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ABSTRACT

In order to better understand the role of child-centered learning strategies in creating democratic, collaborative behaviors for states of the former Soviet Union, this study evaluated the impact of Step by Step, an early childhood development program in Bulgaria, Kyrgyzstan, Romania, and Ukraine. The study compared educational performance and developmental progress of preschoolers enrolled in the program with that of children in traditional kindergartens. The program's critical elements are family involvement, a child-centered curriculum, teachers as facilitators, and building collaborative relationship with important educational systems. Child assessment batteries were completed during May 1998 for 587 five- to seven-year-olds selected from 5 Step by Step programs and 5 traditional kindergartens in each country. Children were selected according to a stratified, randomized method with gender being the stratification criterion. Child assessment measures included the Test of Early Mathematics Ability; Emergent Literacy Assessment; Adapted Peabody Picture Vocabulary Test; and Torrance Tests of Creative Thinking (TTCT). Findings for Bulgaria indicated that Step by Step children were performing at the same level as children in traditional programs. In Kyrgyzstan, Step by Step children dramatically outperformed those in traditional programs in both numeracy and literacy. In Romania, children in Step by Step classrooms from the low and high ends of the developmental spectrum were gaining more mathematical understanding than children in traditional programs and scored higher on the TTCT Unusual Uses test. In Ukraine, Step by Step children outperformed children in traditional programs in mathematics, the flexibility subscale of the TTCT, and receptive vocabulary. (KB)

EVALUATION OF CHILD ACHIEVEMENT IN FOUR NEWLY INDEPENDENT STATES OF THE FORMER SOVIET UNION:

A LOOK AT LITERACY, NUMERACY, AND CREATIVITY IN ALTERNATIVE AND TRADITIONAL PROGRAMS

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CHAPTER I: OVERVIEW OF THE EVALUATION

PURPOSE

This program evaluation was funded in 1998 by the United States Agency for International Development (USAID), as part of the Improving Educational Quality Project (IEQ) II. The overarching purpose of the evaluation was to gain a better understanding of the role of child-centered learning strategies in creating democratic, collaborative behaviors at the local level for newly independent states of Eastern Europe and Central Asia. As such, it supports USAID/ENI's strategic goals of democratic transition and social stabilization by examining the role of participatory educational practices in promoting democratic behavior.

The evaluation focused on Step by Step, an ongoing and growing early childhood development program in the ENI sector. Working with host country researchers in four countries—Bulgaria, Kyrgyzstan, Romania, and Ukraine—Education Development Center, Inc. (EDC) examined Step by Step's impact on children, parents, and communities. First, we compared educational performance and developmental progress of preschool children enrolled in the Step by Step program with children in traditional programs. We also investigated the program's effects on families, teachers, and school administrators. Third, using a range of methods, we examined Step by Step programs' institutional capacity and uptake in key educational systems in order to gauge its sustainability. Finally, as with all IEQII initiatives, we sought to build the capacity in applied evaluation and assessment techniques within host countries. This paper reports only on the comparisons of educational performance of children in Step by Step compared to those in traditional programs.

In this chapter, we describe the Step by Step model, discuss the importance of this evaluation and its implications for future policies, and briefly summarize the study methods and instruments.

OVERVIEW OF THE STEP BY STEP MODEL

Since its inception in 1994, the main objective of the Step by Step program has been to turn formerly state-supported day care facilities into centers for child development which promote learning and encourage democratic behaviors among children and their families. The Open Society Institute (OSI) funds the Step by Step program in the belief that educating young children in a manner that encourages family participation and individualized teaching, while supporting children's ability to make choices, will lead to a new generation of citizens equipped to live in democratic societies.[1] The Step by Step model was developed by Children's Resources International, Inc. (CRI) in partnership with OSI, and they continue to refine the model, support the expansion of the program, and create a forum for networking among Step by Step programs operating throughout the world. What began as an ambitious pilot in 15 countries with 250 classrooms is now an accepted educational program in 26 countries with more than 5,636 classrooms implementing the Step by Step methodology.

To better understand the evaluation and the relevance of the instruments used, it is important to have a general notion of the key features of the Step by Step methodology. The Step by Step model is based on four critical elements:

- Family involvement, and parent participation in particular, is a mainstay of the Step by Step model. Families are encouraged to become actively involved in their children's classrooms, working with teachers to implement the curriculum. Family involvement also extends beyond the classroom, as family members often contribute to the larger school community.
- Child-centered curriculum is another key feature which stresses that teaching in Step by Step classrooms should be individualized, reflect the cultures and traditions of participating families, and provide opportunities for child choice and learning through play and experimentation. The classroom is, therefore, organized into activity centers to support the child-centered curriculum.
- To support child-centered practices, the teacher's role is transformed from transmitter of information to facilitator. This has implications for building

[1] P. Coughlin, presentation at International Conference on Early Childhood in Mongolia, 1997.

teachers' understanding of child development and the ways in which they assess learning and development.

- Effective program implementation depends on building collaborative relationships with important educational systems within countries, especially ministries of education and teacher training institutions. Such collaborative relationships need to be established at the kindergarten level as well—among administrators, teachers, and parents.

OSI and CRI have worked together to introduce the program to participating countries. In collaboration with the local OSI foundation, they select a country team that will assume responsibility for launching the program; typically the country team consists of a country director and master teacher trainers. While all programs are required to incorporate the key features mentioned previously, country teams are encouraged to adapt the Step by Step model to fit the unique characteristics and traditions within each country. Such an approach is likely to be a contributing factor to the program's growth.

Since 1994, there has been an increasing demand for Step by Step and the enrollment figures are impressive. The program has not only expanded in size; but also in scope. The program now extends beyond preschool[2] to primary school, infant and toddler care, and orphanages. Over time, the Step by Step model has also formalized its outreach to institutions of higher education responsible for teacher training. CRI now conducts annual international seminars for faculty. These seminars provide course material on specific aspects of the Step by Step methodology, such as observing young children and learning though play.

Over the past several years, there has been an increasing emphasis on making Step by Step programs self-supporting. Country teams have been encouraged to establish non-governmental organizations (NGOs), and seek administrative independence from local OSI foundations, which initially housed the program. As

[2] Preschools are referred to as kindergartens throughout the remainder of this report and typically include children between the ages of three and seven, though some kindergartens have historically provided services to infants and toddlers as well.

we launched this study, only Romania had NGO status. As the study has drawn to a close, Bulgaria and Kyrgyzstan have also established themselves as NGOs.[3]

As Step by Step moves toward organizational independence, the program has also undertaken a new initiative. Programs have worked to establish associations for parents, teachers, and early childhood faculty. The intention is that these associations will become active mechanisms within and across countries to advocate on behalf of children and to sustain the program's philosophy. The move toward NGOs, and the increasing weight placed on these associations, signals that Step by Step may be here to stay—not a fleeting demonstration program.

Increasing demand for the program, informal accounts of its impact, and the energy devoted to creating an infrastructure have suggested that Step by Step has been highly successful in reaching its goals. Host countries view the child-centered methodology and the emphasis on family participation as a powerful way to contribute to the development of democratic ideals and behaviors in children, parents, and the community. Prior to this USAID-funded evaluation, however, the impact of the program on children, families, and teachers, and its effect on local participation in schools has remained anecdotal and has not been studied systematically. Consequently, USAID has undertaken this rigorous evaluation to determine whether these child-centered practices lead to more democratic behaviors at the local level.

Importance of Evaluating This Model

Eastern Europe and Central Asia have had a long tradition of state-supported early childhood education. Even though these child care programs differed in their quality and scope, they could be found in most city neighborhoods and in many towns and villages. With the dissolution of the Soviet Union came social and economic upheaval, which had a profound effect on the social sector—particularly child care. One has only to review UNESCO data that compares attendance rates in preprimary programs from 1989 to 1996 to grasp the magnitude of the impact.

[3] CRI reports that Ukraine is currently in the final stages of the application process.

For example, in Bulgaria preprimary enrollment dropped significantly from 93 percent in 1989 to 62 percent in 1996.[4] Even in newly independent states such as Kyrgyzstan, where attendance had not been as widespread, rates fell precipitously.

The Step by Step program was introduced at a time when the child care system in this sector of the world was foundering, but still operational. Its child-centered methodology directly related to the goals of these newly independent states to build a democratic society. Its climate of openness that invited parent participation and encouraged teachers to make decisions matched the spirit of the revolutionary movement in progress.

Change in well-entrenched, bureaucratic systems are slow and difficult to effect. Yet Step by Step appears to have galvanized the energies of diverse adults and propelled them into an organization that is implementing sweeping changes. By identifying the young child as the lever for change, parents, teachers, administrators, and local authorities seem to have been drawn into a movement that began with the education of young children but could, with time, influence and alter many social institutions. By concentrating its reform efforts on children in the earliest levels of schooling, the Step by Step model is strategically designed to leverage change by building momentum that will gather force as children move through the educational system.

The importance of child-centered, participatory learning programs for promoting democratic behaviors among young children, and the emphasis on family and community participation, suggest an important learning opportunity within ENI countries about the role of education in fostering local empowerment. The program may offer a model for encouraging community initiative to meet social needs. The involvement of local research institutions with the program offers the possibility to create an institutional capacity for assessing the programs and incorporating the findings into pedagogical practice.

[4] UNICEF (1999). *The State of the World's Children.* Accessed from the World Wide Web on 23 February 1998 at http://www.unicef.org/sowc99e.pdf

METHODOLOGY

To evaluate the impact of Step by Step, we used multiple methods including a quasi-experimental design and qualitative approaches. Quasi-experimental methods were used to compare two types of programs—Step by Step and traditional kindergartens—on measures of program quality and children's learning.

During the initial start-up of the evaluation, EDC's research team worked closely with the staff of CRI and the Step by Step leadership within each of the four host countries: Bulgaria, Kyrgyzstan, Romania, and Ukraine. We worked together to refine the study questions and gather preliminary data so that the methods and instruments used could effectively assess the program's impact. We also recruited four highly qualified in-country research coordinators who served as essential collaborators throughout the entire research effort. We collaborated on the study design, instrument selection and adaptation; research coordinators also monitored the quality of data collection.

We devised research methods and instruments to address the following research question:

Are the educational performance and developmental progress of Step by Step children comparable to those of children in traditional programs?

- How do children compare on mathematical, literacy, problem solving, and creative measures?

Instrumentation and Data Collection

EDC worked closely with CRI in the early stages of the project to refine the study design and to prepare draft instruments for the initial wave of data collection. Because kindergartens in all four countries close or alter their program content for the summer months, it was critical to finalize child assessment and collect these data by early June 1998. After examining more than 20 instruments, EDC identified three child assessment instruments that were appropriate assessments

for the constructs to be measured and could be adapted for use in all four countries. Since we were unable to locate a commercially available instrument to assess key components of early literacy, we adapted a tool we had developed for our ongoing program of domestic research in early childhood.

