ENCOURAGEMENT OF ACADEMIC SKILLS IN YOUNG CHILDREN: MEASURING AND INVESTIGATING PARENTS' EFFORTS TO EDUCATE THEIR YOUNG CHILDREN.

BY

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Abstract

The Encouragement of Academic Skills in Young Children (EASYC) is a new measure, used to investigate the benefits of parents using in-home educational activities with their young children. The overall goals of this study were to 1) validate the EASYC as a reliable instrument for measuring parents' at-home education practices, and 2) demonstrate the importance of providing a stimulating home educational environment for young children. In general, the EASYC was demonstrated as applicable to 4 year old children and the US sample, with future development possible for other populations. Key findings illustrated 1) the fast development of children's learning, 2) the co-dependence of literacy and numeracy in young children, 3) that formal activities are more influential than informal activities, 4) that parental involvement is maintained across time, and 5) that culture influences how parents teach their children. The EASYC was established as a measure of parent involvement in pre-school education with a scope not previously achieved and the potential to benefit learning outcomes and school preparation in pre-school children.

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Encouragement of Academic Skills in Young Children: Measuring and Investigating Parents' Efforts to Educate their Young Children.

It is important that children enter formal schooling physically and developmentally ready to learn so that they are not behind their classmates from the very beginning of their educational career. To achieve school readiness, the learning development of pre-school children must be fostered, and parents are prime candidates for enhancing academic growth. The current study sought to investigate the ways parents assist their young children in literacy and numeracy development, and what impact in-home help is having on the learning outcomes of children.

A parent-report measure, the Encouragement of Academic Skills in Young Children (EASYC) was constructed to assess the efforts parents exert in educating their young children. The EASYC gauges the frequency parents implement commonly used educational activities; scores from this measure were associated with literacy and numeracy test-scores of the children in the present study. A longitudinal relationship between the child's in-home educational environment and their current and future academic success was sought as an illustration of the important role parents play in the current and future academic success of their child. In addition, the study was able to clarify the most effective ways of presenting numeracy and literacy content to children, thereby informing parents, educational facilities and policy makers on how best to ensure children are prepared when they begin primary school.

Preparing Children for School

For decades society has been conscious of the difficulties that occur for children when they begin school and the problems that can follow if children are not adequately prepared (e.g. Anderson, 1939; Behrmann, 1972; Howes et al., 2008; Roberts, 1993). The progression from pre-school education to primary school creates an enormous shift in the child's social, academic and physical environment, and children who do not adapt well or are unable to fully engage in classroom activities risk long term negative effects including poorer academic growth (Ladd & Dinella, 2009). Education facilities and teachers generally recommend children be physically and emotionally ready to interact socially, and possess basic skills such as letter and number recognition (Lara-Cinisomo, Fuligni, Ritchie, Howes, & Karoly, 2008). Accordingly, research has illustrated that children who enter school with an existing knowledge base show accelerated academic growth compared to those children who arrive at school lacking fundamental skills (e.g. Ahtola et al., 2011; Aunola, Leskinen, Lerkkanen, & Nurmi, 2004). Despite a long history of research on this topic, concerns still exist around the adequacy of education young children receive before beginning formal schooling. The quality of preschool education and the preparedness of children to enter school has been publicly discussed and highlighted in the New Zealand media (e.g. Blundell & Palmer, 2009; Hill, 2010; Laxon, 2009), illustrating there is public concern that some children are not ready to enter a classroom environment when they reach school age. Practical solutions for encouraging school readiness must be identified and promoted, to ensure children begin school with a strong educational foundation which enables their capacity to grow to full potential.

Parents as Education Providers

Preschool facilities are often deemed primarily responsible for preparing children for formal schooling, and as a result considerable research has addressed the standards preschools need to meet in order to fulfil this goal (Ahtola et al., 2011; Connor, Morrison, & Slominski, 2006; Howes et al., 2008). Such research has highlighted the roles of quality instruction and close teacher-child relationships in spurring academic growth (Howes et al., 2008), though providing one-on-one interaction to every child in an environment with a relatively high ratio of children to adults proves difficult to achieve in practice. In contrast, the home environment, which generally has a higher ratio of parents or caregivers to children, seems better equipped to facilitate quality adult-child interactions, supplement preschool education and in turn hone school readiness. In general, educators encourage parents to prepare children emotionally and build a home environment which supports academic learning (Lara-Cinisomo et al., 2008), and in doing so parents increase the chance of their child’s successful transition to formal schooling. Many early education researchers believe that promoting education in the home environment is a viable and practical method of bolstering school readiness in young children. Research can help establish parents as effective educators, by indicating the types of activities and the methods of teaching most conducive to the child’s future academic success.

