

Effectiveness of an intervention program for six-year-olds: a summer-school model

Sevda Bekman^{a*}, Ayhan Aksu-Koç^b and Eser Erguvanlı-Taylan^c

^aDepartment of Primary Education, Boğaziçi University, Istanbul, Turkey; ^bDepartment of Psychology, Boğaziçi University, Istanbul, Turkey; ^cDepartment of Western Languages and Literatures, Boğaziçi University, Istanbul, Turkey

ABSTRACT: This study reports on the evaluation of a ‘summer pre-school model’ as an intervention measure. A 10-week program was designed to increase the school readiness of Turkish children from disadvantaged and multilingual environments by supporting their cognitive and linguistic skills during the summer prior to the start of school. The intervention consisted of a Pre-school Education Program with a special focus on Turkish language, pre-literacy and pre-numeracy skills. The evaluation study was carried out on its first implementation in a southeastern province of Turkey where it was attended by bilingual six-year-olds. A pre-post, control-group, quasi experimental design was used with 92 intervention trained and 93 non-trained control children from the same neighborhoods. Compared to the control children the intervention children scored significantly higher on post-test measures of pre-literacy and pre-numeracy skills, and on measures of syntactic knowledge and story comprehension. The results also revealed the importance of the educational level of the mother for progress in language skills. The findings indicate the overall short-term effectiveness of the program and of the summer pre-school model as a primary prevention strategy that aims to bring children at risk to a higher level of school readiness.

RÉSUMÉ: Cette étude rend compte de l'évaluation d'un 'modèle d'école maternelle d'été' en tant que mesure d'intervention. Un programme de 10 semaines a été conçu pour améliorer la préparation scolaire des enfants turcs issus d'environnements défavorisés et multilingues, en soutenant leurs capacités cognitives et linguistiques durant l'été précédant l'entrée à l'école élémentaire. L'intervention se composait d'un Programme d'Enseignement Préscolaire avec un accent particulier mis sur la langue turque et les compétences dans les domaines de la pré-alphabétisation et de la pré-numératie. L'évaluation a débuté dans une province du sud-est de la Turquie, avec des enfants bilingues de six ans. Une méthode quasi expérimentale, avec pré et post-test et groupe de contrôle, a été utilisée auprès de 92 enfants qui ont bénéficié de cette expérience d'été et de 93 autres qui ne l'ont pas vécue, tous venant de la même région. Par rapport aux enfants du groupe de contrôle, les enfants qui ont bénéficié de l'intervention ont obtenu des scores significativement plus élevés aux mesures du post-test en pré-alphabétisation et pré-numératie, et aux mesures des connaissances syntaxiques et de la compréhension du récit. Les résultats ont également révélé l'importance du niveau d'instruction de la mère dans le progrès en compétences linguistiques. Les résultats indiquent l'efficacité globale à court terme du programme et du modèle de l'école maternelle d'été, en tant que

*Corresponding author. Email: bekman@boun.edu.tr

stratégie de prévention primaire visant à amener les enfants à risque à être mieux préparé à l'entrée à l'école élémentaire.

ZUSAMMENFASSUNG: Diese Studie berichtet über die Auswertung eines Sommer-Vorschulmodells als Förderungsmaßnahme. Es wurde ein 10-wöchiges Programm entwickelt, welches darauf abzielte, die Schulreife türkischer Kinder mit sozial schwachem und bilinguaem Hintergrund durch Unterstützung ihrer kognitiven und sprachlichen Fähigkeiten im Sommer vor dem anstehenden Schulbeginn zu erhöhen. Die Förderung bestand aus einem Vorschulprogramm mit besonderem Schwerpunkt auf der türkischen Sprache sowie den frühen Lese- und Rechenfertigkeiten. Die Studie wurde zunächst in einer Provinz im Südosten der Türkei umgesetzt. Hier nahmen bilinguale sechsjährige Kinder teil. Ein kontrollgruppenbasierter, quasi experimenteller Vortest-Nachtest-Versuchsplan wurde mit 92 geförderten und 93 nicht geförderten Kindern aus der gleichen Nachbarschaft durchgeführt. Im Vergleich zu den Kindern in der Kontrollgruppe erzielten die geförderten Kinder im Rahmen von anschließend durchgeführten Testmaßnahmen deutlich höhere Punkte im Bereich der frühen Lese- und Rechenfertigkeiten sowie beim syntaktischen Wissen und beim Gesichtsverständnis. Das Ergebnis zeigte auch die Bedeutung, welche der Bildungsstand der Mütter bei der Entwicklung von Sprachkenntnissen hat. Die Ergebnisse verdeutlichen die allgemeine kurzfristige Effektivität des Programms und des Sommer-Vorschulmodells als primäre Förderungsstrategie, mithilfe derer sozial gefährdete Kinder auf eine höhere Ebene der Schulreife gebracht werden sollen.

RESUMEN: Este estudio trata de la evaluación del 'modelo de la escuela de verano' como medio de intervención. Se trata de un programa durante el verano, antes del inicio de la escuela, de 10 semanas para apoyar la habilidad cognitiva y lingüística de los niños turcos de los ambientes subdesarrollados y multilingües que ha sido diseñado con el fin de prepararlos para la escuela. La intervención consistió en un programa de educación preescolar, se centró en habilidades del idioma turco y matemáticas. La primera aplicación de la evaluación se ha realizado en una provincia en el sureste de Turquía con la participación de los niños bilingües de 6 años de edad. El grupo de control estuvo formado por 92 niños educados y 93 niños sin educación procedentes del mismo entorno, con el grupo de control se ha utilizado un medio de planificación antes y después, semi experimental. En proporción a los niños del grupo control, los niños en el grupo de intervención tienen las puntuaciones más altas, junto con la escritura en educación de la lengua escrita y matemáticas también en cuanto a la comprensión de conocimientos sintácticos y cuentos. Los resultados han demostrado la importancia de la educación de la madre para el desarrollo en las habilidades del lenguaje. Los resultados muestran que el modelo de escuela de verano y todo el programa es eficaz como estrategia preventiva para preparar a los niños en situación de riesgo, para un nivel de preparación superior.

Keywords: early support; centre-based early childhood education; pre-literacy skills; pre-numeracy skills; support in the second language

Introduction

Children subject to unequal conditions due to socio-economic, ethnic and gender related inequalities tend to lag far behind their peers in school, and this developmental gap expands in later years (Berrueta-Clement et al. 1986; Hess 1970; Lazar and Darlington 1982; Pehrson and Robinson 1990). For such children who are at risk, early intervention is an effective means of increasing the likelihood of success in school, and, in particular, the final level of education attained (Barnett and Boocock

1998; Bekman 2003; Campbell and Ramey 1994; Guralnick 1997; Kağıtçıbaşı, Sunar, and Bekman 2001; Kağıtçıbaşı et al. 2009). Effective programs that give children a fair start in the early years also decrease the need for remedial programs for unsuccessful and repeating students (Myers 1992; Reynolds 2004; Schweinhart, Barnes, and Weikart 1993). Early childhood intervention programs are thus more cost-effective as compared to those provided in later years. Recent evaluations of such programs such as High Scope (Schweinhart et al. 2005), the Chicago Longitudinal Study (Reynolds and Ou 2004), and the Abecedarian Project (Campbell et al. 2002) underline the effectiveness of early intervention particularly on cognitive skills related to school achievement and adjustment (Blok et al. 2005).

There is no specific early childhood education curriculum associated with success in early intervention. Recent research indicates that success depends on numerous factors such as the appropriateness of the model to the context (home-based vs. center-based), age of onset (as early as three-to-four years vs. kindergarten), duration of the program (one vs. more years), intensity of the curriculum (semi-structured, child-centered vs. teacher-centered programs), and the quality of the school children enter afterwards (Lee and Loeb 1995; Reynolds, Chang, and Temple 1998; van Tuijl, Leseman, and Rispens 2001).