While we shared our initial thinking about study instruments with research coordinators, the careful examination of possible instruments and the resulting decisions occurred in a cross-country research meeting Bucharest, Romania in April 1998. This face-to-face meeting and subsequent gatherings were important for establishing critical understandings among our international team of researchers.

To ensure the validity of the child assessment instruments, each research coordinator conducted a pilot test of the instruments and its adaptations. The pilot involved assessing children in both Step by Step and traditional programs and evaluating the results in conjunction with the U.S. research team. Pilot test data led to adaptations of all child and classroom instruments, which were implemented and monitored by U.S. researchers. All tools were translated into Bulgarian, Kyrgyz, Romanian, Russian, and Ukrainian.[5] The Russian versions were used both in Ukraine and Kyrgyzstan where there are large Russian-speaking populations. Translated versions were reviewed by educational experts within each country to ensure that the constructs were accurately represented.

In spring 1998, research coordinators hired data collectors to administer child assessments. Because participation in the study offered the chance to learn new applied research methods, research coordinators were able to recruit an unusually skilled cadre of data collectors for this effort, including faculty from prestigious universities. In Ukraine, for instance, several notable developmental psychologists served in this capacity; in Bulgaria, graduate students competed for data collector positions.

[5] OSI New York provided the necessary funds for these translations.

Although recruitment was highly successful, research coordinators in all four countries trained a greater number of candidates than actually would be needed. In this way researchers had the opportunity to select individuals who demonstrated the best understanding of the methods and who were able to reliably conduct the assessments. Data collector training was divided into two five-day segments the first of which was training for the child assessment instruments. Training was conducted onsite in each country by a team composed of a U.S researcher and the local research coordinator. In addition to a thorough review of conceptual underpinnings of the study design, our training involved using the instruments with children in actual classrooms. We also had extensive conversations about scoring decisions, which helped us identify which of the trainees were best qualified to carry out the data collection activities.

While onsite in host countries, we also worked closely with local research coordinators to review procedures for random selection of child sample, set up systems for data management, and design mechanisms for quality control during data collection.

Child and Classroom Data Collection and Analysis

Data collection occurred primarily during May 1998 in five locations in each of the four countries. During this period child assessment batteries were completed on 587 children. Research coordinators traveled with data collectors and worked with them to resolve problems encountered, to monitor their efforts, and to review score sheets. Research coordinators also debriefed with data collectors as they returned their material. Score sheets were reviewed, inventoried, and sent to EDC for data entry. Once received in the U.S., data were checked, prepared for entry, double entered, and cleaned by EDC research assistants.

We primarily used analysis of variance and analysis of covariance models to compare group means from Step by Step and traditional groups. Statistical significance and confidence intervals were calculated to assist with the process of statistical inference. Effect size measures were calculated (η^2 and/or Cohen's d)

when practical to assess the size and importance of the differences between groups. For categorical variables, contingency table analysis was used to compare percentages for the Step by Step groups and traditional groups. Pearson χ^2 tests were used to test statistical significance, and phi and Cramer's phi statistics to measure effect size. Occasionally missing data reduced the Ns reported below, though missing data were minimal throughout the study.

A second cross-country meeting was held in Budapest, Hungary in November 1998 to discuss and interpret the preliminary results from the first phase of data collection.

Limitations of Research Design

Undertaking an international research effort of this scope in less than a 12-month period was a challenge. Because of the time and logistical constraints, our ability to answer the key question about the program's impact on children is limited for three main reasons. First, we were only able to collect data at one point in time. It would have been preferable to collect data at two or more points in time to enable us to determine the amount of growth children made while in kindergarten. Second, we had very little information about children's families, leaving open the possibility that children in Step by Step and traditional classrooms came from different kinds of homes. We attempted to control for this problem by drawing our two groups of children from the same schools and by identifying the child's home language and their ethnicity. Also, we used a random selection procedure to ensure as much comparability as possible between the two groups. Nonetheless, there could be systematic biases in the selection of families whose children attend one type of kindergarten or another. Third, we had no tests with norms for the countries where we were collecting data; therefore we could not compare the developmental status of children we were testing with expected developmental levels for the country.

STUDY SAMPLE

City/Kindergarten Sample

In order to select our sample, we gathered data from each country team regarding the location and characteristics of kindergartens that first adopted the Step by Step methodology when the program was introduced. In each country, there were between seven and ten kindergartens in the initial wave of funding in 1994 and 1995 and we elected to examine five of these in each country. Each kindergarten had both initial Step by Step classrooms as well as expansion classrooms. Expansion classrooms were added after the first year of operation and received less resources for start-up than did initial Step by Step classrooms. To select the five cities and, therefore Step by Step kindergartens, we considered a number of factors including: the urbanicity of the city/town, its distance from the central office of the country team, geographic diversity, and presence of ethnic minorities in the population.

The sample consisted of children from five Step by Step and five traditional kindergartens in each of the four countries (see Table I.1 below). Traditional kindergartens were selected from the same city and neighborhood, where possible, and were also matched according to the characteristics mentioned above. With the exception of one kindergarten in Ukraine, two initial classrooms and two expansion classrooms were selected from each of the five Step by Step kindergarten sites in each country.[6] Two classrooms were also selected from five traditional kindergartens in each country. Thus, children were selected from a total of 10 kindergartens (30 classrooms) per country or a total of 40 kindergartens and 120 classrooms across countries.

[6] In one of the five cities in Ukraine, expansion classrooms had to be selected from a nearby Step by Step program that was closely matched to the initial kindergarten program.

Table I.1: Kindergarten, Classroom, and Child Samples

	Per Country		Overall	
	Step by Step	**Traditional**	**Step by Step**	**Traditional**
Number of kindergartens	5 (6)[a]	5	21	20
Number of classrooms per kindergarten	4 (2 initial; 2 expansion)	2	–	–
Total number of classrooms	20 (10 initial; 10 expansion)	10	80 (40 initial; 40 expansion)	40
Total number of children	70[b] (83)	70 (84)	293	294

In order to be included in the sample, Step by Step kindergartens met the following criteria:

- They contained at least two Step by Step initial classrooms, that is classrooms that have been using the Step by Step methodology since the inception of the program in the country.
- More than 50 percent of the children in the initial classrooms participated in Step by Step for at least two years.
- Children in initial Step by Step classrooms ranged in age from five to seven years old.
- Teaching staff in initial Step by Step classrooms had been employing the Step by Step methodology for at least a two-year period.

When possible, we selected Step by Step kindergartens that had at least two expansion classrooms serving children within the specified age range. When kindergartens in the sample contained more than two initial and/or expansion classrooms, we randomly selected those classrooms that were included in the study.

[a] Numbers in parentheses indicate sample size in Ukraine.
[b] Seven per classroom, on average. Children in expansion classrooms were not part of this study.

Child Sample

The child sampling plan was to include 140 children from each of the four countries—70 from initial Step by Step and 70 from traditional classrooms, for a total of 560 children. Because Ukraine included additional children in the sample—83 children from Step by Step classrooms and 84 children from traditional classrooms—it brought the total to 587 children across all four countries. Children were selected according to a stratified, randomized method with gender being the criterion for stratification. This sample size was selected because it enabled us to detect moderate effect sizes, i.e., those that are educationally relevant. See Tables I.2 and I.3 for a presentation of child demographics.

Table I.2: Child Demographics—Gender

	Step by Step		**Traditional**	
	N	%	N	%
Male	138	48	129	44
Female	152	52	162	56
Total	**290**[a]	**100**	**291**	**100**

[a] Relevant data not available for three children from each condition.

Table I.3: Child Demographics—Age

	Step by Step		Traditional	
Age (yrs)	N	%	N	%
4	12	4	21	7
5	81	28	90	31
6	147	50	145	49
7	53	18	38	13
Total # of Children	**293**	**100**	**294**	**100**
Mean Age	**5.82**		**5.68**	

STUDY INSTRUMENTS

To address the research questions, we used child assessments in the areas of numeracy, literacy, and creative thinking. A more detailed description of study instruments and their psychometric properties can be found in Appendix I. Instruments developed specifically for this study can be found in Appendix II.

Child Assessments

Test of Early Mathematics Ability, Second Edition (TEMA-2)[7]. The TEMA-2 is a commercially available instrument, specifically designed to assess the mathematical thinking skills of young children who may not yet be readers. It measures informal mathematics awareness (e.g., relative magnitude concepts, counting skills) and also assesses children's abilities in formal mathematics (e.g., knowledge of conventions, number facts, calculation skill).

Emergent Literacy Assessment (ELA).[8] EDC developed the ELA to assess various aspects of children's progress in early literacy development in four areas: 1) Letter Identification, 2) Emergent Writing, 3) Early Reading, and 4) Print Concepts and Reading Comprehension.

Adapted Peabody Picture Vocabulary Test, Third Edition (PPVT-III).[9] The PPVT-III was adapted to assess children's receptive vocabulary.

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[7] Ginsburg, H.P. & Baroody, A.J. (1990). *Test of Early Mathematics Ability, Second Edition.* Austin, TX: PRO-ED.

[8] The ELA was an adaptation of the Early Literacy Profile developed by David K. Dickinson and Carolyn Chaney, ©Education Development Center, Inc., 1998 with permission of the authors and publisher.

[9] Dunn, L.M. & Dunn, L.M. (1997). *Peabody Picture Vocabulary Test, Third Edition.* Circle Pines, MN: American Guidance Service, Inc.

Torrance Tests of Creative Thinking (TTCT). The TTCT is an instrument designed to assess the important characteristics of creative thinking on the dimensions of fluency, flexibility, and originality. Due to time constraints, we used only two activities of the verbal subtest of the TTCT: Product Improvement and Unusual Uses.

CHAPTER II: IMPACT ON CHILDREN'S LEARNING

In this chapter, we will examine the progress of individual children in core academic areas. This child progress will be an important indicator that will help determine whether or not local decision makers and parents continue to support this approach to education. Step by Step recognizes this challenge and has responded by developing a pedagogical approach designed to teach children literacy and numeracy competencies along with other core knowledge valued by each country, in the context of classrooms that foster development of creativity, responsibility, and problem-solving skills.[10]

The individual child assessment part of this evaluation addressed the following research question:

> *Are the educational performance and developmental progress of Step by Step children comparable to those of children in traditional programs?*

The assessment tools used were chosen to address the most salient indicators of child progress in the core academic areas of literacy, numeracy, and language development. In addition, we used a tool that is widely employed to assess creative thinking, because one of the special features of Step by Step is its effort to nurture children's creative development. The characteristics of each instrument and their psychometric properties are discussed in more detail in Appendix I.

