .01$), with students' performance at the end of the year ($M = 49.50$, $SD = 13.38$) higher than at the beginning of the year ($M = 37.05$, $SD = 8.65$).

Another Mann-Whitney test was conducted to examine the differences between the two groups at the conclusion of the program. Results indicate significant differences between the two groups ($Z = .93.92$, $p < .001$), with the mean of the students in the intervention group ($M = 86.95$, $SD = 8.43$) higher than that of the comparison group ($M = 49.50$, $SD = 13.38$). The findings show that the contribution of the intervention program to the advancement of students' comprehension skills in the intervention group is beyond the traditional contribution of learning in class.

Figure 1.
Intervention and Control Groups at the beginning and the end of the program.
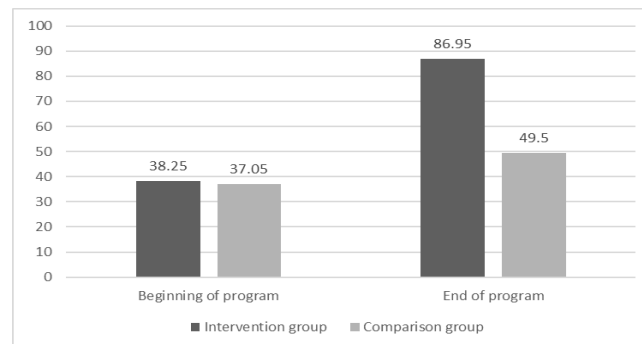
4.2. Students' Progress in Comprehension Skills in the Intervention Group

Figures 2-6 shows the progress of the students in the intervention group on the comprehension skill measured. In the short-term memory reconstruction skill, 87% of students progressed to "experienced student" category at T3, compared to only 10% in T1. In the long-term story reconstruction skill, only 20% of the students were rated as "experienced students" at T1, compared to 79% at T3. In the skill of retrieving explicit information from text, 20% were categorized as experienced students at T1, compared to 91% at T3. In the skill of interpretive comprehension – identifying main idea, at T1 half the students (50%) were concentrated in the two lower ratings "struggling student" and "beginning student", while at T3, 78.3% of students moved to the top rating. Finally, in the interpretive comprehension skill – drawing conclusions, most students (53.4%) were rated as struggling students at T1, while 55% of the students were rated as experienced students and 33% were rated as advanced students at T3.

Tables 1-5 show the changes occurring in percentages of students per category between each two time points, for each skill tested. Students progressed gradually from lower ratings such as "struggling student" and "beginning student" to the higher ratings of "advanced student" or "experienced student", and the transitions from each time point were found to be significant in almost all ratings; that is, the students' rating at T1 was different from T2, and T2 was different from T3.

Figures 2-6.
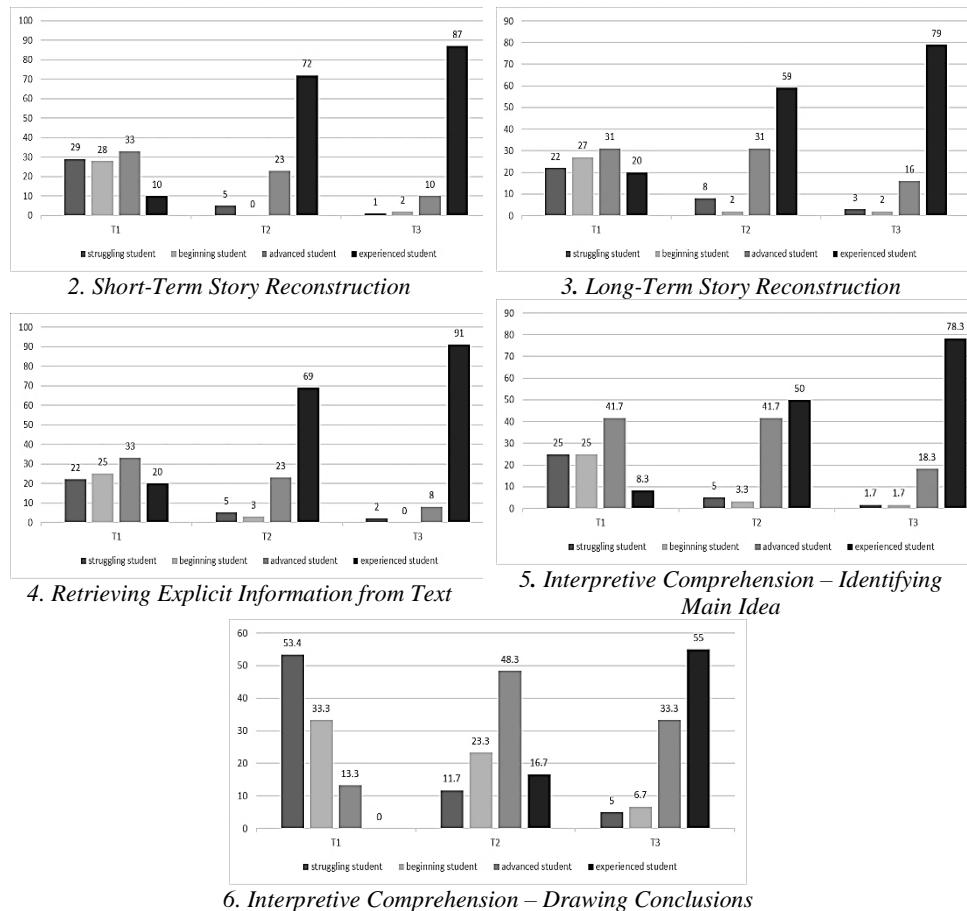*Students' Progress by Subgroups (Frequencies by Percent) in all different skills.*