Different intervention models, such as center-based (where children attend classes at pre-school centers), home-based (where parents attend parenting programs that consist of group meetings and/or home visits), or a combination of center-based and home-based (where children attend classes at centers outside the home and there is a family outreach) have been tried out in different contexts depending on a set of socio-cultural as well as economic factors. In a meta-analysis of 19 studies, Blok et al. (2005) compared the effectiveness of center-based, home-based, and center- and home-based combined models, and found that in the cognitive domain center-based and combined models yield superior outcomes compared to home-based programs. Results of evaluation research also show positive outcomes of programs that include both parent support and child enrichment (Eccles and Harold 1993; Kağıtçıbaşı, Sunar, and Bekman 2001; Kağıtçıbaşı et al. 2009; Korenman, Miller, and Sjaastad 1995; Lee and Croninger 1994; Masten and Coatsworth 1998; McLoyd 1998; Yoshikawa 1994; Zigler, Taussig, and Black 1992).

Differences in the home environment in parental education, frequency and style of parent-child interaction, availability of literacy materials, and frequency of literacy activities are related to children's language competence and discourse skills. Children from low-income families with low levels of education and limited opportunities for literacy-related activities are particularly at a disadvantage in these respects (Aksu-Koç 2005; Baydar, Brooks-Gunn, and Furstenberg 1993; Campbell and Ramey 1994; Hart and Risley 1995; Hoff-Ginsberg 1991; Pan et al. 2005; Payne, Whitehurst, and Angell 1994; Raz and Bryant 1990; Snow 1993; Snow, Burns, and Griffin 1998; Snow and Tabors 1996; Sofu 1995). They are at a double disadvantage if their first language is different from the language of school since a mismatch between the linguistic experience at home and the linguistic demands of the school is one of the major obstacles for academic progress (Aksu-Koç, Erguvanlı-Taylan, and Bekman 2002; Cobo-Lewis et al. 2002; Verhoeven 1999; Wells 1985). For such populations, center-based intervention programs that provide immersion in the school language may prove to be more effective.

Early intervention programs focus on language competence and readiness for literacy and numeracy acquisition by developing children's vocabulary, numerical

concepts, familiarity with print, listening comprehension, narrative competence, and phonological awareness (Aksu-Koç, Örüng, and Cesur 1999; Dickinson and Tabors 2001). Results of evaluation studies of language intervention programs reveal promising outcomes. Cobo-Lewis et al. (2002) report positive effects of center-based programs for Spanish–English bilingual children, though more for children from high-income homes, and homes where both languages are spoken than for children from low-income homes and homes where only the home language was spoken. Dickinson and Tabors (2001) report that the effects of language support both at home and in the classroom to low-income children were observed in enhanced vocabulary, listening comprehension and discourse production skills in the later years. These findings confirm those obtained in previous research by Anderson and Freebody (1981), Bus, van Ijzendoorn and Pellegrini (1995), and Wells (1985).

Numeracy is yet another significant component of early learning that needs to be supported (van Tuijl, Leseman, and Rispen 2001). The ways in which children think about mathematics is very much dependent on the types of mathematical experiences they have. While Piaget (1970) underlines the role of objects, the social world and especially peers, Vygotsky (1978) emphasises the importance of interactions with those who are more competent in the process of mathematical understanding. This makes both the home and the pre-school important for creating an environment that would facilitate mathematical knowledge. Evidence indicates social class differences in the extent to which children are involved in mathematical experiences (National Research Council 2009). Researchers such as Clements (2001), Ginsburg and Russell (1981), Ginsburg, Klein and Starkey (1998), Saxe, Guberman, and Gearhart (1987), Starkey and Klein (2000) and Starkey et al. (1999) report that more mathematical activities are provided at home by middle-class than by working class parents and that many of the economically disadvantaged children are poorly prepared for formal schooling. Moreover, the parents of low income children are reported to believe that it is the role of the pre-school teacher to provide instruction in mathematics rather than that of the parents (Holloway, Rambaud, and Fuller 1995; Starkey and Klein 2000; Starkey, Klein, and Wakeley 2004).

Research points to important differences in mathematical understanding during the early ages (Ginsburg, Klein, and Starkey 1998; Ginsburg and Russell 1981) indicating that numeracy skills do not wait upon the first years of school ('Early Childhood Mathematics' 2003; 'Mathematics for the Youngest Learners' 2002). Achievement levels in mathematics are reported to be stable through out the primary and secondary school years and disparity at school entrance tends to increase as students advance in the system (Fogelman 1983; Young-Loveridge 1991, 2004). Therefore, enhancing the child's numeracy skills prior to school could be effective for later mathematics learning and achievement (Clements 2001).

Various studies provide evidence for success in reducing differences in mathematics achievement with early intervention programs (Gervasoni 2001, 2002; Wright et al. 1996). Three- and four-year-olds display considerable knowledge and consistent patterns of responding to numeracy problems if they are aided by someone more knowledgeable than themselves (Ewers-Rogers and Cowan 1996), and primary school children display sustained improvement in these skills even after the termination of the intervention ('Early Numeracy Research Project Final Report' 2003; Fraser et al. 1998). Early et al. (2006) underline the association between teacher's educational credentials and gains in children's math skills. More years of teacher's education led to more gains in math skills in children.

Altogether these findings indicate the importance of enrichment programs for young children, particularly for those who receive less stimulation from their environments.

Aim of the research

Based on the reasons discussed above, ‘the Pre-school Education Program’ that focuses on language, literacy and numeracy skills, was designed for monolingual and bilingual children at risk for school success because they come from under-resourced backgrounds. It was designed as an intensive summer school program targeting children scheduled to start primary school in the fall of that year. The present study reports the results of research on the effectiveness of this accelerated pre-school intervention on the literacy, numeracy and language skills of children that are scarcely reached.

The ‘summer pre-school’ model

Turkey does not have a widespread standardised system of early childhood education. Nearly all the services are center-based and located in the large cities. Only 33% of four- to six-year-olds and 51% of five- to six-year-olds attend any sort of pre-school institution. The situation is even more critical for children from disadvantaged environments since a large number of available facilities are privately owned and charge tuition. The present system, therefore, does not reach those children who are most in need of early childhood support.

In the last two decades, intervention programs have been developed to support children at risk (Kağıtçıbaşı, Sunar, and Bekman 2001; Kağıtçıbaşı et al. 2009). These programs that are mainly home based have yielded short and long term effective outcomes indicating success in academic achievement and later life adjustment. The novelty of the intervention program reported here is that it is a center-based model which provides an accelerated program designed to fit a summer school, has a language component particularly devised for bilingual and monolingual children who come from under-resourced environments, and a component aimed at enhancing literacy and numeracy skills. The particular emphasis on language was motivated by the characteristics of the educational system as well as the target population. The language of instruction in the centralised formal education system is Turkish. However, neither the early childhood education nor the primary school systems are equipped with special programs to bridge the language gap for children with insufficient knowledge of Turkish either because they come from homes where Turkish is the second language or from low-income, low-education homes. Remedial instruction in Turkish is given, at best, in the first grade by the class teacher using informal self-devised methods.

The need for a program that would support children’s social, cognitive, linguistic, and physical development prior to formal schooling was determined with a large scale survey carried out in three provinces, one in the east and one in the southeast region of Turkey with multilingual populations speaking Turkish, Kurdish and Arabic, and one in the west with predominantly Turkish monolingual home-language environments (Aksu-Koç, Erguvanlı-Taylan, and Bekman 2002).

The program was designed as a summer school program with an accelerated curriculum with the goal of reaching a maximum number of children, with maximum quality in content, but with the minimum amount of cost. It is therefore original, being custom designed on the basis of a need assessment study for a disadvantaged pre-school population of mixed first language backgrounds.

The pre-school education program

Aim and target population

The Pre-School Education Program is a center-based program with an emphasis on cognitive and language skills in the context of a comprehensive early childhood education curriculum that also targets social-emotional and physical competencies in order to foster overall development. Its main objective is to improve the school readiness of six-year olds from mono- or multi-lingual disadvantaged environments (Bekman et al. 2003).