All of our child assessments were built on two core assumptions: 1) our tasks elicited performances that reveal information central to understanding a child's developmental level in the domain being assessed, and 2) our tasks allowed us to chart the developmental trajectory of children as they acquire skill in a given domain. That is, we expected that older children would do better than younger

[10] In our on-site visits to Step by Step programs we found that topics related to the history, culture, and artistic and musical traditions of the country are also an important feature of Step by Step kindergartens. It was evident that to some degree, a major criterion guiding selection of this material was a desire to expose children to knowledge common to all children in the country. It is well beyond the scope of this study to assess children's mastery of this country- and culture-specific knowledge.

children; therefore performance differences would reveal developmental differences in a domain. We also assumed that highly effective programs would move children through these developmental progressions more quickly than less effective programs. Given these assumptions, it was essential that we take age into account when comparing children from different programs. One way to control for age is to ensure that all children are the same age. Unfortunately, the samples drawn from Step by Step and traditional programs were not consistently matched in age. We therefore used statistical methods to adjust for age in our means. As a result, all mean scores and all analyses comparing children in Step by Step to those in traditional programs take into account the effect of age differences among children in the sample for a given country.

In this chapter we make within-country comparisons, but no cross-country comparisons. We have taken this approach because the issue of interest is whether children in Step by Step programs are achieving at levels consistent with those typically seen in a given country. The success of Step by Step must be viewed in terms of its ability to use the resources and organizational systems of a given country to educate. Even if one wanted to compare across countries, there would be no psychometric basis for making cross-country comparisons using the tests we employed. Therefore, while the display of results may appear to invite comparisons among countries, it is not valid to do so.

In this chapter, we drew our sample of Step by Step children only from initial classrooms. Consequently, we present findings only from children in Step by Step initial classrooms and the comparison group in traditional classrooms.

NUMERACY

The Test of Early Mathematical Ability, Second Edition (TEMA-2), was used to evaluate both formal and informal mathematical knowledge. The informal skills measured include relative magnitude, counting, and calculation skills. These are the kinds of skills that children can acquire as they play with materials, participate in games, and engage in casual conversations with adults about their activity.

They might acquire such knowledge at home or during the course of informal kindergarten activities and conversations. The formal abilities measured include knowledge of convention, number facts, calculation skills, and base ten concepts. Children are more likely to acquire these capacities through direct instruction; thus they are more likely to acquire them in school. In the test, more informal items appeared earlier, and formal items later. However, even five- and six-year-old children encountered some of both kinds of items.

Because the score a child receives reflects performance on a composite set of items, it is difficult to interpret raw scores. In the U.S. raw scores are given meaning by relating them to age norms. No such norms exist for the countries included in this study, but it is reasonable to expect that children in other countries acquire the mathematical understandings tapped by the TEMA-2 in roughly the same order as U.S. children. Because we use age-adjusted means and lack country-specific norms, one cannot use these U.S. mean scores to draw conclusions about the rate of acquisition of mathematical knowledge in other countries. They do, however, provide a starting point for considering cross-national developmental pathways in mathematics learning. Therefore, Table IV.1 displays patterns of performance reflected by different total scores. These allow the reader to attach some meaning to the raw scores. The points along the continuum describing score profiles correspond to the score achieved by an average U.S. child between the ages of four and eight. It should be noted that the linkage between these average profiles and any given child's actual performance is only approximate, because children will vary in the items they pass and those they miss as they approach a ceiling. Nonetheless, this chart provides some guidance regarding overall patterns of development.

Table IV.1: TEMA-2 Profiles

Score	Performance Profile
13 U.S.: 4 year old performance	**Informal** *Counting.* Counts up to 10 objects; enumerates up to 5 objects **Formal** *Conventions.* Reads single-digit numerals
23 U.S.: 5 year old performance	**Informal** *Counting.* Forward in the 20's and 30's; backwards from 10 to 1; enumerates 9 and 10 dots on a card *Calculation.* Up to 2 + 5 pennies being combined in a hand *Relative magnitude.* Single-digit proximity on a number line (e.g., 5: closer to 1 or 7?; 3: closer to 1 or 6?)
31 U.S.: 6 year old performance	**Informal** *Counting.* Forward to 42; by 10's until 90 *Relative magnitude.* Double-digit proximity on a number line (e.g., 32: closer to 24 or 61?) **Formal** *Conventions.* Writes numbers in the teens; reads double-digit numbers
39 U.S.: 7 year old performance	**Informal** *Counting.* Backwards starting at 20; by tens up to 160 **Formal** *Number facts.* Rapid recall of facts (2 + 2; 3 + 4; 6 + 3) *Conventions.* Writes three-digit numerals
46 U.S.: 8 year old performance	**Informal** *Counting.* Continues sequences over 100 started by examiner (e.g., "161, 162, ...") **Formal** *Number facts.* Addition facts (8 + 8, 7 + 7); subtraction (8 - 4, 12 - 6) *Base Ten.* Number of $10 bills in $100? $100 bills in $1000? (local currency was used) *Conventions.* Writes three-digit numerals *Calculation.* Adding without carrying (23 + 15, 64 + 32)

Bulgaria

In Bulgaria there were no significant differences between the performance levels of children in the Step by Step program (Mean = 25.9, SD = 9.5) and children in traditional programs (Mean = 28.01, SD = 10.42). These overall mean scores indicated that children are performing at similar levels and acquiring skills such as counting in the twenties, enumerating 10 objects, and using a number line to determine the relative proximity of a single-digit numeral (e.g., 5) to two others (e.g., 1, 7). While differences between the two types of kindergartens were not statistically significant, inspection of graphs depicting the frequency data (see Figures IV.1a and IV.1b), revealed a somewhat greater incidence of scores at the lower end of the continuum among children from Step by Step classrooms. Of all children assessed in Step by Step classrooms, 45 percent scored 22 points or less; whereas 30 percent of the children from traditional programs received such scores.

Figure IV.1a: TEMA-2
Bulgaria: Step by Step (n=70)

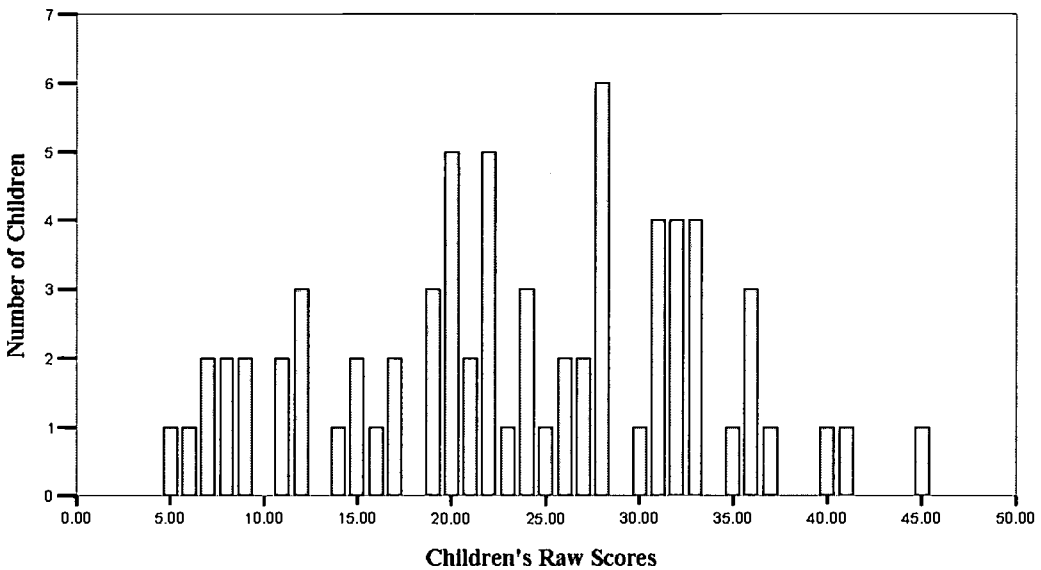
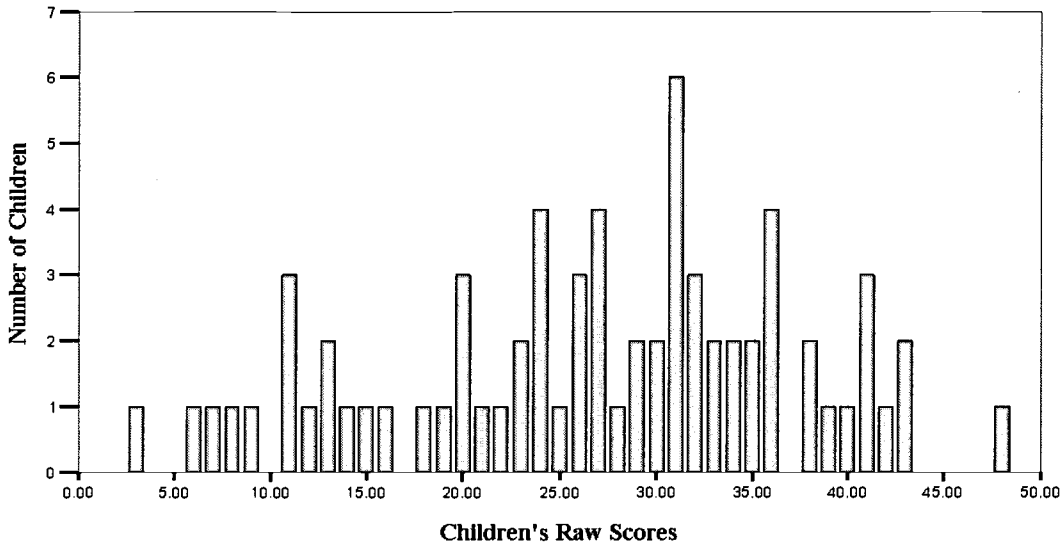


Figure IV.1b: TEMA-2
Bulgaria: Traditional (n=70)



Kyrgyzstan

In Kyrgyzstan, the mathematical achievement of children in Step by Step programs (Mean = 32.30, SD = 7.88) was significantly higher ($p < .001$) than that of children in traditional kindergartens (Mean = 26; SD = 8.67). The size of these differences was dramatic, as indicated by the very large effect size of .761. An effect size of this magnitude is very rare in educational research and indicates that the difference observed is not only statistically significant, but is of considerable educational importance. Another way to consider these differences is in developmental terms. In the United States the point differential observed between the two programs (8.3 points) is roughly equal to the point difference seen between children of two different ages (7.9 points between five and six, 8.2 points between six and seven).

If we examine Table IV.1, we can get a qualitative sense of the performance levels of children in these two types of kindergartens. Children in Step by Step programs could count into the forties and by tens and demonstrate varying skills with double-digit numbers—reading and writing, determining their relative magnitude—while, in general, children in traditional programs demonstrated skills with single-digit numbers and could count in the twenties.