2. Short-Term Story Reconstruction

3. Long-Term Story Reconstruction

4. Retrieving Explicit Information from Text

5. Interpretive Comprehension – Identifying Main Idea

6. Interpretive Comprehension – Drawing Conclusions

Table 1.
Differences in the Frequencies of Students in Each Subgroup: Short-Term Reconstruction.

Student level	T1 to T2	T1 to T3	T2 to T3
Struggling	-3.31*	-3.31*	.00
Beginning	-3.15**	-3.18*	-1.00
Advanced	-1.41*	-2.36*	-2.45***
Experienced	-3.56*	-4.00*	-2.30***

*p<.001; ** p<.01; *** p<.05

365

Table 2.

Differences in Frequencies of Students in Each Subgroup: Long-Term Reconstruction.

Student rating	T1 to T2	T1 to T3	T2 to T3
Struggling	-2.48***	-3.21*	.45
Beginning	-3.42*	-3.42*	.00
Advanced	-.11	-1.57***	-2.19***
Experienced	-3.02**	-3.76*	-2.35***

*p<.001; ** p<.01; *** p<.05

Table .3

Differences in Frequencies of Students in each Subgroup: Retrieving Explicit Information from Text.

Student level	T1 to T2	T1 to T3	T2 to T3
Struggling	-3.35*	-3.35*	-1.00
Beginning	-3.50*	-3.67*	-1.63
Advanced	-2.05***	-3.46**	-3.37**
Experienced	-3.87*	-3.94*	-3.48*

*p<.001; ** p<.01; *** p<.05

Table 4.

Difference in Frequency of Students in each Subgroup: Interpretive Comprehension – Identifying Main Idea.

Student level	T1 to T2	T1 to T3	T2 to T3
Struggling	-3.42*	-3.42*	.00
Beginning	-2.97**	-3.12**	-.58
Advanced	.00	-1.79	-2.13***
Experienced	-3.35*	-3.74*	-2.41*

*p<.001; ** p<.01; *** p<.05

Table 5.

Difference in Frequency of Students in each Subgroup: Interpretive Comprehension – Drawing Conclusions.

Student level	T1 to T2	T1 to T3	T2 to T3
Struggling	-3.70*	-3.91*	-1.00
Beginning	-1.08	-2.86**	-1.88
Advanced	-2.87**	-2.24***	-1.37
Experienced	-2.23***	-3.46*	-3.07**

*p<.001; ** p<.01; *** p<.05

4.3. Effectiveness of the Intervention Program in Promoting Comprehension Skills: Interaction with Tutor-Student Motivation