Content

The program has four components. The physical component targets the development of self-care behaviors, physical fitness and healthy nourishment habits. The cognitive component aims to stimulate conceptual development, and to develop some pre-literacy and pre-numeracy skills ('literacy' and 'numeracy' henceforth). The purpose of the language component is to support the development of vocabulary, grammar and narrative competence. Finally, the social-emotional component emphasises the recognition and communication of emotions, and social interaction with peers and adults. These aims are distributed over the nine different parts of the daily routine. An activity of any part of the daily routine may address one or more aims of one or more program components. The Program has activities initiated either by the teacher or the child or both. The schedule of the daily routine (content and time allocated to each section) is given in Table 1.

Implementation

The program was implemented in sixteen classrooms in four public schools and the experimental pre-school of the Mother–Child Education Foundation in the Southeastern province where the need-assessment research was done. All five schools were in five neighborhoods that have a high population of socio-economically disadvantaged families with many children and little or no access to pre-school education facilities. The program lasted five days a week for 10 weeks between 9:00 am–14:00 pm, in classes of 20 children per teacher and a teacher assistant. Thus each child attended the center for five hours per day, five days a week. The average attendance rate was 99%. If the child was not present in the sessions, supervisors contacted the families and enquired about the reasons of absence. The program was implemented with the collaboration of Ministry of National Education and the Mother–Child Education Foundation in accordance with the Ministry's ECE programs.

Staffing, quality assurance and staff training

The program was run by four levels of staff: a regional coordinator, two program coordinators; three supervisors, and a teacher and a teacher's aid for each classroom. The regional coordinator conducted the administrative activities in coordination with the regional authorities. The program coordinators trained the teachers and the supervisors, and observed and provided them with feedback several times during the course of the implementation. The supervisors observed the teachers during different phases of the implementation and wrote reports to the program coordinators. The teachers were local graduates of Child Development and Education programs of Girls Vocational

Table 1. The schedule and aims of daily activities in the summer school program.

Time slots in daily routine and nature of the activity	Aims
Arrival and free play (9.00–9.15) <i>Child initiated</i>	
Gymnastics (9.15–9.30) <i>Teacher and child initiated</i>	To support physical development, body awareness, and creativity through bodily expression.
Clean-up time (9.30–9.40)	To promote habits of self-care.
Snack time (9.40–9.55)	To promote habits of self-care.
Cleaning time (9.55–10.05)	To promote habits of self-care.
Circle time (10.05–10.25) <i>Teacher and child initiated</i>	To promote thinking about a topic, sharing ideas, and seeing the cause-effect relationships between events.
Outdoor time (10.25–11.00) <i>Child initiated</i>	To have children exert energy and use skills of speaking, observing and thinking through games.
Language time (11.00–11.25) <i>Teacher initiated</i>	To teach various morpho-syntactic structures of Turkish and enhance use of verbal skills.
Planning time (11.25–11.40) <i>Child initiated</i>	To promote planning skills by talk about what, where, and with whom child will play in playtime.
Play time (11.40–12.25) <i>Child initiated</i>	To give children the opportunity to work independently with different materials, engage in problem solving, and share experiences with friends and adults. Teachers contribute by observing and actively participating in children's games with questions and comments directed at the development and use of the target concepts.
Recall time (12.25–12.40) <i>Child initiated</i>	To provide an opportunity to share with others activities done in play time.
Clean-up time (12.40–12.50)	To promote habits of self-care.
Snack time (12.50–13.05)	To promote habits of self-care.
Clean-up time (13.05–13.20)	To promote habits of self-care.
Preparation for school time (13.20–13.40) <i>Teacher initiated</i>	To develop literacy and numeracy skills by having children do structured exercises.
Story time (13.40–14.00) <i>Teacher initiated</i>	To enhance discourse skills by having children listen to stories, relate story characters and events to their own lives, and project what would be an alternative unfolding of events.
Departure (14.00–14.15)	

Schools that provide high school level training in child development and education, arts and crafts, food and beverages, and computer use. They had pre-school teaching experience of two years on the average, and were bilingual in Turkish and Kurdish.

To make sure that the program was implemented as intended, classroom observations were carried out using a checklist of behaviors on a six-point scale. There

were 62 items reflecting the objectives of nine parts of the curriculum and 11 items for evaluating the quality of teacher-child relationship. A total score was obtained for each teacher and inter-rater reliability was .80. These scores were used for purposes of feedback and comparisons among teachers, but not for purposes of research. The supervisors observed and gave feedback to the teachers daily, and met them once a week to discuss the various issues related to achieving high quality implementation.

Each family was visited twice during the program by the teachers. The aim was to have some contact with the family, to be informed about the nature of mother-child interactions and the learning opportunities available at home as well as to inform the family about the activities of the program in order to enhance chances of sustainability. Teachers reported about the home visits to the supervisors in the weekly meetings.

Teachers were given training for two weeks before their appointment to the program was finalised. The training included both theoretical and practical information with demos to provide the teachers with hands-on experience about the components of the program. The teachers continued to receive training from the supervisors throughout the implementation. The supervisors also participated in a two-week training seminar where they (i) received information about the role and the aim of a supervisor in running the program; and (ii) were given a chance to observe simulations of situations they might encounter, to discuss their observations, and gain practice in giving feedback.

The evaluation study

The evaluation study was conducted to assess the short-term impact of the Pre-school Education Program on the literacy, numeracy and linguistic (vocabulary, syntax and narrative) skills of children from homes where the first language is not Turkish and the parents have low literacy levels in both languages. The study was carried out within a pre-post, control-group, quasi experimental design. The time elapsed between the two assessments was 10 weeks.

Method

Participants

The program was implemented in the southeast province of the need assessment study where majority of the population is bilingual with Kurdish as the home and Turkish as the second language. In this province the population of children between four- to six-years is about 73,000 and the number of children who have access to pre-school for this age range is 18,937. The percentage of nursery school coverage is thus around 25% (retrieved from www.tuik.gov.tr, 2008).

Announcements about the program were made in five economically disadvantaged areas through primary schools and home visits by the Mother-Child Education Foundation, the NGO implementing the program. Three hundred and sixty six-year-olds who had not attended any pre-school before and were going to enroll in school that fall were accepted to register. The sample was a self-selected one since of the families eligible for intervention in these low-income residential sites only those who chose to do so participated. However, they were representative of the population of their areas given the homogeneity of the residents in terms of socio-economic standing. All the families were living within the walking distance of the schools where the program was implemented.

To constitute the trained group for the evaluation study 100 children were selected randomly from the pool of 360 registered to attend the program. For the control group home

Table 2. Educational and occupational status of the parents of the training and control children.

Years of education	Mother		Father	
	Training (%)	Control (%)	Training (%)	Control (%)
Illiterate	67	65	24	10
literate: 0–2 years	10	12	8	17
4 years	1	3	1	9
5 years	22	18	53	51
7 years	0	1	3	3
8 years	0	0	5	4
11 years	0	0	7	5
Occupation	Training (%)	Control (%)	Training (%)	Control (%)
Unemployed	0	0	33	24
Unskilled worker	0	0	34	44
Skilled worker	0	0	27	19
Small Business	0	0	1	10
Public service	0	0	4	2
Farmer	0	0	0	2

Note. All mothers were housewives.

visits were made on a random basis in the five implementation sites and 100 children were selected from families who had not chosen to participate in the intervention but agreed to do so in the research. At the end of the study there were 92 trained children and 93 non-trained control children due to attrition. The attrition rate for the whole sample was 8%.

For demographic information an interview was conducted with the parents. These data show that a low-income group had been reached both for the trained and the non-trained groups. As can be observed in Table 2, two thirds of the mothers were illiterate in both languages and only 22% of the trained and 18% of the non-trained group were graduates of primary school with five years of schooling. Half of the fathers in both groups were primary school graduates. All mothers were housewives. Thirty-three per cent of the fathers from the trained and 24% from the non-trained group were unemployed. Fathers were employed either in skilled or unskilled labour, with very few in small business or the service sector. The number of children in the families ranged between one and 13. Just about 50% of the families in both groups had four to six children. The majority of the families were two parent families and this was typical of the population reached in the study.