What Early Skills are Important?

Many factors contribute to school readiness, for example social and emotional development (e.g. Fantuzzo et al., 2007; Raver & Zigler, 1997; Sheridan, Knoche, Edwards, Bovaird, & Kupzyk, 2010), friendship quality (Ladd, Kochenderfer, & Coleman, 1996) and satisfactory physical and motor development (Piotrkowski, Botsko, & Matthews, 2000). Previous research suggests that encouragement of early numeracy and literacy skills is crucial for preparing children for formal schooling. For example in a meta-analysis of 6 longitudinal studies, Duncan and colleagues (2007) found that of a number of school readiness measures (such as attention capacity, social skills and emotional development), early numeracy and literacy competencies were the best predictors of future academic achievement. For this reason, the current study used numeracy and literacy attainment as a benchmark indicator of a child’s school readiness.

Development of literacy. Literacy is the capacity to express language through reading and writing. Emergent literacy skills such as letter naming, vocabulary, understanding the function of print, and phonological awareness, form the foundations of literacy development (Perlman & Fletcher, 2008; Sénéchal & LeFevre, 2002). Achievement in emergent literacy is a known indicator for later development in reading and writing, and conversely those lacking in early literacy skills show poorer reading development. For example, Lonigan, Burgess, and Anthony (2000) mapped developmental continuity from emergent literacy skills in early preschool to reading ability in the first year of primary school. This developmental progression was extended by Duncan and colleagues (2007) who, in a meta-analysis of 6 longitudinal studies spanning 42 months to 13 years, found preschool emergent language and reading skills to predict later academic achievement in reading. From this finding they concluded that identifying children with poor emergent literacy skills in the preschool years may allow the identification of those children prone to reading difficulties in later childhood. Early detection and intervention of emergent literacy complications may avoid the development of more severe literacy impediments. Therefore, ensuring children possess a sound knowledge of emergent literacy skills is an important factor when assessing school readiness.

Development of numeracy. Analogous to literacy, mathematical knowledge is thought to be preceded by emergent numeracy skills such as number naming, counting, and an understanding of quantity. Research illustrates the importance of possessing a foundation of emergent numeracy knowledge in the preschool years. Aunola and colleagues (2004) found preschool counting ability predicted better mathematical achievement and growth in the first years of school, and generally an accelerated rate of mathematics attainment for children who entered school with a high level of emergent numerical skill. In comparison, those who did not have a basic understanding of numeracy concepts developed mathematics competence at a slower rate. In the previously mentioned meta-analysis by Duncan and colleagues (2007), mathematic ability at school entry was identified as the most important predictive factor for future academic achievement. Skills in emergent numeracy are foundational for further development of mathematic knowledge and are therefore integral to a child's preschool skill-set.

Despite the evidence that mathematical knowledge and skills are an essential aspect of school preparation, parents and preschool teachers have been found to rate maths ability and the implementation of maths activities as less important than literacy attainment, social skills, and general knowledge (Blevins-Knabe, Berghout, Musun-Miller, Eddy, & Jones, 2000; LeFevre, Skwarchuk, Smith-Chant, Fast, & Bisanz, 2009) . Many, perhaps most, parents feel maths skills can, or should, be left to formal school education (Blevins-Knabe et al., 2000), however in light of previously mentioned research, deferring maths education until children start school may put them at a developmental disadvantage, and hinder overall mathematic achievement.