Table 6 shows that in T1, "experienced student" ratings differed by motivation status (high-motivation tutors/high-motivation students: 32.0%; high-motivation tutors/low-motivation students: 11.3%; low-motivation tutors/high-motivation students: 12.7%; low-motivation tutors/low-motivation students: 4%.) This proves that the best environment for learning and progress is when students and tutors alike are highly motivated. The group of high-motivated tutors/low-motivated students increased in their abilities

between measurements: their ratings as "experienced student" rose from 72% at T2 to 98% at T3. This shows that a highly motivated teacher can promote their struggling, unmotivated students and achieve excellent results. In the low-motivation tutors/high-motivation students (third group), "experienced student" ratings were achieved by only 52%, compared to 72% of the high motivation tutors/low motivation student group (the second group). In T3, the second group almost completed its ascend to "experienced student" (98%) while in the third group it was only 85.3%. It is important to note that an effective tutor-student interaction was found among students who studied with highly motivated tutors, even if they themselves had low motivation when they started the program. The students of this group achieved almost as much as the first group; that is, the tutors were able to help their students move forward and the personal commitment of tutors contributed to learning. Progress was also found among highly motivated students, even though they studied with low-motivated tutors. The students' level of motivation and ability helped them realize their potential for learning. The group where both tutors and students had low motivation was the weakest. At T2, only 32.7% were "experienced students" and at T3 only 51.3%. Moreover, only 36% of students arrived at the "advanced" level.

Table 6.
Percentage of Students in Each Category of Tutor\Student Motivation in Each Measurement, Across All Comprehension Skills.

Tutor/Student Motivation Category	T1				T2				T3			
	1	2	3	4	1	2	3	4	1	2	3	4
High tutor motivation/ high student motivation	10.0	22.7	35.3	32.0	3.4	0.0	11.3	85.3	0.0	1.3	2.0	96.7
High tutor motivation/ low student motivation	24.7	29.3	34.7	11.3	0.0	2.7	25.3	72.0	1.3	0.0	0.7	98.0
Low tutor motivation/ high student motivation	26.7	25.3	35.3	12.7	7.4	5.3	35.3	52.0	0.0	0.0	14.7	85.3
Low tutor motivation/ low student motivation	44.6	30.7	20.7	4.0	15.3	8.7	43.3	32.7	8.0	4.7	36.0	51.3
Total (N = 20)	26.5	27.0	31.5	15.0	6.5	4.2	28.8	60.5	2.4	1.5	13.3	82.8

1=Struggling Student; 2=beginning student; 3=advanced student; 4=experienced student.

5. DISCUSSION

The current intervention program combined a personal tutoring framework with an e-learning environment aimed at establishing balanced and interactive learning to cultivate the four basic processes of reading. The results of the study suggest that with the help of a multi-component intervention program it is be possible to help Arabic-speaking children of low SAS to overcome the cumulative shortcomings posed by the Arabic language at the beginning of reading acquisition. Moreover, it was found that the motivational component, both in learning and teaching, is elementary to reading acquisition.

5.1. Contribution of the Intervention Program to Comprehension Skills

The findings of the study indicate that the intervention improved basic skills needed to advance the reading of the participants. These finding are consistent with research consensus that structured intervention programs that combine phonological awareness with instruction in identifying writing symbols lead to significant improvement in reading skills (Ehri et al., 2001; Felton, 1993; Hurford et al., 1994; Smith et al., 1993; Snow et al., 1998). Olshtain and Zuzovsky (2004) suggest that compensatory intervention within the school, i.e creating a supportive in-school reading environment for students from low SAS, could be a solution to deficiencies stemming from students' home environment.

Results also show that the structured learning environment in this study, combining interactive and individualized learning with tutoring, was able to bridge the language gap and overcome obstacles arising from the problem of diglossia of the struggling students. These findings are consistent with the results of studies relating to the Arabic language which underline the importance of a targeted multi-component program (Abu-Rabia, 1999, 2000, 2002, 2003; Makhoul, 2006).

The optimality of the teaching method in the intervention program occurs with the simultaneous fostering of semantic and contextual knowledge that aids the processes of decoding and understanding. Novice readers must devote many of their resources to decoding, but semantic and contextual knowledge can address the resulting difficulty and contribute to the processes of reading comprehension (McKoon, & Ratcliff, 1992; Perfetti et al., 2005; Pressley & Afflerbach, 1995; Pressley, 1998). Accordingly, it is important to cultivate reading strategies that help the learner acquire phonemic-graphic matching skills, since understanding context guides the child in the decoding process and provides them with immediate feedback on the quality of their decoding (Torgesen & Hecht, 1996). This process reflects the interactive aspect of the reading process that combines "bottom-up" processes with "top-down" processes, a concept which served as a basic principle in the current intervention.