Instruments of assessment

Literacy and numeracy skills

To assess the immediate effects of the program in the cognitive domain, verbal and numerical skills important for the acquisition of reading, writing and arithmetic were measured. An instrument comprising a verbal and a numerical part was constructed for this purpose. The skills that were assessed were covered in the program through out the daily routine and especially during the ‘preparation for school’ time; therefore

Table 3. Pre-literacy and pre-numeracy skills targeted in the program and assessed in the evaluation study.

Pre-literacy skills	Pre-numeracy skills
Visual recognition and discrimination of geometric shapes, animals, fruits and other objects (<i>matching those that are the same</i>)	Visual recognition and discrimination of numerals (<i>identifying and naming numerals, matching those that are the same</i>)
Identifying part-whole relations in figures of animals, fruits and other objects (<i>finding and completing the missing pieces</i>)	Visual matching (<i>matching a number of object drawings to corresponding numerals</i>)
Visual memory for shapes, figures of animals, fruits and other objects (<i>same and different, finding pairs, finding and completing the missing pieces</i>)	1:1 Correspondence (<i>drawing a set of objects in 1:1 correspondence with the given set</i>), matching pictures that have same number of objects
Fine motor control (<i>following a path with a pencil, drawing lines of different kinds, etc.</i>)	Visual counting (<i>counting the things in the pictures</i>)
Classification (<i>grouping instances belonging to the same category such as girls vs. boys</i>) seriation (<i>arrangement of objects in increasing or decreasing order</i>)	Counting (<i>in addition and subtraction</i>)
Sequencing (<i>temporal-causal ordering of events in a story</i>)	Grouping (<i>classifying same numerals or same number of objects</i>)
Concepts (<i>pointing to objects that vary with respect to various properties such as small, big, long, short, etc.</i>)	Addition (<i>addition using objects or pictures</i>)
Copying geometric shapes, letters, figures of animals, fruits and other objects	Subtraction (<i>subtraction using objects or pictures</i>)
Listening to and following verbal instructions	Auditory attention (<i>listening to instructions to carry out different tasks of numeracy</i>)
Listening comprehension (<i>repeating sentences, answering questions about a story after listening to it, picking out the picture that illustrates a specific part of the story</i>), phonological awareness (<i>discriminating first and last sounds</i>)	

Note. The activities constituted the content of 'preparation for school time', but were also incorporated into the other slots of the daily program as much as possible.

there is a correspondence between what was taught and what was measured in task format, but the task stimuli differed. For example, if the children were taught 'same and different' by comparing-contrasting pictured items of food versus clothing, the same concept was tapped in the instrument using different categories of objects and pictures than used in the classroom. In other words the outcome measures are near transfer activities, however they still require generalisation. Table 3 presents a list of the sub-skills that were taught and assessed.

The verbal part of the scale had 26 questions and the numerical part had 15 questions. A maximum score of 81 could be obtained on the verbal scale and a maximum of 58 on the numerical scale. As this instrument was developed in the context of the research, it is not standardised. The internal reliability coefficients are .74 for the verbal scale, and .69 for the numerical scale.

Language skills

The effects of the program on language skills were assessed in the areas of vocabulary, syntactic knowledge and story comprehension. A special vocabulary module was not designed in the program because being immersed in a five-hour daily Turkish language curriculum, children were exposed to new vocabulary in the context of almost all activities. The targeted syntactic structures were determined on the basis of the need assessment study and our knowledge about their order of acquisition in Turkish as a first language. For each morpho-syntactic construction structured exercises in the form of action- or table-games, picture descriptions, and story-completion pictures were designed and used. For narrative competence, children listened to stories, answered questions, and made elaborations relating the events to their own lives in the daily story-time period. Table 4 presents a list of the language components in which training was given and assessment was done.

For the assessment of receptive vocabulary, the Turkish adaptation of the Peabody Picture Vocabulary Test (PPVT) was used. The adaptation and standardisation was done by Katz et al. (1974) on a sample of 1440 children between 2–12 years. Even though the age norms need to be updated, the raw scores are useful for comparison among children.

Level of syntactic knowledge was measured with a test of elicited imitation that presented 16 sentences incorporating specific morpho-syntactic structures of Turkish

Table 4. Language components targeted in the program, assessed in the evaluation study and (*instruments of assessment*).

Vocabulary		Syntactic structures	Narrative competence
Lexical categories	Morphology (<i>Elicited imitation</i>)	Clausal structures	Story comprehension
(PPVT)		(<i>Elicited imitation</i>)	(<i>Sequencing of story pictures</i>)
Nouns	Noun inflection (singular, plural, possessive and case)	Nominal sentences Verbal sentences (affirmative and negative)	Plot structure Initiating event Complicating action Resolution
Verbs	Verb inflection (tense–aspect–modality, person–number marking)	Imperative and optative sentences Wh-questions and yes–no questions	
Adjectives		Comparative structures Sentence conjoining Adverbial clauses Complement clauses Causative and passive structures Relative clauses	
Spatial and temporal adverbs			

(e.g., coordinate, comparative, adverbial, complement and relative clauses) controlled for sentence length in words (five–six) and morphemes (10–14) for memory constraints. Each child was asked to repeat the model sentence right after the experimenter read it out loud. The elicited imitation method rests on the assumption that speakers who have fully internalised a given structure will be able to repeat it verbatim or with minor modifications not affecting the meaning (Slobin and Welsh 1971). The imitated sentences were coded into three response categories: (i) correct response (verbatim repetition or repetition with minor modification with no consequence for structure or meaning); (ii) modified response where semantic coherence is preserved (repetition resulting in structural and/or semantic change due to subordinate clause reduction, noun phrase deletion or deletion of a morphological unit); and (iii) incorrect response (no response, incomplete or ungrammatical repetition). Thus each subject could potentially have three scores on this task: if s/he repeated all sentences verbatim, s/he would get a score of 16 for ‘correct’ response and zero for the other two categories, but if s/he repeated only nine of the sentences verbatim, modified five and did not respond to two, s/he would get a score of nine for ‘correct’, five for ‘modified’, and two for ‘no’ response.

Story comprehension was assessed by using a five-card picture story. The experimenter first put the cards in front of the child in order and read the story, pointing to the characters and events on each card. Then she collected the cards and put them back in mixed order, and asked the child to listen carefully and give her the correct picture as she re-read each sentence of the story. Thus the task measured comprehension of sequential organisation in narrative. A correct sequencing of the five cards by the child received a score of two, a correct sequencing of three cards a score of one, and any other sequence received a score of zero. Comprehension rather than production was assessed because ‘story reading’ time trained children in listening comprehension.

Procedure

The pre-test data were collected during the week between registration and the beginning of the program; the post-test data were collected one week after the termination of the 10-week program. The subjects from the trained group were tested in the school they were attending the program, the subjects from the non-trained group were tested in their homes. Each child was tested individually, in an empty room or quiet corner. Data collection was carried out in two days for each child: the literacy and numeracy scales, which lasted 45 minutes in total, were administered the first day. The three language tasks, which lasted about 30 minutes in total, were administered the second day. The testers were not blind to the experimental and control groups.

Results

In order to see if the experimental and control groups differed prior to training, t-tests were carried out for the demographic variables (educational and occupational level of the parents, number of children and distribution of the sample to the five implementation sites) and the dependent variables (literacy, numeracy, vocabulary, story comprehension and syntactic competence). The analyses revealed no difference between groups on any of these variables.

To assess the effects of the program analyses of covariance (ANCOVA) were carried out for post-test scores on literacy, numeracy, vocabulary, story comprehension and syntactic competence. The covariates were the pre-test scores on the same variables. In addition to intervention training, parental education levels were treated as independent variables. Maternal and paternal education levels were combined into three groups: low maternal–low paternal education, low maternal–high paternal education, high maternal–high or low paternal education. While low maternal education and low paternal education were defined as no schooling and zero-to-two years of schooling, respectively, high maternal education was taken to correspond to one-to-six years, and high paternal education five-to-twelve years of schooling. No analyses for effects of teacher characteristics on child outcomes could be carried out due to the low number of children (three-to-five) sampled from each teacher's classroom.