Figures IV.2a and IV.2b provide yet another way to understand the differences between children in these two programs. Far more children in traditional kindergartens received very low scores, with 23 percent of the sample receiving scores of 15 and below; no child in Step by Step received such a score. Similarly dramatic differences were apparent at the high end of the continuum, with 34 percent of the children in Step by Step receiving scores of 40 and above, compared with only 4 percent of the children in traditional kindergartens. In essence the Step by Step program appears to have resulted in considerable gains across the entire developmental spectrum, boosting achievement of children at the lower end and raising that of more able children.

Figure IV.2a: TEMA-2
Kyrgyzstan: Step by Step (n=70)

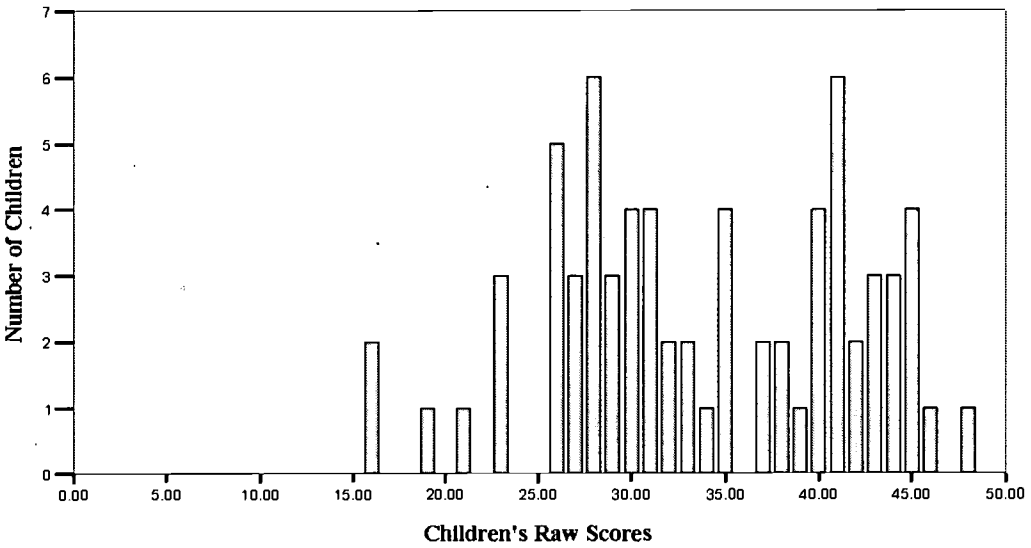
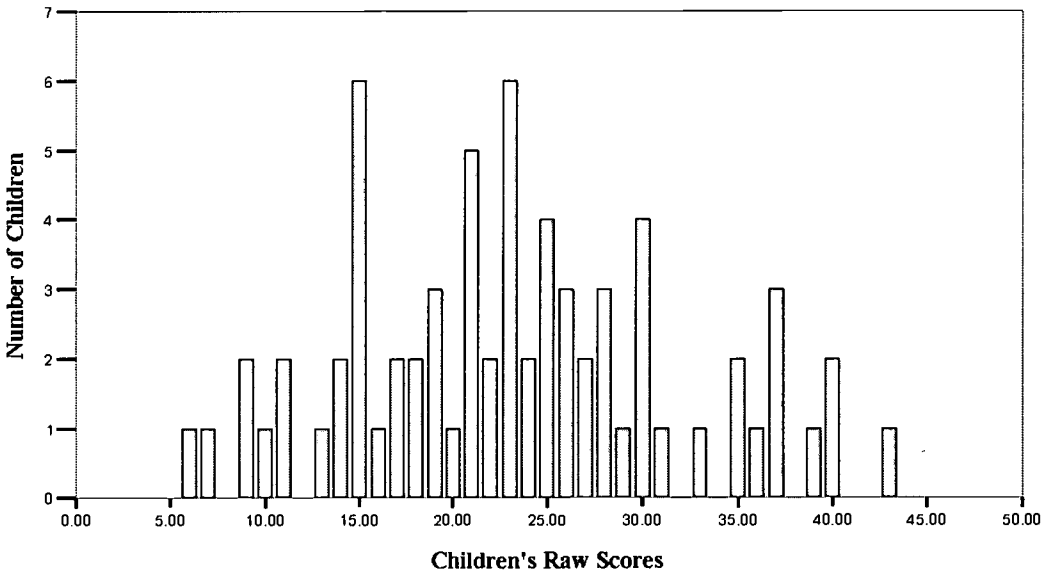


Figure IV.2b: TEMA-2
Kyrgyzstan: Traditional (n=69)



Romania

In Romania the performance of children in Step by Step programs (Mean = 28.18, SD = 8.15) was significantly stronger ($p < .05$) than that of children in traditional kindergartens (Mean = 25.63, SD = 7.13). The effect size of .334 indicated moderate differences that are large enough to be of educational importance. As indicated in the figure describing performance levels, we see that children in both types of programs are gaining skill counting in the twenties. In addition, children in both types of programs are beginning to know simple addition facts and have a sense of the relative magnitude of single-digit numbers. More advanced children are gaining skill reading and writing numerals.

Graphs of scores presented in Figures IV.3a and IV.3b reveal interesting differences at both ends of the developmental continuum. Scores of 23 or less were received by 44 percent of the children from traditional programs but by only 23 percent of the Step by Step children. Conversely, scores of 35 and higher were received by 24 percent of children from Step by Step programs and only 13 percent of the children from traditional programs. Thus, in comparison to the traditional kindergartens, the Step by Step program appears to be somewhat more successful in raising the performance of children with less advanced understanding of mathematics while also supporting growth of more advanced students.

Figure IV.3a: TEMA-2
Romania: Step by Step (n=70)

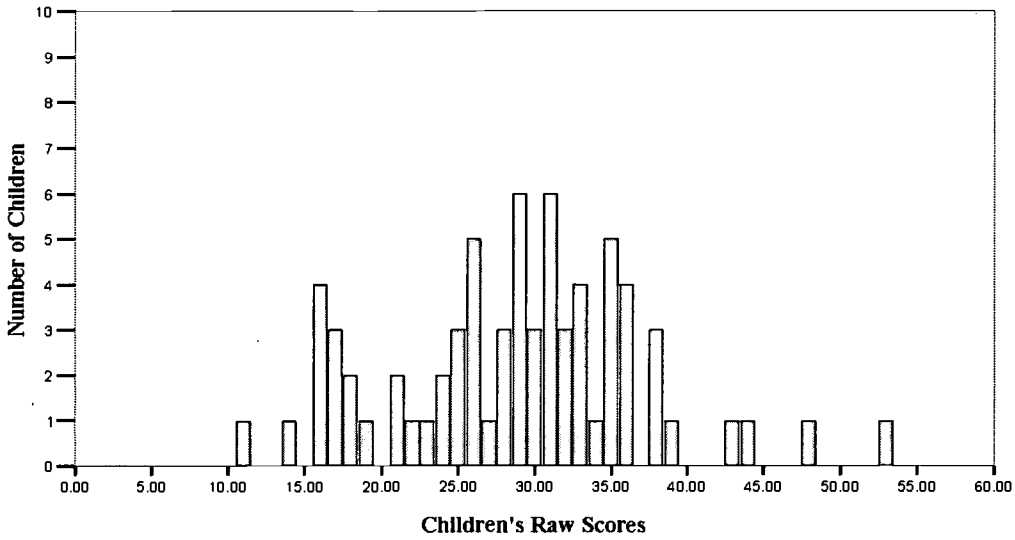
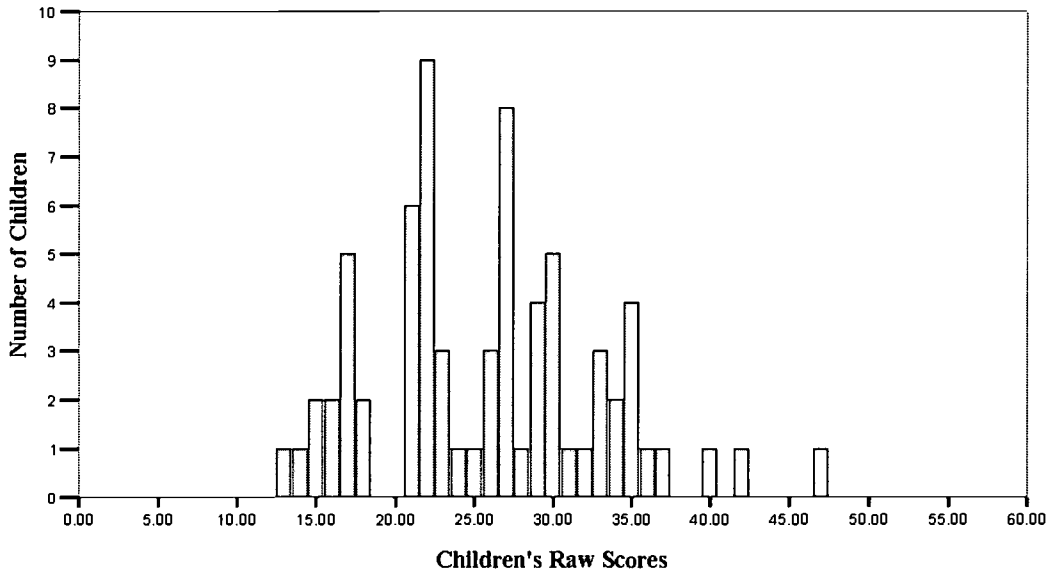


Figure IV.3b: TEMA-2
Romania: Traditional (n=70)



Ukraine

In Ukraine, Step by Step children's mathematical achievement was significantly higher than that of children in traditional programs ($p < .001$). The difference between scores of children in Step by Step kindergartens (Mean = 34.96; SD = 10.79) and those in traditional kindergartens (Mean = 28.92; SD = 8.98) was very large, as indicated by the effect size of .611, an effect size that is rarely seen in educational research. From Table IV.1 one can note the differences between average performances of Step by Step children and those from traditional programs. On average, Step by Step children displayed a more advanced sense of the relative magnitude of double-digit numbers and have made more progress in acquiring conventional mathematical skills related to knowledge of number facts and reading and writing double-digit numbers.

The graphs displaying frequencies of different scores (Figures IV.4a and IV.4b) reveal the impact the Step by Step program made at both ends of the developmental continuum. Relatively low scores of 26 and lower were three times as frequent for children in traditional classrooms (37 percent) as for children from Step by Step classrooms (13 percent). Conversely, scores of 41 and higher, at the top of the developmental continuum, were nearly three times more frequent among children from Step by Step programs (31 percent) than among children from traditional programs (11 percent). Thus, the Step by Step program is more successful in supporting development of children across the developmental continuum.