5.2. Contribution of the Tutors and the Interaction between Tutor and Student Motivation to the Development of the Students' Comprehension Skills

In all comprehension skills, the group most successful in promoting learning was that of highly motivated tutors and highly motivated students, whereas the least effective group was low-motivated tutors and low-motivated student pairs. This shows that although the interactive program did promote good achievements in all subgroups, in promoting literacy development it is necessary to address the motivation of the child to learn and the teacher's motivation to teach. That is, it is not enough to find struggling students and prepare a suitable curriculum for them; there must be activities targeting students' motivation to participate in the program and learn through it. In addition, ways must be devised to find suitable teachers and to ensure their high motivation.

There is a significant contribution of the tutoring environment in promoting student achievement in reading skills. The findings of the study show that students acquired the comprehension and phonological awareness skills during the program, and almost half of the students had good achievements by the intermediate measurement. Our findings are consistent with the findings of many studies that point to tutoring as an educational environment with substantial potential for improving and promoting reading ability (Cohen, Kulik, & Kulik, 1982; Fitzgerald, 2001; Juel, 1996; Leslie & Allen, 1999), especially for students diagnosed as at risk for reading acquisition.

6. CONCLUSIONS

This research shows that early intervention may prevent future failure, thus early detection and intervention are critical. Also, it is important to address individual differences in students' level of functioning in language and reading. This requires attending to the needs of the individual, especially among vulnerable populations with substantial language deficits. It is also important to build multi-component intervention programs that address the various factors that affect the reading and comprehension process (language characteristics, emotional aspects, general knowledge, etc.). The combination of motivational teachers, a learning environment that emphasizes social-emotional learning, and innovative tools suitable for the 21st century, may aid in closing literacy gaps formed by early risk factors.

The study showed the value of an individualized learning environment specifically for the struggling Arab learner. Therefore, consideration should be given to expanding the use of this method in the national Arab school system. Due to the unique characteristics of the Arabic language, it is important to master the phonological aspects and understanding of context. Teaching methods in Arabic must built on the principles of the interactive model in order to deal with the difficulties mentioned above. That is, any syllabus for literacy instruction should develop a foundation of comprehension and phonological awareness skills before systematically engaging in decoding skills. These principals are ought to be implemented via national education policies and curricula set by the Ministry of Education.

The quality of teaching is a central component of an educational system (Bean, 2020) and it is connected to the development and advancement of students' achievement (Darling-Hammond, 2017). As shown in the current study, it is important to choose teachers in training carefully, examining their degree of personal commitment and their ability to realize the theoretical principles in practical pedagogic tools that promote every student. These abilities are no less important than the academic abilities of the teachers in training, since without high motivation and personal commitment they will not succeed in contributing to and advancing the field of education.

7. FUTURE RESEARCH DIRECTIONS

The results of the current study point to the benefits of this intervention program for children at literacy risk. However, while a significant component of the learning environment developed and examined in the study was the integration of computers in teaching and as a means of supporting mediation, the contribution of the computer itself was not directly evaluated. Therefore, further research is suggested to examine the extent to which e-learning environment influences achievement in the comprehension and phonological awareness skills.

The sample in the present study included 20 students in each group, and the intervention group was divided into subgroups of 5 student-tutor pairs. Because the study incorporated both quantitative and qualitative tools, this sample is sufficient to test the hypotheses. However, it is advisable to conduct a follow-up study on a larger sample.

The motivation of the tutors and students was determined prior to conducting the study, by teacher trainers for the tutors and classroom teachers for the students. The results of the study indicate that motivation diagnosis was maintained over the 26 sessions; but it will be beneficial to specifically examine change in the initial motivation of tutors and students in longitudinal and cross-sectional studies.

Another aspect related to the students' achievements is the extent to which these achievements affect the students' progress in acquiring reading in second grade. It is advisable to further study the effect of the intervention on students' acquisition of reading skills later in their studies.