For the variables literacy, numeracy, vocabulary and story comprehension, preliminary analyses evaluating the homogeneity-of-slopes assumption indicated that the relationship between the covariate and the post-test scores did not differ significantly as a function of the independent variables, permitting the subsequent steps. For syntactic competence, the homogeneity-of-slopes assumption was satisfied for the categories of correct response and modified response, but not for the category of no response.

Effects of training on literacy and numeracy skills

The post-test scores on the literacy test were submitted to an ANCOVA with the pre-test literacy scores as covariate, and training and parental education level as the independent variables. The analysis revealed a significant effect of training on children's literacy skills ($F(1,175) = 115.52, p < .001$); partial eta square indicated that the training program accounted for 40% of the variance (see Table 5 for the means and standard deviations). No other main or interaction effects were found.

A similar ANCOVA was carried out on the post-test scores on numeracy for the impact of the program and parental education level. Again, there was a significant effect of training ($F(1, 175) = 176.69, p < .001$), which accounted for 51% of the variance as indicated by partial eta square. As Table 6 shows, the trained group had a higher mean score than the non-trained group. No other main or interaction effects were found.

These findings indicate that the program was highly effective on the literacy and numeracy skills that are called for in the acquisition of literacy and numeracy in school.

Effects of training on linguistic skills: vocabulary, syntactic competence and story comprehension

An ANCOVA was carried out on the post-test scores of the PPVT as the dependent variable, the pre-test scores as the covariate, and training and parental education as the independent variables. The analysis yielded a significant effect of parental education ($F(1,170) = 3.75, p < .03$); and a trend towards significance of training ($F(1,170) = 3.60, p < .06$). No interaction effect was found.

The means in Table 7 show that children from families where the mother's level of education is high – regardless of the father's level of education – achieved higher scores in vocabulary than those children whose mothers had no schooling. Parental education accounted for 4% of the variance as indicated by partial eta square.

Table 5. Pre-post means, standard deviations and SEMs for literacy skills by training and levels of parental education.

Training condition	Levels of maternal–paternal education	Pre-test			Post-test		
		Mean	SD	SEM	Mean	SD	SEM
Trained	Lo M & F N = 24	19,21	13,46	2,75	35,75	14,82	3,02
	Lo M & Hi F N = 36	19,75	13,74	2,29	37,25	15,60	2,60
	Hi M & Lo/ Hi F N = 30	24,20	12,58	2,30	41,10	13,28	2,42
	Total	21,09	13,33	1,40	38,13	14,66	1,54
Nontrained	Lo M & F N = 22	18,27	11,46	2,44	21,04	9,77	2,08
	Lo M & Hi F N = 33	18,60	12,85	2,24	20,79	12,43	2,16
	Hi M & Lo/Hi F N = 31	21,42	14,10	2,53	23,81	15,59	2,80
	Total	19,53	12,92	1,39	21,94	13,02	1,40

Table 6. Pre-post means, standard deviations and SEMs for numeracy skills by training and levels of parental education.

Training condition	Levels of maternal–paternal education	Pre-test			Post-test		
		Mean	SD	SEM	Mean	SD	SEM
Trained	Lo M & F N = 24	14,71	11,23	2,29	32,12	15,68	3,20
	Lo M & Hi F N = 36	13,47	9,85	1,64	33,78	14,61	2,43
	Hi M & Lo/ Hi F N = 30	19,23	11,15	2,04	36,57	15,15	2,77
	Total	15,72	10,85	1,44	34,27	15,01	1,58
Nontrained	Lo M & F N = 22	12,95	8,72	1,86	15,32	8,91	1,90
	Lo M & Hi F N = 33	13,21	8,62	1,50	14,85	9,37	1,63
	Hi M & Lo/Hi F N = 31	12,93	11,43	2,05	17,32	13,15	2,36
	Total	13,05	9,64	1,04	15,86	10,72	1,16

The effect of the program on children's syntactic skills was revealed by the analyses of the correct responses obtained on the elicited imitation test. The ANCOVA on the post-test correct response scores with the pre-test scores as covariate, and training and parental education as independent variables showed that the program had a significant effect at $p < .001$ level ($F(1,175) = 10.98$). Children who attended the program produced a higher number of correct repetitions of the stimulus sentences than children who did not (see Table 8 for the means). Variance explained by the program was

Table 7. Pre-post means, standard deviations and SEMs for vocabulary (PPVT) by training and levels of parental education.

Training condition	Levels of maternal–paternal education	Pre-test			Post-test		
		Mean	SD	SEM	Mean	SD	SEM
Trained	Lo M & F N = 24	25,96	10,46	2,13	34,62	10,63	2,17
	Lo M & Hi F N = 36	26,28	12,19	2,03	33,00	11,98	2,00
	Hi M & Lo/ Hi F N = 30	30,73	9,41	1,72	39,00	12,26	2,24
	Total	27,68	10,97	1,16	35,43	11,90	1,25
Nontrained	Lo M & F N = 20	21,80	8,82	1,97	30,77	11,62	2,48
	Lo M & Hi F N = 32	25,62	10,73	1,90	27,91	10,76	1,87
	Hi M & Lo/Hi F N = 29	29,14	11,09	2,06	33,16	12,32	2,21
	Total	25,94	10,69	1,19	30,53	11,65	1,26

Table 8. Pre-post means, standard deviations and SEMs for syntactic skills by response type (correct, modified and no/ungrammatical response), training and levels of parental education.

Correct response							
Training condition	Levels of maternal–paternal education	Pre-test			Post-test		
		Mean	SD	SEM	Mean	SD	SEM
Trained	Lo M & F N = 24	4,46	3,42	.699	6,87	3,65	.745
	Lo M & Hi F N = 36	5,61	3,41	.568	8,92	3,84	.640
	Hi M & Lo/ Hi F N = 30	9,40	4,49	.820	10,83	4,91	.896
	Total	6,57	4,29	.453	9,01	4,41	.465
Nontrained	Lo M & F N = 22	5,18	3,87	.826	6,41	4,50	.959
	Lo M & Hi F N = 33	5,79	4,31	.751	7,00	4,25	.740
	Hi M & Lo/Hi F N = 31	6,90	4,96	.891	7,93	4,94	.887
	Total	6,03	4,46	.481	7,18	4,56	.492
Modified response							
Training condition	Levels of maternal–paternal education	Pre-test			Post-test		
		Mean	SD	SEM	Mean	SD	SEM
Trained	Lo M & F N = 24	2,71	2,59	.530	5,17	3,79	.775

(Continued)

Table 8. (Continued).

Correct response							
Training condition	Levels of maternal–paternal education	Pre-test			Post-test		
		Mean	SD	SEM	Mean	SD	SEM
Nontrained	Lo M & Hi F N = 36	3,17	2,18	.364	4,14	3,50	.583
	Hi M & Lo/ Hi F N = 30	1,57	1,91	.348	2,63	3,49	.637
	Total	2,51	2,30	.242	3,91	3,67	.387
	Lo M & F N = 22	2,82	2,57	.549	3,54	2,89	.616
	Lo M & Hi F N = 33	2,88	2,48	.432	3,36	2,86	.498
	Hi M & Lo/Hi F N = 31	2,35	2,29	.411	2,58	2,77	.497
	Total	2,67	2,42	.261	3,13	2,83	.305
Ungrammatical response							
Training condition	Levels of maternal–paternal education	Pre-test			Post-test		
		Mean	SD	SEM	Mean	SD	SEM
Trained	Lo M & F N = 24	8,79	3,71	.756	3,79	3,68	.752
	Lo M & Hi F N = 36	7,22	3,59	.599	2,80	3,13	.522
	Hi M & Lo/ Hi F N = 30	5,03	3,78	.691	2,40	3,80	.694
	Total	6,91	3,93	.415	2,93	3,52	.371
Nontrained	Lo M & F N = 22	7,95	3,85	.820	6,04	4,13	.881
	Lo M & Hi F N = 33	7,24	3,90	.678	5,64	3,79	.660
	Hi M & Lo/Hi F N = 31	6,68	4,76	.855	5,45	4,62	.829
	Total	7,22	4,20	.453	5,67	4,15	.447

6% as indicated by partial eta square. No other significant effects were found. The ANCOVA carried out on the post-test modified response category did not yield significant results for either of the independent variables.