Figure IV.4a: TEMA-2
Ukraine: Step by Step (n=83)

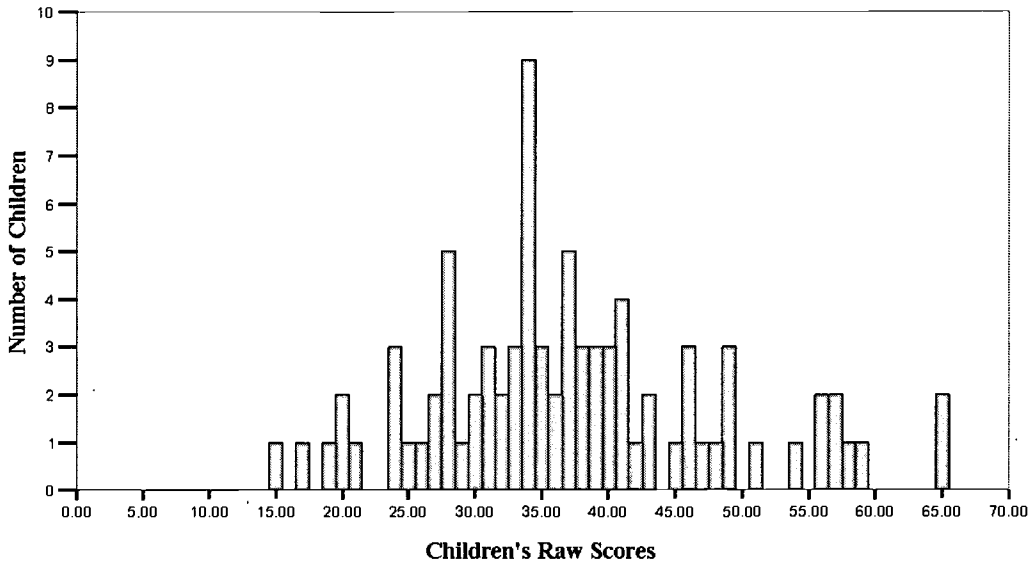
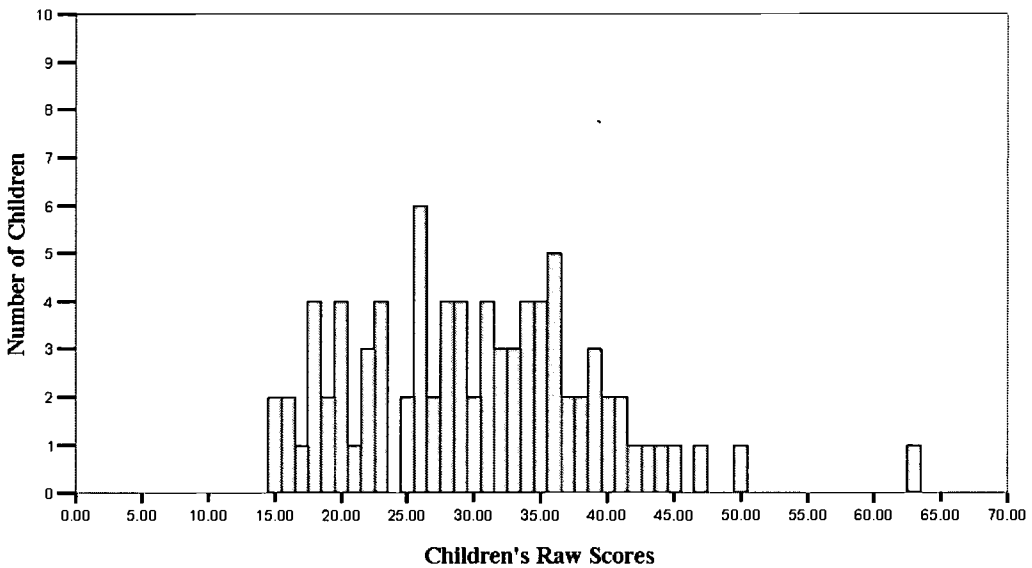


Figure IV.4b: TEMA-2
Ukraine: Traditional (n=84)



LITERACY

A central objective of schools that serve children between the ages of five and eight is to help them learn to read and write. Research in the U.S. has established the fact that children's early literacy development is a strong predictor of future academic performance. Literacy learning has also been a high national priority in all four countries we studied. Therefore, it is important that Step by Step programs support children's literacy development during these critical early years. Considerable research by developmental and cognitive psychologists has established that literacy development, especially during the early years, is multifaceted. While reading and writing appear to be distinct skills, both draw on a common core of knowledge that children are constructing. This core of knowledge includes oral language in addition to more typical literacy-related knowledge (e.g., letter recognition, decoding, spelling). Our task, therefore, was to assess children's early literacy development broadly. To this end we used a broad-gauged assessment of early literacy, the Emergent Literacy Assessment (ELA) and a receptive vocabulary test. The ELA is divided into four subtasks: *Letter Identification, Emergent Writing, Early Reading,* and *Print Concepts and Reading Comprehension.* The receptive vocabulary tool was an adaptation of the Peabody Picture Vocabulary Test, Third Edition (PPVT-III). We worked closely with team members as we devised tools appropriate for local circumstances.

To provide the reader with a more qualitative sense of the results from each country, Table IV.2 describes what each ELA subtest involves and the number of points required to receive full credit. For each subtest we have clustered scores into rough groupings and have indicated the general developmental level associated with each cluster. These clusters are provided simply to help the reader conceptualize the relative developmental level of the "average" child.

Table IV.2: Contents of the Emergent Literacy Assessment (ELA)

Subscale OVERALL TEST	Scoring *TOTAL poss.: 76 pts.*	Prompts	Range
Letter Identification Subscale	***total possible: 24 pts.***		
(8 upper case, 4 lower case letters)	2 points for naming letters and 1 point for pointing to letter named by assessor	"What letter is this?" *(letter naming)* "Can you show me the B?" *(letter identification)*	*4–8: Emergent* beginning to note letters of special interest *9–14: Early Mastery* familiar with several letters, name some on demand *15–22: Advanced* identifies and names many letters *23–24: Expert* solid letter knowledge
Emergent Writing Subscale	***total possible: 22 pts.***		
Name Writing *(writes own name)* ***Own Word Writing*** *(writes 2 words of own choosing)* ***Spelling*** *(writes 3 words)*	*total possible: 4 pts.* intends to write name, correct letters used *total possible: 9 pts.* directionality (2 pts.), grasp (1 pt.), spelling accuracy (9 pts). *total possible: 9 pts.* spelling accuracy	"Show me how you write your name." "What did you write?" "Show me how you wrote it." "Please write … Spell it the best way you can."	*2–5: Early Emergent* early sense of how writing is organized and what is expected when one is asked to write *6–8: Emergent* knows some conventional forms associated with familiar words *9–12:Early Conventional* associating initial sounds to symbols, some known words *13–18: Advanced* associating final and some medial sounds to symbols *19–22: Expert* grasp of sound-symbol correspondence for words in early writing repertoire
Early Reading Subscale	***total possible: 9 pts.***		
(reads own name and 8 more words of increasing difficulty)		"Can you tell me what this says?"	*1: Emergent* can only read own name *2–4: Early Conventional* some sight words *5–7: Advanced* associating intial sounds to symbols; early decoding skill *8–9: Expert* grasp of how to approach decoding; skill with initial reading vocabulary
Print Concepts and Reading Comprehension Subscale	***total possible: 21 pts.***		
Book & Print Concepts ***Comprehension***	*total possible: 10 pts.* Book concepts (4 pts.) (handling, author) Directionality (2 pts.) Word/letter concept (2 pts.) Written-spoken word matching (2 pts.) *total possible: 11 pts.* literal recall (5), inferential (6)	How book is held. "What did (author) do?" Which way do you go when reading? "Show me a word." Read and finger point "What happened first? Second?" "What do you think is going to happen?"	*4–8: Early Awareness* Some sense of book use, limited understanding of story line *9–13: Developing Reader* General sense of book use and print conventions; able to follow major thread of simple story line *14–18: Experienced Reader* Grasps basic print concepts; follows story line including most inferences *19–22: Veteran Reader* Solid grasp of print concepts; skilled at recalling details and inferring critical information

Bulgaria

Children in Step by Step and traditional programs scored at comparable levels in acquisition of literacy skills. Receptive vocabulary scores were not significantly different, and on the ELA, children's overall and subtest scores were also comparable. Table IV.3 shows that, on average, children in both settings demonstrated "advanced" letter identification skill, indicating that most children could name several letters and point to others. The writing mean scores of 14 placed children of both groups at the low end of the "advanced" grouping, reflecting ability to write some familiar words and beginning ability to sound out others. The word reading scores of 4 placed children near the top of the "early conventional" band, indicating that children are beginning to read some familiar words and that some are associating some sounds to letters. Children's scores on the *Print Concepts and Reading Comprehension* subscale suggested that, on average, children have a basic grasp of how books work and are developing some skill in understanding the vocabulary and following the plot line of a story. Thus, children in both programs are beginning to acquire knowledge required for reading and writing, and are just beginning to solidify basic understanding required for conventional reading and writing.

Table IV.3: Literacy Findings—Bulgaria

	Step by Step			Traditional			
ELA	**Adj. Mean**	**SD**	**n**	**Adj. Mean**	**SD**	**n**	**Cohen's d**
Letter Identification	17.9	6.99	69	16.76	7.70	70	.155[a]
Emergent Writing	14.33	7.26	69	13.66	8.58	70	.085[a]
Early Reading	3.95	2.97	69	4.11	3.25	70	-.051[a]
Print Concepts and Reading Comprehension	15.16	3.61	69	14.68	4.94	70	.112[a]
Total	**51.76**	**18.58**	**69**	**49.65**	**21.72**	**70**	**.105[a]**
PPVT	83.40	27.73	70	86.23	32.13	70	-.095[a]

[a] Not statistically significant

While differences between Step by Step and traditional kindergartens are not significant overall, frequency graphs suggest some potentially interesting differences in how these two kinds of programs support children's growth (see Figures IV.5a and IV.5b). Interestingly, different patterns appeared at the two extremes. If we look at children who received overall scores of less than 20 (a total score reflecting very limited grasp of literacy conventions), we find 14 children in traditional programs with such scores as opposed to only 6 Step by Step children. It seems that Step by Step may be somewhat more able to support the growth of children who are having some difficulty acquiring basic literacy skills. On the other hand, if we examine the number of children receiving scores of 54 or above, we find both programs to be comparable. These results are based on only a small number of children, but they suggest that both types of programs are supporting literacy development of many children. However, traditional programs may have difficulty meeting the needs of children in need of special support.