B. Makhoul, E. Olshtain, & R. Ibrahim

REFERENCES

Abu-Rabia, S. (1999). The effect of vowels on the reading comprehension of second- and sixth-grade native Arab children. *Journal of Psycholinguistic Research, 28*, 93-101. https://doi.org/10.1023/A:1023291620997

Abu-Rabia, S. (2000). Effects of exposure to literary Arabic on reading comprehension in a diglossic situation. *Reading and Writing: An Interdisciplinary Journal, 13*, 147-157. https://doi.org/10.1023/A:1008133701024

Abu-Rabia, S. (2002). Reading in a root-based-morphology language: the case of Arabic. *Journal of Research in Reading, 25*(3), 299-309. https://doi.org/10.1111/1467-9817.00177

Abu-Rabia, S. (2003). The influence of working memory on reading and creative writing processes in a second language. *Educational Psychology, 23*(2), 209-219. https://doi.org/10.1080/01443410303227

Adams, M.J. (1991). Beginning to read: thinking and learning about print. MIT Press.

Aram, D. & Levin, I. (2001). Mother-child joint writing in low SES: Socio-cultural factors, maternal mediation, and emergent literacy. *Cognitive Development, 16*(3), 831-852. https://doi.org/10.1016/S0885-2014(01)00067-3

Assink, E.M.H (1994). *Literacy Acquisition and Social Context.* Routledge.

Bean, R.M. (2020). The Reading/Literacy Specialist. In Bean, R. M., & Dagen, A. S. (Eds.). *Best Practices of Literacy Leaders: Keys to school improvement*. Guilford Press.

Bentin, S., & Ibrahim, R. (1996). New evidence for phonological processing during visual word recognition: The case of Arabic. *Journal of Experimental Psychology: Learning ,Memory, and Cognition, 22*(2), 309-323. https://doi.org/10.1037/0278-7393.22.2.309

Bus, A.G., Van Ijzendoorn, M. H., & Pellegrini, A. D. (1995). Joint book reading makes for success in learning to read: A meta-analysis on intergenerational transmission of literacy. *Review of Educational Research, 65*(1), 1-21. https://doi.org/10.3102/00346543065001001

Clay, M.M. (1972). *Reading: The patterning of complex behaviour*. Heinemann Educational Books.

Clay, M.M. (1986). *The early detection of reading difficulties (3ʳᵈ ed.)*. Heinemann Educational Books.

Clay, M.M. (1991). *Becoming literate: The construction of inner control*. Heimmann Educational Books.

Clearfield, M. W., & Niman, L. C. (2012). SES affects infant cognitive flexibility. *Infant Behavior and Development*, *35*(1), 29-35. https://doi.org/10.1016/j.infbeh.2011.09.007

Cohen, P.A., Kulik, J.A., & Kulik, C.L.C. (1982). Educational outcomes of tutoring: A meta-analysis of findings. *American Educational Research Journal, 19(2),* 237-248. https://doi.org/10.3102/00028312019002237

Darling-Hammond, L. (2017) Teacher education around the world. What can we learn from international practices? *European Journal of Teacher Education*, *40*(3), 291-309. https://doi.org/10.1080/02619768.2017.1315399

Demirer, V., & Sahin, I. (2013). Effect of blended learning environment on transfer of learning: an experimental study. *Journal of Computer Assisted Learning, 29*(6), 518-529. https://doi.org/10.1111/jcal.12009

Ehri, L. C., Nunes, S. R., Willows, D. M., Schuster, B. V., Yaghoub-Zadeh, Z., & Shanahan, T. (2001). Phonemic awareness instruction helps children learn to read: Evidence from the National Reading Panel's meta-analysis. *Reading Research Quarterly*, *36*(3), 250-287. https://doi.org/10.1598/RRQ.36.3.2

Feitelson, D., Goldstein, Z., Iraqi, J., & Share, D.L. (1993). Effects of listening to story reading on aspects of literacy acquisition in a diglossic situation. *Reading Research Quarterly, 28*(1), 70-79. https://doi.org/10.2307/747817

Felton, R.H. (1993). Effects of instruction on the decoding skills of children with phonological-processing problems. *Journal of Learning Disabilities, 26*(9), 583-589. https://doi.org/10.1177/00222194930260090

Fitzgerald, J. (2001). Can minimally trained college student volunteers help young at risk children to read better? *Reading Research Quarterly, 36*(1), 28-36. https://doi.org/10.1598/RRQ.36.1.2

Hackman, D.A., Farah, M.J., & Meaney, M.J. (2010). Socioeconomic status and the brain: Mechanistic insights from human and animal research. *Nature Reviews Neuroscience, 11*, 651-659. https://doi.org/10.1038/nrn2897

Halliday, M. A. K. (1989). *Spoken and Written Language*. Oxford University Press.