Co-dependence of literacy and numeracy. As well as emergent literacy and numeracy being independently important for future development, there is evidence to suggest the skill areas may be co-dependent, where achievement in one promotes future progression of the other. Duncan and colleagues (2007) found early maths and literacy ability to be similarly predictive for future reading achievement, and early literacy skills weakly predicted later maths attainment. Likewise, a study by Senechal (2006) illustrated the interconnectivity of numeracy and literacy development. Children with more book exposure were shown to have shorter numerical latency, general letter skills positively correlated with number skills, and the use of number books and maths knowledge positively correlated with vocabulary. Further investigation is required to unpack the extent early numeracy and literacy skills are interdependent. Contrary to the wide-spread lay belief that maths and literacy are separate skill areas it seems that, at least in early childhood, there is no clear partitioning in their development. It is important numeracy and literacy are examined in unison so the effect of one upon the other can be investigated. Illustrating that numeracy and literacy develop together would highlight the importance of exposing children to both types of activities from an early age.

How do we Teach These Skills to Young Children?

Not only do parents need to know *what* skills to prepare their young children with, but they also need to know *how* to effectively convey the desired information in a way that encourages development. A widely disputed notion concerns the relative efficacy of formal versus informal methods of teaching for young children. Many early childhood education specialists (e.g. Connor et al., 2006; Sénéchal & LeFevre, 2002) believe that activities should be focused on fun and play for this age group (i.e. informal methods). On the other hand, Huntsinger and colleagues (Huntsinger, Jose, Larson, Balsink Krieg, & Shaligram, 2000) have shown that Asian-American children seemingly enjoy an advantage in mathematics-related tasks partly because their parents use formal methods at home to teach maths-based concepts before they begin school.

Formal versus informal methods. Formal methods use a direct and structured approach to education, with explicit presentation of the message or skill to be learnt (such as copying letters or completing sets of equations). Conversely, informal methods are those where the message is embedded within an everyday activity (such as reading a picture book or measuring during cooking). There is a long history of enquiry into these opposing methods. For example, Anderson (1939) proposed that children will be primed to learn more from formal lessons in school if they have been previously exposed to a corresponding informal experience. He recommended school curriculums be structured so that children are exposed to an informal learning activity in the year prior to learning the corresponding formal lesson. From this early postulation, research has expanded the realm of formal vs. informal education, with mixed results as to which is the better teaching method in preschool children.

Seneschal, LeFevre and colleagues (2002; 2009; 2006) advocate both methods as important to child development. In terms of literacy, they found that formal activities such as direct teaching of literacy predicted development of emergent literacy skills, whereas informal experience such as reading a story book aloud with an adult predicted receptive language ability (Sénéchal & LeFevre, 2002). Similarly, in numeracy development, informal home experience with numbers was related to the child's fluency in basic number skills (LeFevre et al., 2009). Connor and colleagues' (2006) work parallels the literacy-based findings of Senechal and LeFevre (2002) in a preschool setting. Through video-taped observations of preschool classes they found formally instructed activities to predict alphabet and word development, whereas informal meaning-focused activity (such as reading books) predicted development in vocabulary. It is possible that formal and informal methods are important for different types of learning, and therefore parents should use a collaboration of styles to encourage holistic development of academic ability. Likewise, informal activities may prepare children for formal learning, providing valuable foundational skills which assist in later development.

Additionally, as noted above, a cultural element has been identified as potentially influential on beliefs concerning formal or informal instruction. Western cultures are generally inclined to implement informal, play-oriented learning environments for young children, whereas formal family-based education is more common in the Chinese culture (Huntsinger et al., 2000). A culture's tendency to use formal or informal methods has been implicated as a possible reason for differences in academic attainment between cultures and countries. Huntsinger and colleagues (2000) found that between the ages of 5-10 years, Chinese American children generally displayed higher maths and vocabulary attainment than European American children. The crucial factor implicated for this cultural difference was that Chinese American parents preferred to use formal structured lessons at home, whereas

European American parents were more inclined to advocate informal education activities. Similarly, a cross-cultural examination of 4 and 5 year olds' numeracy ability by Aunio and colleagues (2008) found Chinese children to be top performers, followed by Finnish, and then English children. They described the Chinese culture as advocates of early mathematic knowledge and the use of a systematic (or formal) approach to teaching. In contrast, the Finnish culture emphasises play-based, self-directed learning (informal), and a mix of the two styles is exhibited in England. These culturally embedded approaches to learning mathematics are said to extend from institutional learning such as in pre-school and primary school, to the way parents approach home-based education and are therefore influential to children's learning (Aunio et al., 2008). The exceptional maths performance of Chinese children in both studies suggests that the formal style of educating preschool children is effective at laying a good foundation for formal schoolwork.