Figure IV.5a: ELA
Bulgaria: Step by Step (n=70)

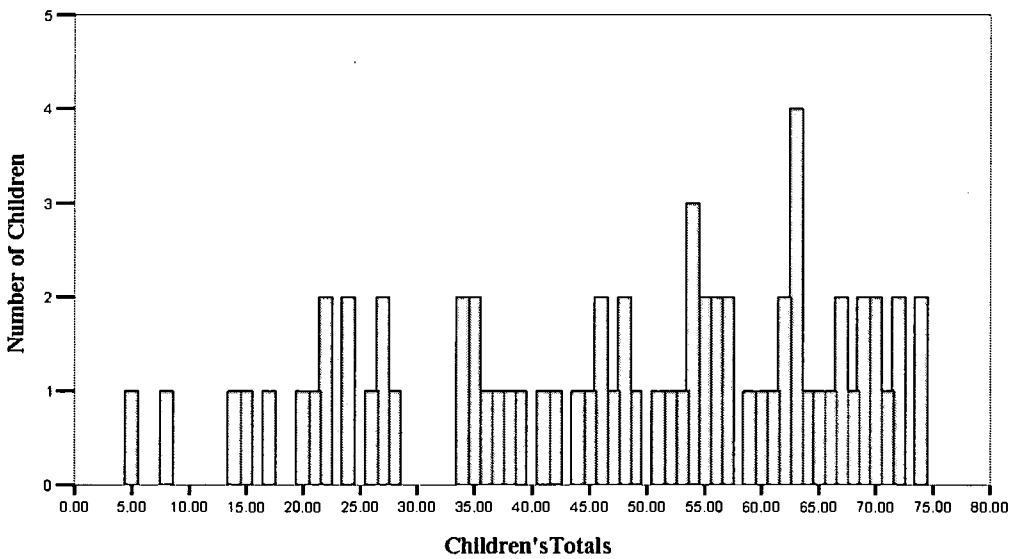
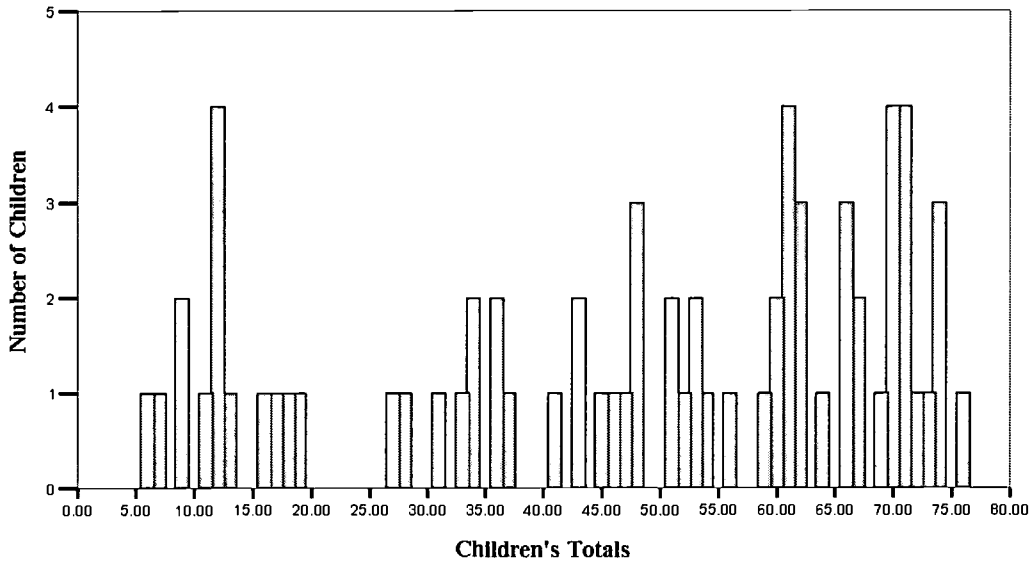


Figure IV.5b: ELA
Bulgaria: Traditional (n=70)



Kyrgyzstan

In Kyrgyzstan, Step by Step kindergartens have had considerably more success than traditional kindergartens in supporting children's literacy development. Dramatic differences were seen on children's receptive vocabulary scores (adapted PPVT), with children in Step by Step programs receiving raw scores that averaged 20 points higher than children in traditional programs. Similar dramatic differences were evident on the ELA, with Step by Step children's average scores (Mean = 60.37; SD = 15.76) far surpassing the total mean scores received by children in traditional programs (Mean = 40.32; SD 26.23). A quantitative expression of the difference is the enormous effect size of .955.

If we examine the ELA subscales, we can understand the meaning of these differences in mean scores. On the *Letter Identification* subscale, children in Step by Step were solidly in the "advanced" score band, whereas children in traditional kindergartens fell into the "early mastery" band. Similarly, on the *Emergent*

Writing subscale Step by Step children displayed "advanced" skills, whereas children in traditional programs were just beginning to construct conventional understandings of print. Similarly, on the *Early Reading* and *Print Concepts and Reading Comprehension* subscales, Step by Step children were a full score band above children in the traditional kindergartens. Thus, across all dimensions of early literacy, children in Step by Step programs were significantly ahead of children in traditional programs in literacy and language development.

Examination of frequency data in Figures IV.6a and IV.6b sheds light on the source of these enormous differences between the two kindergarten models. Thirty-two children in the traditional kindergarten sample (46 percent) received low total scores which fell below 20. In Step by Step classrooms only three children, 4 percent of the sample, received such low scores. Conversely, strong scores of 61 or higher were received by only 19 children in traditional classrooms (27 percent of the sample), but by 44 Step by Step children (63 percent). The bimodal distribution seen among children from traditional programs suggests that some children, perhaps those who enter school with home support for literacy, have benefited from the traditional approach employed, whereas many other children have made limited progress.

Table IV.4: Literacy Findings—Kyrgyzstan

	Step by Step			Traditional			
ELA	Adj. Mean	SD	n	Adj. Mean	SD	n	Cohen's d
Letter Identification	19.44	6.79	69	13.18	8.80	70	.803[b]
Emergent Writing	16.08	6.40	69	9.48	8.94	70	.860[b]
Early Reading	6.83	2.94	69	3.72	3.66	70	.942[b]
Print Concepts and Reading Comprehension	17.14	3.65	69	12.35	4.35	70	1.12[b]
Total	**60.37**	**15.76**	**69**	**40.32**	**26.23**	**70**	**.955[b]**
PPVT (Adapted)	91.61	30.03	70	71.44	31.56	70	.655[b]

Statistical significance:

(a) $p < .001$
(b) $p < .0001$

Figure IV.6a: ELA
Kyrgyzstan: Step by Step (n=70)

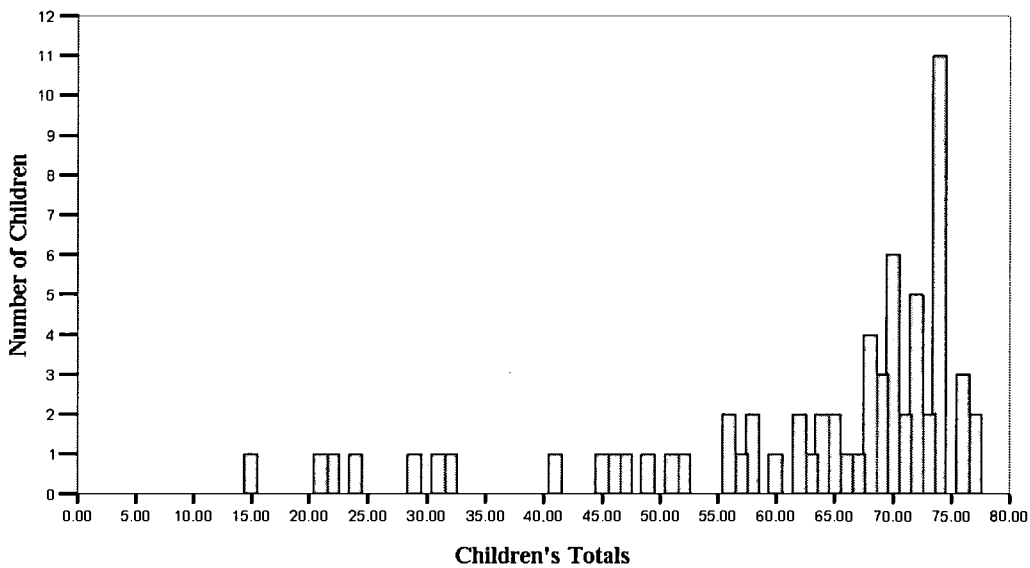
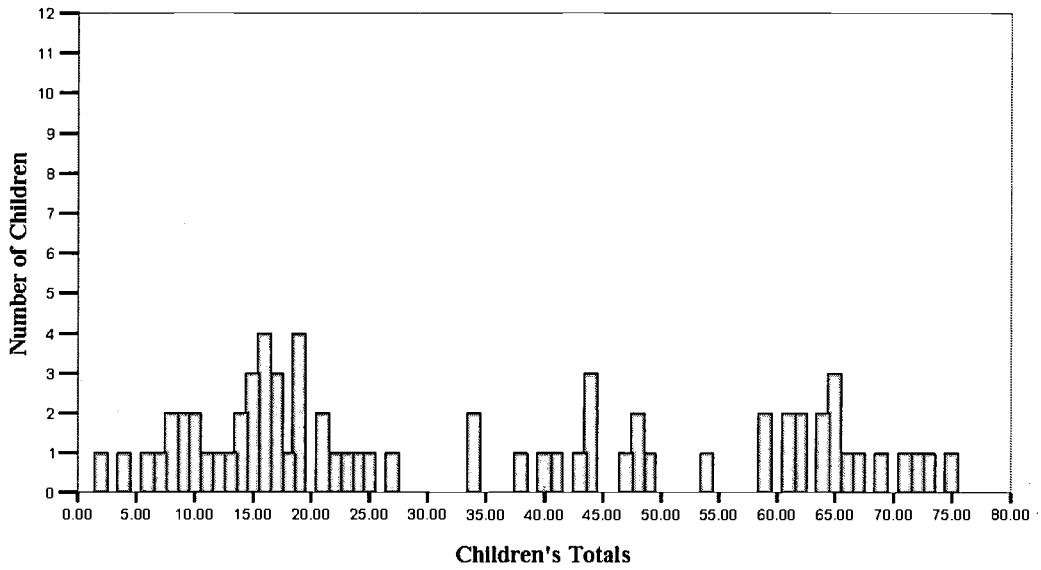


Figure IV.6b: ELA
Kyrgyzstan: Traditional (n=69)



Romania

Children in Step by Step and traditional kindergartens in Romania are making comparable progress toward acquiring early literacy skills. Mean scores on the receptive vocabulary test (adapted PPVT) were nearly the same (Mean = 76.6; SD = 77.2) and total ELA scores were similar (Mean = 40.7; SD = 37.4). Examination of subscales revealed comparable scores for children in both programs. On *Letter Identification,* the average scores placed children in the "early mastery" score band, indicating beginning ability to identify and name a few letters. The *Emergent Writing* scores of children in both programs placed them at the upper end of the "early conventional" band, indicating that, on average, children knew some words and were beginning to associate initial sounds of words with symbols. *Early Reading* scores also placed children in the "early conventional" score band, indicating that children could read their own name and were just beginning to be able to read other words. *Print Concepts and Reading Comprehension* results also placed children at the "developing reader" level, suggesting that they were beginning to understand how to handle books and how to follow major aspects of the story line of a book.