The ANCOVA conducted on post-test story comprehension scores with pre-test scores as the covariate revealed significant effects of both the intervention program ($F(1,168) = 6.67$, $p < .01$) and parental education ($F(1,168) = 4.15$, $p < .02$). There was also a significant interaction of training and parental education ($F(1,168) = 2.42$, $p < .05$). While attendance to the program accounted for 4% of the variance, parental education accounted for 5%. It is observed from Table 9 that children who attended the program but came from homes where both of the parents had almost no education

Table 9. Pre-post means, standard deviations and SEMs for story comprehension by training and levels of parental education.

Training condition	Levels of maternal–paternal education	Pre-test			Post-test		
		Mean	SD	SEM	Mean	SD	SEM
Trained	Lo M & F N = 24	0,25	0,67	.138	0,26	0,62	.129
	Lo M & Hi F N = 36	0,33	0,72	.119	0,61	0,80	.134
	Hi M & Lo/ Hi F N = 30	0,23	0,63	.114	0,90	0,98	.181
	Total	0,28	0,67	.071	0,61	0,85	.091
Nontrained	Lo M & F N = 21	0,09	0,30	.066	0,27	0,63	.134
	Lo M & Hi F N = 33	0,00	0,00	.000	0,16	0,45	.079
	Hi M & Lo/Hi F N = 28	0,25	0,58	.111	0,43	0,77	.141
	Total	0,11	0,38	.042	0,28	0,63	.069

Table 10. Difference between pre- and post-means, standard deviations and SEMs for the trained and non-trained groups on literacy, numeracy, vocabulary, story comprehension and syntactic (correct, modified, ungrammatical responses) skills.

		Mean difference	Standard deviation	Standard error of mean
Literacy	Trained	17,00	10,69	1,11
	Non-trained	2,53	8,33	.86
Numeracy	Trained	18,27	9,14	.95
	Non-trained	2,56	5,91	.61
Vocabulary	Trained	7,52	9,76	1,02
	Non-trained	5,84	8,49	.90
Story-comp	Trained	.33	1,05	.11
	Non-trained	.15	.67	.07
Syn: correct-R	Trained	2,45	3,17	.33
	Non-trained	1,25	2,47	.26
Syn: mod-R	Trained	1,43	3,69	.38
	Non-trained	.38	2,74	.28
Syn: ungram-R	Trained	-4,01	3,95	.41
	Non-trained	-1,56	3,76	.39

did not show any improvement on the story comprehension task, whereas children who attended the program and came from households where the mother had a high level of education showed the highest gains on the story comprehension measure.

To compare the growth trajectories of the two groups on all the dependent variables t-tests for independent samples were carried out. Results revealed significant outcomes favoring the experimental group for literacy ($t(1,172) = 10.27, p < .001$), numeracy

($t(1,156) = 13.85, p < .001$), correct response ($t(1,172) = 2.87, p < .005$), modified response ($t(1,168) = 2.21, p < .03$) and no response ($t(1,182) = -4.32, p < .001$). No significant differences were found for vocabulary and story comprehension variables (see Table 10).

Discussion

The present study aimed to evaluate the effectiveness of a 'summer pre-school model' as an intervention measure for six-year-olds from multilingual and disadvantaged environments. The results revealed an overall short-term effectiveness of the program as well as the importance of the educational level of the mother.

The Pre-school Education Program was found to have a significant impact on the development of children's literacy and numeracy related concepts. The literacy skills comprised visual recognition, discrimination and matching, classification and seriation, listening comprehension, phonological awareness, and fine motor control. The numeracy skills were those that contribute to basic arithmetic readiness such as recognition of numerals, matching number of objects to numerals, counting, and simple addition and subtraction using objects. The results indicated that the training program enhanced the development of these skills beyond the level that could be reached if the children had not attended the program.

The program, was also effective on children's linguistic skills. Almost all came to the program speaking and understanding Turkish at some level, and at the end of ten weeks of immersion, their syntactic knowledge and story comprehension skills were significantly enhanced and vocabulary knowledge showed a positive trend.

The significant changes observed in the intervention group's performance on the test of syntactic structures indicate that systematic exposure helped children internalise more of the complex constructions of the language and consolidate their existing knowledge. In addition, in 'story time' children listened to stories and answered questions which gave them further opportunity to encounter and practice complex morphology and syntax.

In the lexical domain we observe the importance of mother's education level. In this socio-geographical context higher level of education means higher level of knowledge of Turkish since this is the language of formal schooling. It is therefore not surprising that children of mothers with five years of education on the average showed more gains in vocabulary than children of mothers with no schooling. The role of the mother's level of linguistic competence in determining the child's linguistic environment has also been reported by Pan et al. (2005) who, in a sample of low SES children, found that variation in vocabulary growth is positively related to diversity of maternal lexical input and maternal language and literacy skills. In fact, it has been suggested by Hoff (2003) that the primary pathway through which SES effects children's vocabulary is maternal language characteristics. The trend indicating a higher gain in vocabulary by the trained children than the controls even though there was no specifically designed module for it shows the effectiveness of participation in an immersion program and suggests that incidental as well as structured learning should be taken advantage of in the preparation of similar intervention programs. Vocabulary development is particularly dependent on the richness of early childhood experiences and parent-child discourse that centers around them (Hart and Risley 1995); the present findings suggest that in the absence of such discourse at home, exposure to new

vocabulary integrated with children's enriched daily experiences at the center may also be effective.

The program also targeted children's narrative skills which constitute a foundation for dealing with abstract written texts. The intervention trained children in general, and amongst them those whose mothers had a higher level of education, in particular, performed best on the story comprehension task, reflecting the positive effects of the 'story time' activity.

Altogether, the findings indicate that the language component of the program is effective particularly for children whose mothers have sufficient knowledge in the second language to support the child, that is, for children whose home environments make use of both the home and the school languages (Cobo-Lewis et al. 2002). They also add to the body of evidence that show the effectiveness of center-based intervention programs for mono- or bi-lingual children from low socio-educational home environments, enhancing their school readiness (Aksu-Koç, Örüng, and Cesur 1999; Bus, van Ijzendoorn and Pellegrini 1995; Cobo-Lewis et al. 2002; Dickinson and Tabors 2001; Pan et al. 2005; Tabors, Snow, and Dickinson 2001; Wells 1985).

Although the results of the present study are not surprising in view of the findings in the literature regarding short-term positive effects of early intervention programs (Campbell et al. 2002; Reynolds and Ou 2004), they are nevertheless striking given the limited program duration of ten weeks. We think this is a function of the good fit between the characteristics of the target population and those of the program. The demographic characteristics of the sample as reflected by the level of education and occupation of the parents and family size show that the program has indeed reached its targeted population, namely, children from under-resourced backgrounds. The program is center based, has a highly structured curriculum and well trained staff; all three factors contribute to program effectiveness by ensuring fidelity of implementation and success in situations where children from disadvantaged environments are involved (Dickinson and Tabors 2001; van Tuijl and Leseman 2004; van Tuijl, Leseman, and Rispens 2001).

There are certain limitations of the study which need to be mentioned. First, children could not be assigned to the training and control conditions randomly. It would have been ideal to select both the training and control groups from the pool of 360 who registered to attend the program and postpone the participation of the control group in the intervention to the following year. This, however, would have jeopardised the efforts to secure the attendance of as many children as possible in the first introduction of the program to the community and work against the goals of the NGO that had invested in developing and implementing it. To counteract this drawback, analyses of covariance were carried out to control for the possible inequalities between groups in background characteristics and standing on the pre-test measures.

Second, except for the PPVT used in the evaluation of vocabulary, the measures used in assessment were not standardised. The story comprehension task introduced extra on-line cognitive demands as reflected by the overall low means; success on the task relied on memory and ability to match story sentences to pictures as well as comprehension of story or language. Nevertheless, children's gains in story comprehension could still be captured. The elicited imitation task used to evaluate syntactic knowledge, on the other hand, had been used with a very large sample and revised to fit the range of competence displayed by groups similar to children targeted for intervention. The measures for literacy and numeracy skills were devised for the present study; however, their internal reliability coefficients were found to be at a sufficient

level. All these measures were administered both to the intervention and the control groups, therefore whatever positive or negative effects may have accrued, they affected the children of the two groups equally.