At present, inconsistent findings concerning whether formal or informal teaching methods are more effective prevent a clear interpretation as to which is a more beneficial way of parents educating young children. It is possible that a mixture of the two strategies is optimal, or it may be that one should precede or follow the other. Understanding the types of activities parents are performing with their young children and how these correspond with the child's academic achievement at different stages during the preschool period will extend current knowledge and help inform parents of productive ways to encourage early academic achievement.

Existing Measures of Home-Based Education

There are a number of existing measures which aim to examine the educational activities children are exposed to at home. The Home Literacy Environment (HLE) (Griffin & Morrison, 1997) aims to predict differences in early literacy ability based on the literacy environment a child is raised in. Reading habits of the parent and child, television exposure, and utilisation of a library are measured through a 9-item, parent-reported scale. Griffin and Morrison reported an adequate internal reliability (Cronbach's alpha of .74) as well as strong correlations between the HLE and measures of the children's receptive vocabulary and general knowledge. The short length of the HLE is appealing for quick and easy administration; however the repercussion is that some vital elements are missing, such as exploration of emergent literacy. Additionally, the items are somewhat distal from the process under study. Rather than targeting the actual learning processes encouraged by parents, the focus is on easily observable or quantifiable items or actions, such as the number of books in the home and how often a child visits the library. In order to better understand the influence home education activities have on a child's academic development, a measure should examine learning experiences which are more proximal (closer) to the learning process.

In a 5-year longitudinal study, Senechal, LeFevre and colleagues (2002; 1998) developed the Home Literacy Model (HLM). Like the HLE, the main goal of the HLM was to target the child's experience of literacy in the home, though the HLM is more comprehensive than the HLE. The majority of the questionnaire calls for parents to identify the popular book titles and authors they recognise from a list, while remaining questions address the child's book exposure and parent teaching of reading and writing. Children were tested from 4-9 years of age, with the general finding being that preschool parents' reports of children's book exposure positively predicted the development of vocabulary and listening comprehension over time, which in turn predicted reading ability in the third year of school. Another critical finding was that parental teaching of reading and writing in preschool positively predicted emergent literacy development, which followed on to better reading achievement in the first year of primary school. These separate pathways make sense; reading to a child is an oral learning experience, therefore the child develops in oral and listening capacity. Likewise, structured teaching of reading and writing is likely to foster a child's growth in written literacy skills. Furthermore, no correlation was noted between the likelihood of parents implementing the two tasks, which suggests that book exposure and structured teaching are not only differentially influential on the child, but that each activity is a distinct home experience, with the co-occurrence of each varying between households. The HLM highlights the positive impact of parental assistance in early education and the fact that different at-home activities result in different outcomes for children, implying that a diverse range of educational activities would give the best outcomes for academic development.

The HLM provides a new and useful development in measures investigating the impact of parental involvement in early childhood at-home education, however there are limitations to its utility. The majority of questions in the HLM take a distal approach to assessing a child's home-based literacy development. Parents are asked which of 40 children's authors and 40 children's book titles they recognise, with the assumption that parent recognition will predict the child's actual book exposure and this, in turn, contribute to the child's learning development. Despite including 2 items to measure parent teaching, the heavy weighting towards such distal questions means that the HLM requires a long administration time, while giving minimal insight into what parents are actually doing with their children. Additionally, the use of books and authors from popular-culture means that the measure is highly contextual and would be difficult to utilise in varying cultures and different-aged cohorts without considerable revision. Furthermore, the HLM was tested using children from schools that emphasise self-directed, informal learning, and multi-age groupings of children. Generalisations to a normal sample are limited as the sample schools were notably different from traditional schooling in their ethic and approach to teaching.

Both the HLE and HLM provide some insight into the benefit of parents implementing educational activities at home on the later academic development of young children. However, literacy is the only dimension addressed for these two measures; a serious omission is that we are not given insight into the development of mathematics. As with literacy, there are existing measures which aim to tackle the influence of home-based numeracy activities on later mathematic success.