Table IV.3: Literacy Findings—Romania

	Step by Step			Traditional			
ELA	Adj. Mean	SD	n	Adj. Mean	SD	n	Cohen's d
Letter Identification	12.91	7.18	70	11.63	7.15	70	.179[a]
Emergent Writing	12.25	7.41	70	11.44	7.67	70	.107[a]
Early Reading	2.80	3.14	70	2.22	2.97	70	.190[a]
Print Concepts and Reading Comprehension	12.70	3.64	70	12.36	3.32	70	.098[a]
Total	**40.66**	**18.53**	**70**	**37.38**	**18.56**	**70**	**.177[a]**
PPVT (Adapted)	76.63	19.57	70	77.23	14.58	70	-.035[a]

[a] Not statistically significant

Examination of frequency data (see Figures IV.7a and IV.7b) revealed trends that suggest that the overall impact of these two approaches to education may be having differential effects that do not appear when overall means are compared. Scores below 26 were somewhat more frequent among children in traditional kindergartens (37 percent of the sample) than among Step by Step children (26 percent of the sample). Also, higher scores of 57 and greater were somewhat less frequent among children attending traditional kindergartens (19 percent of the sample) than among children in Step by Step classrooms (27 percent). It is likely that these differences in the extreme scores did not result in overall statistically significant differences, because children in the middle range showed somewhat stronger performance in traditional programs. Thus, it seems that Step by Step programs help support growth of less well-prepared children and may be nourishing somewhat more rapid development of children who start with a stronger foundation.

Figure IV.7a: ELA
Romania: Step by Step (n=70)

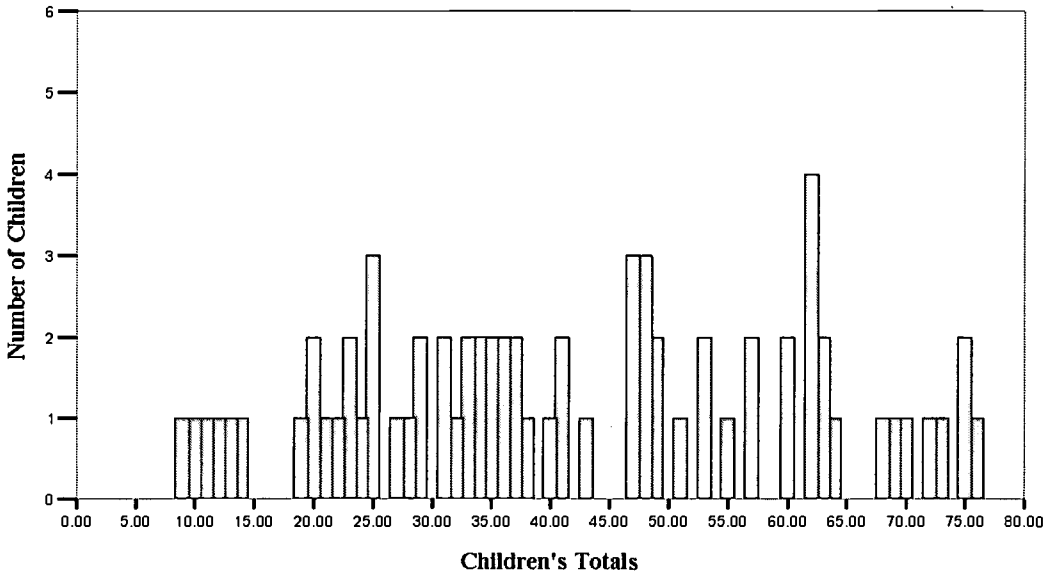
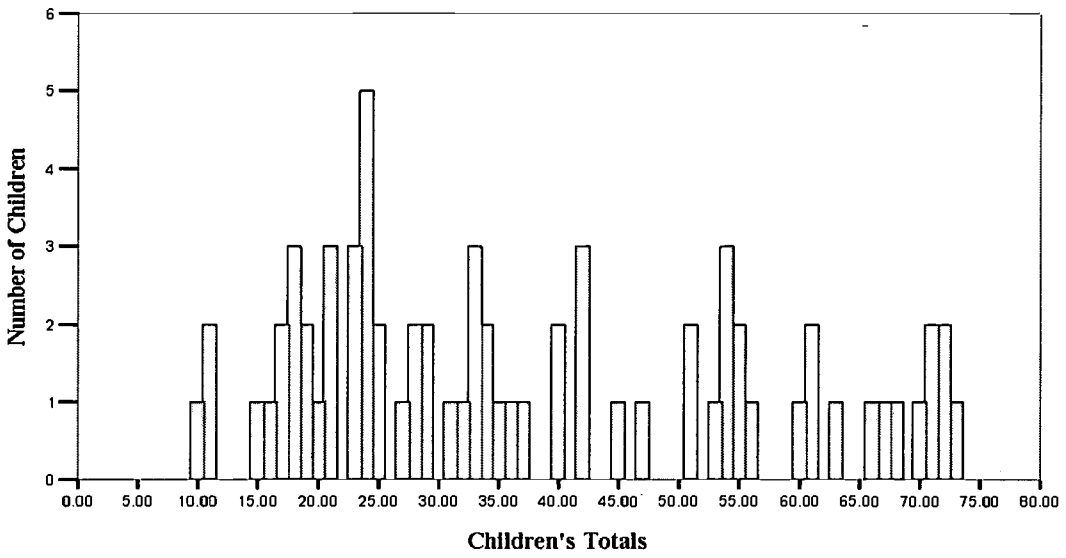


Figure IV.7b: ELA
Romania: Traditional (n=70)



Ukraine

Children in Ukraine, regardless of program type, demonstrated relatively high mean scores (Mean = 63.01; SD = 60.69). There were no statistically significant differences in ELA scores, but raw receptive vocabulary scores of Step by Step children were more than 10 points higher than those of children in traditional kindergartens, a difference that is statistically significant.

Review of the subscale scores revealed that, on average, children in both types of programs were quite skilled at *Letter Identification*. *Emergent Writing* and *Early Reading* scores were also strong, with children in traditional programs falling in the middle of the "advanced" score band and children in Step by Step programs appearing toward the upper end of this score band. Scores on the *Print Concepts and Reading Comprehension* subscale were low relative to the scores on the other subscales, with children in both programs at the low end of the "experienced reader" band. It is worth noting that children in both programs approached the ceiling score of 24. This result suggests that a larger sample or an assessment battery with more challenging items might reveal more information about children's literacy development.

Table IV.4: Literacy Findings—Ukraine

	Step by Step			Traditional			
ELA	**Adj. Mean**	**SD**	**n**	**Adj. Mean**	**SD**	**n**	**Cohen's d**
Letter Identification	22.03	2.75	83	22.32	3.19	84	-.098[a]
Emergent Writing	18.18	3.78	83	16.93	5.78	84	.261[a]
Early Reading	7.65	2.05	83	7.08	2.89	84	.231[a]
Print Concepts and Reading Comprehension	15.10	3.36	83	14.28	3.73	84	.231[a]
Total	**63.01**	**9.76**	**83**	**60.69**	**13.01**	**84**	**.204[a]**
PPVT	101.37	23.40	83	90.76	20.27	84	.486[b]

[a] Not statistically significant
[b] $p < .0083$

Frequency data in Figures IV.8a and IV.8b revealed an interesting pattern which possibly points to differential effects of the two approaches to literacy. First, both types of kindergartens appeared to be providing basic support to all children, since there were no extremely low scores (i.e., nothing below 21), and very few scores below 35. That said, it appeared that Step by Step may be somewhat more successful in ensuring that all children are making strong literacy progress. A comparison of the number of children with scores of 64 and below revealed that 37 percent of the children in traditional programs received such "average" scores; whereas only 19 percent of the children in Step by Step classrooms received such scores.

Figure IV.8a: ELA
Ukraine: Step by Step (n=83)

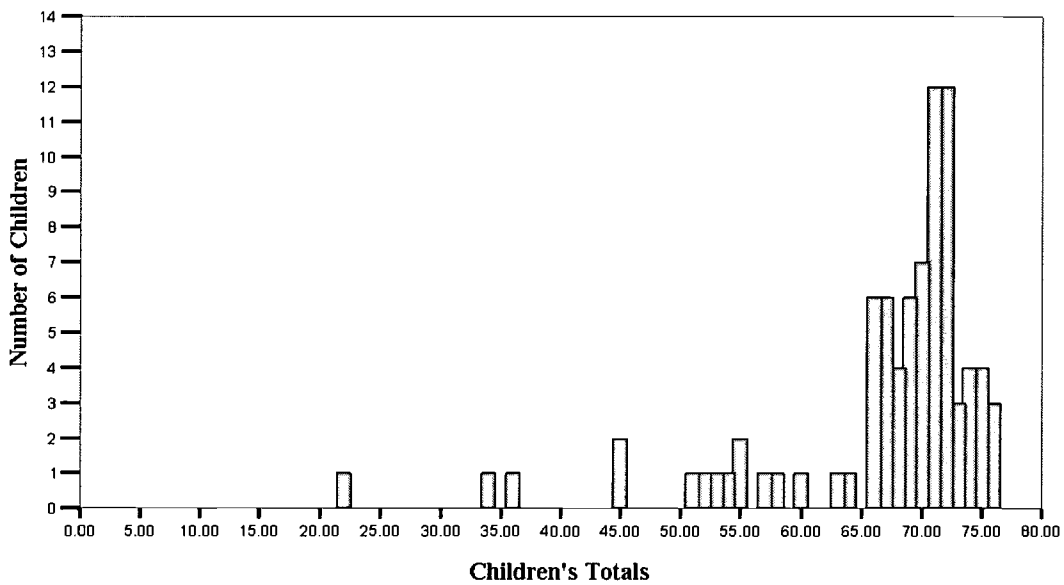
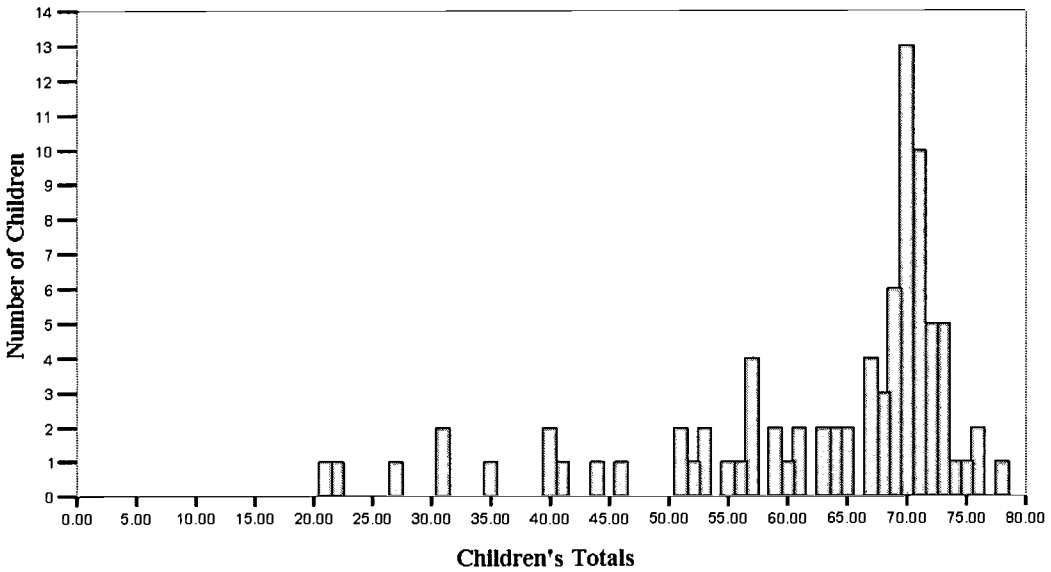