Harris, L. A., & Smith, C. B. (1976). Reading instruction: Diagnostic teaching in the classroom. Macmillan.

Howell, R., Erickson, K., Stanger, C., & Wheaton, J. E. (2000). Evaluation of a computer for reading failure. *Journal of Special Education Technology, 15(4),* 5-14. https://doi.org/10.1177/016264340001500401

Hurford, D.P., Johnston, M., Nepote, P., Hampton, S., Moore, S., Neal, J., Mueller, A., McGeorge, K., Huff, L., Awad, A., Trato, C., Juliano, C., & Huffman, D. (1994). Early identification and remediation of phonological-processing deficits in first-grade children at risk for reading disabilities. *Journal of Learning Disabilities, 27*(10), 647-659. https://doi.org/10.1177/002221949402701005

Ibrahim, R., Eviatar. Z., & Aharon-Peretz, J. (2007). Metalinguistic awareness and reading performance: A cross language comparison. *The Journal of Psycholinguistic Research, 36*(4), 297-317. https://doi.org/10.1007/s10936-006-9046-3

Jednoróg, K., Altarelli, I., Monzalvo, K., Fluss, J., Dubois, J., Billard, C., Dehaene-Lambertz, G., & Ramus, F. (2012). The influence of socioeconomic status on children's brain structure. *PLOS ONE, 7*(10), e42486. https://doi.org/10.1371/journal.pone.0042486

Juel, C. (1996). What makes literacy tutoring effective? *Reading Research Quarterly, 31*(3), 268-289. https://doi.org/10.1598/RRQ.31.3.3

Kamhi, A.G., & Catts, H.W. (2011). *Language and Reading Disabilities* (3rd Edition). Pearson.

Khamis-Dakwar, R. & Froud, K. (2007) Lexical processing in two language varieties: An event-related brain potential study of Arabic native speakers. In M. Mughazy (Ed.) *Perspectives on Arabic Linguistics* (pp. 153-168). John Benjamins.

Levin, B. (2003, November). Improving research–policy relationships: Lessons from the case of literacy. Paper presented at the OISE/UT International Literacy Conference, Toronto, Canada. Retrieved from https://allchildrenlearning.org/wp-content/uploads/2019/12/Improving-Research-policy-relationships.pdf

Leslie, L. & Allen, L. (1999). Factors that predict success literacy intervention project in an early age. *Reading Research Quarterly, 34*(4), 404-424. https://doi.org/10.1598/RRQ.34.4.2

Makhoul, B. (2006). *Kheker tahalikh rekhishat miyumanyu'ot kri'ah b'safa ha'aravit b'misgeret khonkhut muvnet.* [Exploring the process of acquiring reading skills in Arabic as part of structured tutoring.] (Unpublished Doctoral Dissertation). Hebrew University of Jerusalem, Israel.

Makhoul, B., Olshtain, E., & Ibrahim, R. (2015). Promoting comprehension skills among at-risk first graders: The role of motivation in one-to-one tutoring environment. *Psychology, 6*(4), 375-386. https://doi.org/10.4236/psych.2015.64034

McKoon, G. & Ratcliff, R. (1992). Inference during reading. *Psychological Review, 99*(3), 440-466. https://doi.org/10.1037/0033-295X.99.3.440

Ministry of Education (1989). *Tochnit l'hora'at ha-lashon ha'aravit v'sifruta l'beit sefer hayesodi ha'aravi, kitot aleph ad vav.* [A program for teaching the Arabic language and its literature in Arab elementary schools, grades 1-6.].

Ministry of Education (1991). *Madrikh l'morah l'sefer El Riyad, kita aleph.* [Teacher's guide to the book El Riyad, First grade.].