An early example of a numeracy-based measure was constructed by Blenins-Knabe and Musun-Miller (1996). Unlike the distal approach used in existing literacy measures, this study asked parents to identify how often they had engaged their child in a set of 33 specific number-based activities such as naming digits, counting, and discussing number values, giving proximal insight into the processes involved in the child's learning. Relationships were found between number-based parent-child activities and the child's mathematic ability, however due to the correlational design of the study, causality between parent activities and the child's numerical ability cannot be ascertained. Nonetheless, this study provides a foundational connection between home numeracy activity and child academic development, which further research can build upon.

LeFevre and Senechal (2009) argue that the Blevins-Knabe and Musun-Miller's measure was too narrow to capture the full picture of home numeracy practices. While formal activity is addressed sufficiently, informal numerical activities which occur frequently in everyday life, such as cooking and board games were not assessed. In response, a 40-item measure was administered to parents by LeFevre and Senechal (2009) that incorporated both formal and informal numeracy items. Playing number games was the only significant predictive factor of maths knowledge. Surprisingly, formal numeracy activities seemed to have little effect on maths knowledge. However, numerical fluency (the ability to perform maths problems quickly and efficiently) was predicted by both informal measures (number games and everyday applications) and formal teaching of number skills. From these findings the authors argue that mathematical development is enhanced through a young child's exposure to not only formal teaching methods, but everyday, home-based numeracy activities as well.

The overall perception from prior studies is that parents are benefiting the future academic development of their children by exposing them to early literacy- and numeracy-based activities. However, gaps in the methodology and analyses of these studies mean that further work is necessary to address the nature of proximal activities that encourage early development. The most evident problem with current studies is that they each give only half of the story; no measure accounts for both numeracy and literacy activities. As was previously illustrated, it is possible that numeracy and literacy development are co-dependent, with growth in one area assisting the development of the other. A measure which addresses numeracy and literacy development in a balanced fashion is essential to gain further insight into the relationship between literacy and numeracy development in young children. Additionally, current measures do not investigate both formal and informal teaching methods in a balanced way either. Unpacking the value of both forms of teaching is important for providing parents with insight into how they should structure the activities they present to their children. By improving the measure used to assess activities parents are doing with their young children, the benefits of early academic encouragement can be assessed, which will in turn highlight optimal methods for ensuring children are adequately prepared for school.

The Current Study

In response to the gaps in current research, the Encouragement of Academic Skills in Young Children (EASYC) was developed by Carol Huntsinger and Paul Jose. Like previous measures, the questionnaire aims to investigate the actual day-to-day activities children are exposed to at home, but with a broader scope than has previously been achieved. The EASYC is a parent-report measure which includes items to assess both literacy and numeracy activities, with both formal and informal methods of teaching addressed. Items were developed on the back of prior work by Huntsinger and colleagues (2000) which used parent interviews and observational videos of parent child interaction to examine the influence of formal versus informal methods of parent instruction. Interviews and video tapes of parent-child interactions were coded to derive items that are relevant and reflect the actual activities parents engage in with their children. To bolster reliability and validity, a broad sample was longitudinally sourced, with participants drawn from two age groups, in both the US and New Zealand.

The validity of the EASYC was evaluated in the current study by determining whether parental activities reported on the measure predicted children's standardised literacy and numeracy test scores. The current study was designed to collect data to extend existing knowledge of the importance of school readiness and how parental support can facilitate a young child's academic growth.

Main Goals and Hypotheses

Two overarching goals were proposed for this study: 1) to validate the EASYC as a reliable instrument in measuring parents' at-home education practices; and 2) to illustrate the importance of providing a stimulating home educational environment for young children and to give parents insight into what activities are beneficial. On the basis of previous research, the following hypotheses provided a framework for addressing these goals.

1. **Establishment of the reliability and validity of the EASYC as an instrument in measuring parent and child home education practices.** The reliability and validity of the EASYC will be exhibited with examinations of:
   a. ***Internal reliability.*** Cronbach's alphas are expected to be above .70.
   b. ***Test-retest reliability***. Parents' use of EASYC activities was expected to be relatively stable across 1 year.

c. ***Convergent validity.*** The EASYC should correlate with similar measures. The Home Literacy Environment (Griffin & Morrison, 1997) was included in the study for validation purposes.

d. ***Predictive validity.*** Parents' use of EASYC activities should positively predict the child's numeracy and literacy scores.