Figure IV.8b: ELA
Ukraine: Traditional (n=84)



CREATIVITY

One of the distinctive features of the Step by Step approach is its emphasis on encouraging children's creative problem solving. Although research on creativity has been done, it is extremely rare to include measures of it in a program evaluation. This is because we do not know the extent to which such measures are sensitive to performance differences that are affected by children's classroom experiences. Despite this methodological challenge, we included the best available measures of creativity in our child assessment battery. We used two subtests of the Torrance Tests of Creative Thinking; *Product Improvement* and *Unusual Uses.* Each of these tasks were scored using three scales: fluency, flexibility, and originality. Fluency assesses children's ability to generate several responses when asked, for example, what they might do with an empty box. Flexibility refers to children's ability to generate responses from a number of different categories (i.e., "candy store, airplane, telephone booth" vs. "candy store, grocery store, clothing store"). Originality refers to the child's ability to produce responses that are

deemed by the test constructors to be "unusual." For a response to be considered "unusual" it must not appear on a list of "typical" responses. Thus, across the two tasks we obtained scores on these three dimensions of verbal creativity for each child.

Bulgaria

Among children in Bulgaria, we found no significant differences between the children on any dimension for either of the subtests (see Table IV.5). However, the data did indicate an advantage of Step by Step children over children in traditional programs on the *Product Improvement* subtest. On all other dimensions, on each task children from both programs performed equally well.

Table IV.5: Torrance—Bulgaria

	Step by Step		Traditional		
	Adj. Mean	**SD**	**Adj. Mean**	**SD**	**Cohen's d**
Product Improvement					
Fluency	7.08	4.48	6.48	5.04	.126[a]
Flexibility	3.12	1.82	3.31	2.41	-.090[a]
Originality	4.54	3.27	3.87	3.65	.193[a]
Unusual Uses					
Fluency	5.78	5.77	5.80	5.01	-.004[a]
Flexibility	4.16	3.24	3.93	2.57	.079[a]
Originality	3.03	4.14	3.16	3.82	-.099[a]

[a] Not statistically significant

Kyrgyzstan

In Kyrgyzstan there were no statistically significant differences between children from Step by Step kindergartens and traditional kindergartens (see Table IV.6). While there were no significant differences, on every subscale children from Step by Step scored slightly higher than children in traditional programs. This trend was especially apparent in the fluency and flexibility items on both activities.

Table IV.6: Torrance—Kyrgyzstan

	Step by Step		Traditional		
	Mean	**SD**	**Mean**	**SD**	**Cohen's d**
Product Improvement					
Fluency	4.43	2.36	3.77	2.16	.292[a]
Flexibility	2.91	1.54	2.53	1.42	.257[a]
Originality	1.13	1.49	.87	1.05	.205[a]
Unusual Uses					
Fluency	5.67	3.74	4.56	2.05	.383[a]
Flexibility	3.61	2.08	2.95	1.30	.391[a]
Originality	1.54	1.72	1.27	1.17	.187[a]

[a] Not statistically significant

Romania

In Romania there was some evidence that children in Step by Step programs were able to be more creative than children in traditional kindergartens. On the flexibility subscale of the *Unusual Uses* task, Step by Step children performed significantly better ($p < .001$) than children from traditional classrooms, with the magnitude of these differences indicated by the educationally important effect size of .432. In addition, it is interesting to note that the mean showed a trend toward greater fluency and creativity in Step by Step children in the *Unusual Uses* task and for the flexibility subscale in the *Product Improvement* task.

Table IV.7: Torrance—Romania

	Step by Step		Traditional		
	Adj. Mean	**SD**	**Adj. Mean**	**SD**	**Cohen's d**
Product Improvement					
Fluency	5.40	3.83	5.06	3.39	.094[a]
Flexibility	3.08	1.80	2.62	1.42	.286[a]
Originality	2.71	2.48	2.3	2.29	.138[a]
Unusual Uses					
Fluency	6.11	4.95	5.01	3.28	.267[a]
Flexibility	4.06	2.77	3.08	1.77	.432[b]
Originality	2.81	3.29	2.06	2.25	.271[a]

[a] Not statistically significant
[b] $p < .01$

Ukraine

Children's scores on the *Unusual Uses* subtest provided some evidence that children in Step by Step classrooms are more creative than children in traditional programs. On their flexibility scores, Step by Step children scored significantly higher ($p < .05$) than traditional children, with this difference associated with a moderate effect size of .354. While there were no other statistically significant differences, on the other two subscales for this activity children from the Step by Step classrooms received slightly higher scores on average than did children from traditional programs.

Table IV.8: Torrance—Ukraine

	Step by Step		Traditional		
	Adj. Mean	**SD**	**Adj. Mean**	**SD**	**Cohen's d**
Product Improvement					
Fluency	3.39	2.10	3.45	2.91	.012[a]
Flexibility	2.00	1.62	2.05	2.39	-.025[a]
Originality	2.24	1.71	2.27	2.47	-.014[a]
Unusual Uses					
Fluency	5.74	4.53	4.68	3.65	.259[a]
Flexibility	2.25	1.62	1.54	2.39	.354[b]
Originality	3.96	3.31	3.12	3.08	.263[a]

[a] Not statistically significant
[b] $p < .05$

SUMMARY

Findings for Bulgaria

Across all of the child assessment tasks, children in the Step by Step program seem to be performing at the same level as children in traditional programs. However, examination of trends revealed several hints suggesting areas worthy of further investigation. When comparing children with relatively low scores and ELA from the two types of kindergartens, we found a somewhat higher frequency of low scores among children from Step by Step children on TEMA-2. In contrast, we found that there were more low scores among children in traditional programs on the ELA. These results suggest the possibility that, when working with children who come to school less prepared for academic learning, Step by Step teachers may be more effective in supporting early literacy than early numeracy.

Findings for Kyrgyzstan

There were dramatic differences between children in Step by Step and those in traditional programs on all measures of academic achievement (i.e., numeracy and literacy). Results in mathematics showed an extraordinary effect size of .761, a magnitude that indicates a difference of considerable educational importance. Literacy results were equally impressive, with adapted PPVT results and scores on each of the ELA subscales being significantly higher for Step by Step children.

Findings for Romania

In Romania, there was evidence that children in the Step by Step kindergartens were making better progress than children in traditional programs. In mathematics we found significant differences associated with moderate effect sizes. Children in Step by Step classrooms from both the low and high ends of the developmental spectrum seemed to be gaining more mathematical understanding than were children in traditional programs. While differences between programs on the ELA were not statistically significant, there was evidence that Step by Step classrooms may be somewhat more successful in supporting the development of children with

the weakest early literacy skills. Finally, there was clear evidence of Step by Step children's stronger performance on the flexibility scale of the *Unusual Uses* task, suggesting that these classrooms are nurturing children's creativity more effectively.

Findings for Ukraine

In Ukraine, Step by Step children outperformed children in traditional programs in mathematics. The differences were highly significant and showed an effect size of .611, a magnitude of considerable educational importance. Significant differences favoring Step by Step were also seen on our measure of receptive vocabulary. However, children in Step by Step and traditional programs received similar scores on other measures of early literacy. Finally, there was also evidence that Step by Step settings are more effectively supporting children's verbal creativity as children showed stronger performance on the flexibility subscale of the *Unusual Uses* subtest.

CONCLUSIONS AND DISCUSSION

We can answer the question of the Step by Step children's educational performance being comparable to that of children in traditional programs affirmatively. Across all countries and on every dimension we found that Step by Step children perform as well or in some cases exceed the performance of children in traditional programs. Overall, the academic benefits of Step by Step are most evident in the realm of mathematics, with significant effects favoring Step by Step in three of the four countries. Findings favoring Step by Step might reflect the emphasis on exploration in these classrooms. As children experiment with objects and quantities in different activity centers, they have opportunities to construct notions of relative quantity and, when teachers join them in their explorations, there are many occasions when discourse about mathematical concepts can occur.

Some differences favoring Step by Step were also seen in literacy learning including receptive language. At first glance these findings are somewhat surprising since formal literacy instruction is emphasized in traditional programs. However, when taking a closer look at the nature of teacher-child interaction in Step by Step classrooms with their extended conversations, daily book readings, and writing activities, the findings are more understandable.

In general, our assessments of creativity did not yield significant differences between children in Step by Step programs and children in traditional programs, except in the *Unusual Uses* activity. Results indicated greater creativity among Step by Step children, particularly in their ability to think in flexible ways. Thus, on balance, there is evidence that Step by Step classrooms are more effectively nurturing children's creativity.

Finally, when we inspect frequency distributions for children from the two types of programs, we consistently find that Step by Step programs seem to provide greater support to children who enter with less well-developed academic skills. This finding suggests that the Step by Step's child-centered approach enables teachers to implement a program that is responsive to children's individual needs rather than one dictated by a set curriculum. Since one of the critical components of Step by Step is individualizing the curriculum for children, our data suggests that teachers are making such curricular adjustments skillfully.

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