Ministry of Education (1995). *Tokhniot basis b'kheshbon, handasa v'havanat hanikra l'beit sefer ha'yesodi.* [Basic programs in mathematics, geometry, and reading comprehension for elementary school.]. Van Leer Institute.

Ministry of Education (2001). *Likrat kri'a v'k'tiva tipuakh ha'safa ha'ktuva v'hadvurah b'ganei yeladim.* [Towards improving reading and writing: Fostering the written and spoken language in kindergarten.]. Report of the Early Education Department and the Department for Planning and Development of Educational Programs. Retrieved from https://cms.education.gov.il/NR/rdonlyres/F056D0C0-361C-4230-BC3A-D0DC1036273B/8560/ganim_d.pdf

Ministry of Education (2012). Meitzav 5772, *madedei ye'ilut v'tzmikha beit sifrit – dokh mivhanei hesegim.* [Meitzav 5772, Indices of School Efficiency and Growth – Achievement Test Report.] Report of the National Authority for Measurement and Evaluation in Education (RAMA), Israel. Retrieved from https://meyda.education.gov.il/files/Rama/Hesegim_Report_2012_f.pdf

Mullis, I. V., Martin, M. O., & Gonzalez, E. J. (2003). *PIRLS 2001 international report*. International Study Center. Retrieved from https://timssandpirls.bc.edu/pirls2001i/pdf/p1_IR_book.pdf

National Reading Panel. (2000). *Report of the National Reading Panel: Teaching children to read: an evidence-based assessment of the scientific research literature on reading and its implications*. U.S. Department of Education and Human Development. Retrieved from https://www.nichd.nih.gov/sites/default/files/publications/pubs/nrp/Documents/report.pdf

Olshtain, E., & Zuzovsky, R. (2004). *Hakniat orianut hakri'ah b'yisrael: Mamze'i hamechkar habenleumi b'orianut hakri'ah PIRLS-2001.* [Reading literacy acquisition in Israel: Findings of the international study on reading literacy PIRLS-2001.] University of Tel Aviv: Ramot. Retrieved from https://kotar.cet.ac.il/KotarApp/Viewer.aspx?nBookID=92677230

Perfetti, C. A. (2011). Phonology is critical in reading: But a phonological deficit is not the only source of low reading skill. In S. A. Brady, D. Braze, & C. A Fowler (Eds*.), Explaining individual differences in reading* (pp. 153-171). Routledge.

Perfetti, C. A., Landi, N., & Oakhill, J. (2005). The acquisition of reading comprehension skill. In M. J. Snowling & C. Hulme (Eds.), *The science of reading: A handbook* (pp. 227-247). Blackwell Publishing. https://doi.org/10.1002/9780470757642.ch13

Pressley, M. (1998). *Reading instruction that works.* Guilford Press.

Pressley, M. & Afflerbach, A. (1995). *Verbal protocols of reading: The nature of constructively responsive reading.* Erlbaum.

Regan, K., Berkeley, S., Hughes, M., & Kirby, S. (2014). Effects of computer- assisted instruction for struggling elementary readers with disabilities. *The Journal of Special Education, 48*(2), 106-119. https://doi.org/10.1177/00224669134972

Rush, K.L. (1999). Caregiver-child interactions and early literacy development of preschool children from low-income environments. *Topics in Early Childhood Special Education, 19*(1), 3-14. https://doi.org/10.1177/027112149901900101

Saiegh-Haddad, E. (2005). Correlates of reading fluency in Arabic: Diglossic and orthographic factors. *Reading and Writing, 18*(6), 559-582. https://doi.org/10.1007/s11145-005-3180-4

Saiegh-Haddad, E. & Henkin-Roitfarb, R. (2014). The structure of Arabic language and orthography. In Saiegh-Haddad, E. & Joshi, M (Eds.). *Handbook of Arabic Literacy* (pp. 3-27), Springer. https://doi.org/10.1007/978-94-017-8545-7_1

Scarborough, H. S., & Dobrich, W. (1994). On the efficacy of reading to preschoolers. *Developmental Review*, *14*(3), 245-302. https://doi.org/10.1006/drev.1994.1010

Sénéchal, M., LeFevre, J., Thomas, E.M., & Daley, K.E. (1998). Differential effects of home literacy experiences on development of oral and written language. *Reading Research Quarterly, 33*(1), 96-116. https://doi.org/10.1598/RRQ.33.1.5

Shonkoff, J. P., & Phillips, D. A. (2000). *From neurons to neighborhoods: The science of early childhood development*. National Academies Press.