2. **Mean group differences in parent-reported activities and child's test results.** Differences within the sample populations, i.e., gender, age cohort, and country, were explored in relation to the EASYC and child tests of literacy and numeracy ability.
3. **The influence of at home activities on numeracy and literacy test scores will be similar within the Western culture.** To test that the use of the EASYC can be generalised to different countries, samples were drawn from both the US and New Zealand. Parents' use of in-home activities and their influence on young children was not expected to differ significantly between the two countries as they are both thoroughly Western cultures with similar teaching methods.
4. **The use of in-home activities and the numeracy and literacy development of children would be different between cohort groups.** Developmental differences were investigated through the use of two age cohorts; one sample who was 4 years of age and the other 5 years of age at the inception of the study. Age-related differences were expected in that younger children were expected to engage in different tasks with their parents and possibly different numbers of tasks. Additionally, marked cohort differences were expected in measures of literacy and numeracy as one year's difference at this age makes a large difference in children's knowledge and skills in these two areas.

5. **The differential use of home literacy and numeracy activities will impact on the child's ability.** Parents who implement more numeracy-based activities will have children who are more proficient in tests of numeracy. Likewise, parents who implement

more literacy-based activities will have children more proficient in tests of literacy. Weaker (but possibly significant) correlations were expected to be exhibited between literacy activities and numeracy ability and between numeracy activities and literacy ability.

6. **The use of formal and informal teaching methods will differentially impact child learning.** Based on prior research (Aunio et al., 2008; Huntsinger et al., 2000) formal, structured learning environments were expected to result in higher test scores than informal, play-based environments.

7. **Overall, engaging in activities in the home will have a positive influence on the test results of children.** On the whole, children who engage in more educational activities at home were expected to manifest higher literacy and numeracy test scores. In addition, the activities parents implement should be beneficial across time; EASYC scores at time 1 were expected to explain some of the variance in literacy and numeracy test scores at time 2. The influence of the child's country and age cohort, the use of literacy- or numeracy-based activities, and method of formal or informal teaching were all considered over time in order to characterise the longitudinal impact of parental academic encouragement on children 4 to 6 years of age.

8. **Abilities in literacy and numeracy will be interdependent.** Results from all analyses were used to explore the relationship between literacy and numeracy development, with the hypothesis that a child's ability in one area will be influential on the other. In accordance, parents' efforts to assist children in literacy or maths should be beneficial to the other area, at least to some extent. Differences between countries and age cohorts in regard to numeracy and literacy ability were explored, but were not expected to be substantial due to the similarity of the populations.

Method

Participants

Two age cohorts composed of 406 children (217 boys, 189 girls) and their middle class parents in Chicago, USA and Wellington, New Zealand were tested in two phases, separated by one year. The total retention rate from time 1 to time 2 was 57.6%. The distribution of participants is presented in Table 1.

Cohort 1 consisted of children 4 years of age at the first phase of testing, with 60.9% of cohort 1 returning for testing at time 2, when the children were aged 5 years. Children 5 years of age at the first phase of testing made up cohort 2 and 54.9% returned for the second phase of testing when they were 6 years old.

Of the US sample, 48.5% returned at time 2 and the ethnic make-up of the US sample was 79% European American, 14% Asian American, 3% African American, and 4% Hispanic. In the NZ sample the ethnic make-up was 92% European New Zealander and 8% other (i.e., Maori, Asian New Zealander, and Pacific Nations) and 67% of the NZ sample were retained at time 2.