In conclusion, the findings regarding the growth trajectories indicate an acceleration of growth for the intervention group in comparison to a normal growth for the control group. This is significant in a country where the existing early education system scarcely reaches the 'at risk' population. The present intervention program with its contextually sensitive approach and effective outcomes can be considered to be an important means for meeting the needs of this particular target group. The evaluation study, by revealing the short-term effectiveness of the Pre-school Education Program, has shown that this cost-effective 'summer school intervention model' has a high potential for increasing children's level of school readiness.

Acknowledgements

The research was funded by Boğaziçi University Research Fund, Project # 03 R 101.

References

- Aksu-Koç, A. 2005. Role of the home-context in the relations between narrative abilities and literacy practices. In *Perspectives on language and language development*, ed. D. Ravid and H. Bat-Zeev Shyldkrot, 257–74. Dordrecht: Kluwer.
- Aksu-Koç, A., E. Erguvanlı-Taylan, and S. Bekman. 2002. Need assessment in early childhood education and an evaluation of children's level of linguistic competence in three provinces of Turkey. Unpublished research report from <http://www.acev.org>.
- Aksu-Koç, A., S. Örüng, and S. Cesur. 1999. Pathways to literacy in early childhood II: MOCEP predictors of literacy. Paper presented at the Central Asian Literacy Forum, MOCEF & ILI, in Istanbul.
- Anderson, R., and P. Freebody. 1981. Vocabulary knowledge. In *Comprehension and teaching: Research review*. ed. J.T. Guthrie, 77–117. Newark: International Reading Association.
- Barnett, W.S., and S.S. Boocock, eds. 1998. *Early care and education for children in poverty*. Albany, NY: State University of New York Press.
- Baydar, N., J. Brooks-Gunn, and F.F. Furstenberg. 1993. Early warning signs of functional literacy: Predictors in childhood and adolescence. *Child Development* 64: 815–29.
- Bekman, S. 2003. From research project to nationwide programme: The mother-child education programme of Turkey. In *Cross-cultural perspectives in human development*, ed. T.S. Saraswathi, 287–25. India: Sage.
- Bekman, S., A. Aksu-Koç, E. Erguvanlı-Taylan, F. Uzuner, and D. Şenocak. 2003. *Pre-school education program for southeastern Turkey*. Istanbul: ACEV Publications.
- Berrueta-Clement, J.R., L.L. Schweinhart, W.S. Barnett, A. Epstein, and D. Weikart. 1986. Changed lives: Perry pre-school programme on youths through age 19. In *Better start: New choices for early learning*, ed. M.F. Hechinger, 11–40. New York: Wallker Company.
- Blok, H., R. Fukkink, E. Gebhardt, and P. Leseman. 2005. The relevance of delivery mode and other programme characteristics for the effectiveness of early childhood intervention. *International Journal of Behavioral Development* 21, no. 1: 35–47.
- Bus, A.G., M.H. van Ijendoorn, and A.D. Pellegrini. 1995. Joint book reading makes for success in learning to read: A meta-analysis on integrational transmission of literacy. *Review of Educational Research* 65: 1–21.
- Campbell, F.A., and C.T. Ramey. 1994. Effects of early intervention on intellectual and academic achievement: A follow-up study of children from low-income families. *Child Development* 65: 684–98.
- Campbell, F.A., C.T. Ramey, E. Pungello, J. Sparling, and S. Miller-Johnson. 2002. Early childhood education: Young adult outcomes from the Abecedarian Project. *Applied Developmental Science* 6, no. 1: 42–57.

- Clements, D. 2001. Mathematics in preschool. *Teaching Children Mathematics* 7, no. 5: 270–78.
- Cobo-Lewis, A.B., B.Z. Pearson, R.E. Eilers, and V.C Umbel. 2002. Effects of bilingualism and bilingual education on oral and written English skills: A multifactor study of standardized test outcomes. In *Language and literacy development in bilingual children*, ed. D.K. Oller and R.E. Eilers, 64–117. Clevedon: Multilingual Matters.
- Dickinson, D.K., and P.O. Tabors, eds. 2001. *Beginning literacy with language: Young children learning at home and school*. Baltimore: Paul H. Brookes.
- Early, D.M., D.M. Bryant, R.C. Pianta, R.M. Clifford, M.R. Burchinal, S. Ritchie, et al. 2006. Are teachers' education, major, and credentials related to classroom quality and children's academic gains in pre-kindergarten *Early Childhood Research Quarterly* 21: 174–95.
- Early Numeracy Research Project, final report. nd. <http://www.sofweb.vic.edu.au/eys/num/ENRP/Execsummm/background.htm>
- Eccles, J.S., and R.D. Harold. 1993. Parent–school involvement during the early adolescent years. *Teachers College Record* 94: 568–87.
- Ewers-Rogers, J., and R. Cowan. 1996. Children as apprentices to number. *Early Childhood Development and Care* 125: 15–25.
- Fogelman, K., ed. 1983. *Growing up in Great Britain: Papers from the national child development study*. London: Macmillan.
- Fraser, H., A. MacDougall, A. Pirrie, and L. Croxford. 1998. Early intervention and numeracy: Key issues from the national evaluation of the programme. <http://www.scotland.gov.uk/library3/education/ic71-00.asp> Early intervention and numeracy: Key issues from the national evaluation of the programme. <http://www.scotland.gov.uk/library3/education/ic71-00.asp>
- Gervasoni, A. 2001. Specialised programs for students who are low attaining in mathematics: Do they help? In *Numeracy and beyond (proceedings of the 24th annual conferences of the Mathematics Research Group of Australasia)*, ed. J. Bobis, B. Perry and M. Mitchelmore, 249–56. Sydney: MERGA.
- Gervasoni, A. 2002. Intervention in mathematics: Is assistance more effective in Grade 1 or Grade 2? In *Mathematics education in the South Pacific (proceedings of the 25th annual conference of the Mathematics Education Research Group of Australasia, Auckland)*, ed. B. Barton, K.C. Irwin, M. Pfannkuch and M.O.J. Thomas, 301–8. Sydney: MERGA.
- Ginsburg, H.P., A. Klein, and P. Starkey. 1998. The development of children's mathematical thinking: Connecting research with practice. In *Handbook of child psychology. Child psychology in practice*, ed. I.E. Sigel and K.A. Renninger, vol. 4. 401–76. New York: John Wiley and Sons.
- Ginsburg, H.P., and R.L. Russell. 1981. Social class and racial influence on early mathematical thinking. *Monograph of the Society for Research in Child Development* 46, no. 6: 1–68.
- Guralnick, M., ed. 1997. *The effectiveness of early intervention*. Baltimore: Paul H. Brookes.
- Hart, B., and T.R. Risley. 1995. *Meaningful differences in the everyday experience of young American children*. New York: Brookes.
- Hess, R.D. 1970. Social class and ethnic influences upon socialization. In *Carmichael's manual of child psychology*, ed. P.H. Mussen, 457–557. New York: Aldine.
- Hoff, E. 2003. The specificity of environmental influence: Socioeconomic status affects early vocabulary development via maternal speech. *Child Development* 74: 1368–78.
- Hoff-Ginsberg, E. 1991. Mother–child conversation in different social classes and communicative settings. *Child Development* 62, no. 4: 782–96.
- Holloway, S.D., M.F. Rambaud, and B. Fuller. 1995. What is appropriate practice at home and school? Low-income mothers' views of education. *Early Childhood Research Quarterly* 10, no. 4: 451–73.
- Kağıtçıbaşı, Ç., D. Sunar, and S. Bekman. 2001. Long-term effects of early intervention: Turkish low-income mothers and children. *Applied Developmental Psychology* 22: 333–61.
- Kağıtçıbaşı, Ç., D. Sunar, S. Bekman, N. Baydar, and Z. Cemalcılar. 2009. Continuing effects of early enrichment in adult life: The Turkish Early Enrichment Project 22 years later. *Journal of Applied Developmental Psychology*. doi:1016-j.appdev.009.05.003
- Katz, J., F. Önen, N. Demir, A. Uzlukaya, and P. Aladağ. 1974. A Turkish Peabody Vocabulary Test. *Hacettepe Bulletin of Social Sciences and Humanities* 6: 129–40.