Smith, S.S, Christensen, L., Goodale, D., Ingebrand, S., & Steele, K. (1993). *Effects of phonemic awareness training on impoverished first and second graders.* Paper presented at the annual meeting of the National Reading Conference, South Carolina, Charleston.

Snow, C.E., Burns, S.M., & Griffin, P. (Eds.). (1998). *Preventing reading difficulties in young children. National Research Council.* National Academy Press.

Stanovich, K.E. & West, R.F. (1989). Exposure to print and orthographic processing. *Reading Research Quarterly, 24*(4), 402-433. https://doi.org/10.2307/747605

Stanovich, K., West. R., Cunningham, A., & Cipielewski, J. (1996). The role of inadequate print exposure as a determinant of reading comprehension problems. In Cornoldi, C. & Oakhill, J., (Ed.), *Reading comprehension difficulties: Processes and intervention* (pp. 15-32). Lawrence Erlbaum Associates.

Torgesen, J. K. & Hecht, S.A. (1996). Preventing and Remediating Reading Disabilities: Instructional Variables That Make a Difference for Special Students. In *The first R: Every child's right to read.* Teachers College Press and the International Reading Association.

Wagner, A. (1993). *Literacy, culture, and development: Becoming literate in Morocco*. Cambridge University.

AUTHOR(S) INFORMATION

Full name: Bahaa' Makhoul
Institutional affiliation: Oranim Academic College of Education, Israel
Institutional address: Oranim College of Education, Tivon 3600600, Israel
Biographical sketch: Dr. Baha Makhoul is a senior lecturer and researcher at Oranim Academic College, and senior researcher in Edmond J. Safra Brain Research Centre for the Study of Learning Disabilities at Haifa University. Until 2020 She served as a senior academic consultant at the NCJW (Research Institute for Innovation in Education). Since 2007, she is the head for the Arabic language section at the Centre for Educational technology (CET). Recently, she became an affiliated Faculty Member of the Media Education Lab at the Harrington School of Communication and Media, University of Rhode Island. Dr. Makhoul is currently cooperating with both national and international leading researchers in the field of literacy, Digital Media Literacy and education.

Full name: Elite Olshtain
Institutional affiliation: School of Education, Hebrew University of Jerusalem, Israel (Professor Emerita)
Institutional address: Head office, Faculties of Humanities, Social Science, Law, Social Work and Education, Rothberg International School, The Hebrew University Mt. Scopus. Jerusalem 9190501, Israel.
Biographical sketch: Elite Olshtain (PhD, University of California, 1979) is Professor Emerita of language education from Hebrew University in Jerusalem. Her research and teaching focuses on Pragmatics, Second Language Acquisition, Discourse Analysis, Course Design and Policy Making, Classroom Oriented Research and Reading and Writing. Elite Olshtain has published books and articles in her field of expertise at the international level. She was Head of the School of Education at Tel Aviv University during 1990-1992 and Director of the NCJW Research Institute for Innovation in Education at the Hebrew University during 1992-1997. She was also the Wollens Chair for Research in Education.

Full name: Raphiq Ibrahim
Institutional affiliation: Edmond J. Safra Brain Research Center for the study of Learning Disabilities, University of Haifa, Israel.
Institutional address: 199 Aba Khoushy Avenue, Mount Carmel, Haifa 3498838, Israel.
Biographical sketch: Raphiq Ibrahim is a senior researcher and associate professor at the Edmond J. Safra Brain Research Center for the Study of Learning Disabilities at University of Haifa. In his first line of research, he focuses on the cognitive processing of oral and written language. He is investigating brain regions involved in monolinguals and language selection processes in bilinguals. This research has contributed to our understanding of how literacy develops in different languages. In his second line of research, he focuses on the hemispheric specialization of higher cognitive functions and on the neuropsychological basis of reading, diglossia in the Arabic language, and on language dysfunctions and clinical case studies in neuropsychology.