Measures

Encouragement of Academic Skills in Young Children (EASYC). The *EASYC* is a 42-item self-report measure which aims to gauge the types and frequency of educational activities parents engage in with their children at home. The measure was developed following Huntsinger, Jose and colleagues' (2000) cross-cultural study of children's academic achievement. The study used parent questionnaires, interviews and videotaped

Table 1
Distribution of Participants in Each Sub-Group

	US		NZ		Total	
	Time 1	Time 2	Time 1	Time 2	Time 1	Time 2
Cohort 1	100	54	102	69	202	123
Cohort 2	100	43	104	69	204	112
Total	200	97	206	138	406	235

parent-child interactions to determine numeracy and literacy based activities parents use with their children. This resource of information was drawn on to form items in the EASYC. Parents responded to questions by selecting from options on Likert scales or answering yes/no questions concerning the frequency they incorporate specified learning opportunities into their child's environment. Items address different focus areas including literacy (e.g. "encourage our child to complete workbooks that teach proper letter formation"), numeracy (e.g. "practice adding and subtracting single digit numbers"), formal activities (e.g. "do math-related workbooks or worksheets") and informal activities (e.g. "point out letters and words in the environment").

Home Literacy Environment (HLE). The HLE was developed by Griffin and Morrison (1997) to establish the home literacy environment provided by parents for their children. The 9 item measure has a primary focus on the availability of reading material to the child (e.g. "Does anyone in the home have a library card?" and "How often do you read to yourself?") and has a reported Cronbach's alpha of .74. The HLE was included in the present research as it has been reported to predict children's reading recognition and receptive vocabulary skills and provides an opportunity to test for convergent validity.

Test of Early Mathematics Ability- Second Edition (TEMA-2). The TEMA-2, by Ginsburg and Baroody (1990), involves 65 questions and was used to assess the children's mathematic skill. The TEMA-2 was chosen as it is appropriate for children from 3 to 8 years of age, making it relevant for the entire sample in the current study and across both time points. Both formal (30 items) and informal (35 items) abilities are measured using a range of task types, (e.g. picture/flash cards, worksheets, verbal questioning, and interactive use of counters). For each item the child answers correctly they are given 1 point, adding to a total score out of 65, with raw total scores were used in subsequent analyses. The TEMA has also been well documented and is statistically sound, demonstrated to have excellent internal reliability ($\alpha = .94$) and test-retest reliability ($r = .94$, $p < .001$) (Ginsburg & Baroody, 1990).

Test of Early Reading Ability-Third Edition (TERA-3). The TERA-3, by Reid, Hresko and Hammill (2001), assesses a child's early reading skills through 80 items, accounting for knowledge of the alphabet, print conventions, and the ability to understand the meaning of printed script. Similar to the TEMA, the TERA-3 is appropriate for the current study as it is appropriate for 3½ to 8½ year olds and has been shown to be statistically robust, with strong internal reliability ($\alpha = .95$) and test-retest reliability ($r = .98$, $p < .001$) with 4-6 year olds. Children receive 1 point for each correct answer they give, with a total raw score out of 80.

Procedure

To facilitate data collection, local early childhood facilities, such as kindergartens and primary schools, were approached in Illinois and Pennsylvania in the USA and in Karori and Kelburn, Wellington, in New Zealand. Centres received $125 (US centres) or $100 (NZ centres) for their effort. Invitations to participate and permission forms were sent to parents, followed by the questionnaire which included demographic questions, the EASYC and the HLE. The parent questionnaire was completed by one parent in their own home, and then mailed back to the researcher. All components of the questionnaire, including demographics, the EASYC and the HLE are presented in appendices A, B and C.

Once the parent had completed the permission forms and questionnaire, an experimenter spent approximately 20 minutes testing each child. Children completed the TERA and the TEMA individually, in a quiet room at their respective childhood centre. Following data collection, parents received written feedback detailing their child's test performance, and one year later the same participants were contacted to complete the parent questionnaire and child tests again.

Data Analyses

Hypotheses were tested using the following methods of data analysis:

1. Psychometric evaluation of the EASYC was conducted, involving tests of internal reliability using Cronbach's alpha, convergent validity through correlations with similar measures (the HLE), and test-retest reliability across time.
2. ANOVA analyses examined mean group differences between gender, cohort, and country.
3. Correlation analyses within a given year determined associations between EASYC scores and child academic performance.
4. SEM path models on longitudinal data examined relationships across time
5. Equality constraints within SEM analyses assessed differences between countries and cohorts.

Results

Hypothesis 1: Reliability and validity of the EASYC as an instrument in measuring parent and child home education practices.