- Korenman, S., J. Miller, and J. Sjaastad. 1995. Long-term poverty and child development in the United States: Results from the NLSY. *Children and Youth Services Review* 17: 127–55.
- Lazar, I., and R. Darlington. 1982. Lasting effects of early education: A report from the Consortium for Longitudinal Studies. *Monographs of the Society for Research in Child Development* 47, no. 2/3: 1–151.
- Lee, V., and R. Croninger. 1994. The relative importance of home and school in the development of literacy skills for middle-grade students. *American Journal of Education* 102: 286–329.
- Lee, V.E., and S. Loeb. 1995. Where do Head Start attendees end up? One reason why preschool effects fade out. *Educational Evaluation and Policy Analysis* 17, no. 1: 62–82.
- Masten, A.S., and J.D. Coatsworth. 1998. The development of competence in favorable environments: Lessons from research on successful children. *American Psychologist* 53: 205–20.
- Mathematics for the youngest learners. 2002. [Electronic version]. *Scholastic Early Childhood Today* 16, no. 7: 8–9.
- McLoyd, V. 1998. Socioeconomic disadvantage and child development. *American Psychologist* 53, no. 2: 185–204.
- Myers, R. 1992. *The twelve who survive*. London: Routledge.
- National Research Council, Center for Education, Division of Behavioral and Social Sciences and Education. 2009. *Mathematics learning in early childhood: Paths toward excellence and equity*. Washington, DC: The National Academies Press.
- Pan, B.A., M.L. Rowe, J. Singer, and C.E. Snow. 2005. Maternal correlates of toddler vocabulary production in low-income families. *Child Development* 76: 763–82.
- Payne, A.C., G.J. Whitehurst, and A.L. Angell. 1994. The role of home literacy environment in the development of language ability in preschool children from low-income families. *Early Childhood Research Quarterly* 9: 427–40.
- Pehrson, K.L., and C.C. Robinson. 1990. Parent education: Does it make a difference? *Child Study Journal* 20, no. 4: 221–36.
- Piaget, J. 1952. *The child's conception of number*. London: Routledge.
- Piaget, J. 1970. *Science of education and the psychology of the child*. New York: Orion.
- Raz, I.S., and P. Bryant. 1990. Social background, phonological awareness and children's reading. *British Journal of Developmental Psychology* 8: 209–25.
- Reynolds, A.J. 2004. Promoting wellbeing in children and youth: Findings from the Chicago Longitudinal Study. *Children and Youth Services Review* 26: 15–38.
- Reynolds, A.J., H. Chang, and J.A. Temple. 1998. Early childhood intervention and juvenile delinquency: An exploratory analysis of the Chicago child–parent centers. *Evaluation Review* 22: 341–72.
- Reynolds, A.J., and S.R. Ou. 2004. Alterable predictions of child wellbeing in the Chicago Longitudinal Study. *Children and Youth Services Review* 26: 1–14.
- Saxe, G.B., S.R. Guberman, and M. Gearhart. 1987. Social processes in early number development. *Monographs of the Society for Research in Child Development* 52, no. 2: 3–162.
- Schweinhart, L.J., H.V. Barnes, and D.P. Weikart. 1993. *Significant benefits: The High/Scope Perry Preschool Study through age 27 (Monographs of the High/Scope Educational Research Foundation, 10)*. Ypsilanti: High/Scope Press.
- Schweinhart, L.J., J. Montie, Z. Xiang, W.S. Barnett, C.R. Belfield, and M. Nores. 2005. *Lifetime effects: The High/Scope Perry Preschool Study through age 40. (Monographs of the High/Scope Educational Research Foundation, 14)*. Ypsilanti, MI: High/Scope Press.
- Slobin, D.I., and C.A. Welsh. 1971. Elicited imitation as a research tool in developmental psycholinguistics. In *Language training in early childhood education*, ed. C.B. Lavatelli, 70–185. Urbana, IL: University of Illinois Press.
- Snow, C.E. 1993. Families as social context for literacy development. In *The development of literacy through social interaction*, ed. C. Daiute, 11–24. San Francisco: Jossey-Bass.
- Snow, C.E., S. Burns, and P. Griffin. 1998. *Preventing reading difficulties in young children*. Washington, DC: National Academy Press.
- Snow, C.E., and P.O. Tabors. 1996. Intergenerational transfer of literacy. Family literacy: Directions in research and implications for practice. <http://www.ed.gov/pubs/FamLit/transfer.html>.

- Sofu, H. 1995. Acquisition of lexicon in Turkish. PhD diss. Çukurova University, Adana, Turkey, Acquisition of lexicon in Turkish. PhD diss. Çukurova University, Adana, Turkey.
- Starkey, P., and A. Klein. 2000. Fostering parental support for children's mathematical development: An intervention with Head Start families. *Early Education and Development* 11: 659–80.
- Starkey, P., A. Klein, I. Chang, Q. Dong, L. Pang, and Y. Zhou. 1999. Environmental supports for young children's mathematical development in China and the United States. Paper presented at the meeting of the Society for Research in Child Development, April, in Albuquerque, New Mexico.
- Starkey, P., A. Klein, and A. Wakeley. 2004. Enhancing young children's mathematical knowledge through a pre-kindergarten mathematics intervention. *Early Childhood Research Quarterly* 19: 99–120.
- Tabors, P.O., C.E. Snow, and D.K. Dickinson. 2001. Homes and schools together: Supporting language and literacy development. In *Beginning literacy with language: Young children learning at home and in school*, ed. D.K. Dickinson and P.O. Tabors, 313–34. Baltimore: Brookes.
- van Tuijl, C., and P.M. Leseman. 2004. Improving mother–child interaction in low-income Turkish–Dutch families: A study of mechanisms mediating improvements resulting from participating in a home-based preschool intervention program. *Infant and Child Development* 13: 323–40.
- van Tuijl, C., P.M. Leseman, and J. Rispen. 2001. Efficacy of an intensive home-based educational intervention programme for 4- to 6-year-old ethnic minority children in the Netherlands. *International Journal of Behavioral Development* 25, no. 2: 148–59.
- Verhoeven, L. 1999. Literate competence. Paper presented at Developing Literacy across Genres, Modalities, and Languages, February, in Tel Aviv University, Israel.
- Vygotsky, L.S. 1978. Interaction between learning and development. In *Mind in society: The development of higher psychological processes*, ed. M. Cole, V. John-Steiner, S. Scribner and E. Soubberman, 79–91. London: Harvard, (Original work published 1935.).
- Vygotsky, L.S. 1994. The problem of the cultural development of the child. In *The Vygotsky reader*, ed. R. Van der Veer and J. Valsiner, 57–72. Oxford: Blackwell. (Original work published 1929.).
- Yoshikawa, H. 1994. Prevention as cumulative protection: Effects of early family support and education on chronic delinquency and its risks. *Psychological Bulletin* 115: 27–54.
- Young-Loveridge, J.M. 1991. *The development of children's number concepts from ages five to nine. Early mathematics learning project: Phase II. Vol. I: Report of findings*. Hamilton, NZ: University of Waikato.
- Young-Loveridge, J.M. 2004. Effects on early numeracy of a program using number books and games. *Early Childhood Research Quarterly* 19: 82–98.
- Wells, G. 1985. *Learning, language and education*. Philadelphia: NFER-Nelson.
- Wright, R.J., C. Stanger, M. Cowper, and R. Dyson. 1996. First graders' progress in an experimental Mathematics Recovery program. In *Children's number learning: A research monograph of MERGA/AAMT*, ed. J. Mulligan and M. Mitchelmore, 55–72. Adelaide: Australian Association of Mathematics Teachers.
- Zigler, E., C. Taussig, and K. Black. 1992. Early childhood intervention: A promising preventative for juvenile delinquency. *American Psychologist*, 47. 997–1006.