Internal reliability. As shown in Table 2, the internal reliability was very strong for the 42 items in the EASYC, at both time points. When divided by country, cohort, literacy/numeracy and formal/informal, as was used throughout analyses, all measures of the EASYC returned acceptable internal consistencies of above .70, at both time points. In comparison, the 11 item HLE yielded poor internal consistency. The EASYC seems to be more internally consistent than the HLE.

Test-retest reliability. The strong stability of the EASYC from time 1 to time 2, $r(216) = .74$, $p < .000$, indicates that parents' use of the EASYC activities is maintained reasonably well over time.

Convergent validity. The EASYC weakly correlated with the HLE, $r(371) = .25$, $p < .001$, at time 1 and slightly stronger, $r(219) = .31$, $p < .001$, at time 2. These weak finding do not provide support for strong convergent validity, however this weak relationship could be a function of the poor internal reliability of the HLE.

Predictive validity. In many analyses reported below, parents' use of EASYC activities is shown to be associated with child's numeracy and literacy scores. Concurrent relationships were evident between the TERA and TEMA and the overall EASYC and where the EASYC was separated into literacy, numeracy, formal and informal measures. However, disappointingly, the EASYC did not show predictive validity across time with residualised longitudinal analyses. While parents' actions were related to children's success in the moment, there was no significant evidence that the efforts of parents at time 1 impacted on the child's test scores at time 2. The majority of the findings below speak to the issue of the validity of the EASYC as a measure, and will be assessed at the conclusion of the thesis.

Hypothesis 2: Mean group differences of parent-reported activities and child's test results.

An ANOVA was used to explore between and within group differences in the sample populations, for each of the measures. Four dependent variables: the parent's mean EASYC

Table 2

Internal Reliability of the EASYC and the HLE

		Cronbach's α	
		Time 1	Time 2
Overall EASYC		.87	.89
	United States	.90	.87
	New Zealand	.85	.89
	Cohort 1	.85	.87
	Cohort 2	.90	.90
EASYC literacy		.71	.70
EASYC numeracy		.80	.83
EASYC formal		.70	.70
EASYC informal		.79	.75
HLE		.49	.48

literacy and EASYC numeracy scores, and the child's TERA and TEMA scores, from both time points were submitted to a 2(Gender: male vs. female) x 2(Age: cohort 1 vs. cohort 2) x 2 (Country: US vs. NZ) mixed design analysis of variance (ANOVA). Each measure will be unpacked separately, which will help with later understanding and explanation of causal findings.

EASYC literature. Table 3 gives descriptive statistics for the EASYC literacy. Between the countries, US parents practised significantly more literacy activities than NZ parents, and between genders, parents reported more implementation of literacy-based activities with girls than boys. A main effect was not found between the cohorts for EASYC literacy scores. Main effects between factors on the EASYC literacy measure are subsumed by an interaction between gender and cohort, $F(1, 214) = 4.36$, $p < .05$, $\eta^2 = .02$ (Figure 1). The effect of gender on literacy based activities performed by parents is more pronounced for cohort 2 (girls: *M* = 33.60, SD = .64; boys: *M* = 30.96, SD = .57) than for cohort 1, where the difference is negligible (girls: *M* = 32.95, SD = .54; boys: *M* = 32.76, SD = .59). In addition, there was a significant interaction between gender, cohort and country, $F(1, 142) = 167.22$, $p < .05$. Figures 2 and 3 illustrate differences between the countries. US parents in cohort 1 gave more literacy-focused activities to boys (*M* = 34.14, SD = .93) than girls (*M* = 32.89, SD = .75), whereas parents of cohort 2 children exhibited higher EASYC literacy scores for the girls (*M* = 35.22, SD = 1.01) than for boys (*M* = 31.50, SD = .89). The New Zealand data

Table 3
Mean Group Differences for the EASYC Literacy

		M	SD	*F* (1,214)	η^2
Gender	Male	31.86	.41	5.83*	.027
	Female	33.28	.42		
Cohort	1	32.86	.40	.97	.005
	2	32.28	.43		
Country	US	33.44	.45	8.78*	.039
	NZ	31.70	.38		
Time	1	28.56	.29	854.52***	.800
	2	36.58	.35		

Note: *p < .05. **p < .01. ***p < .001.

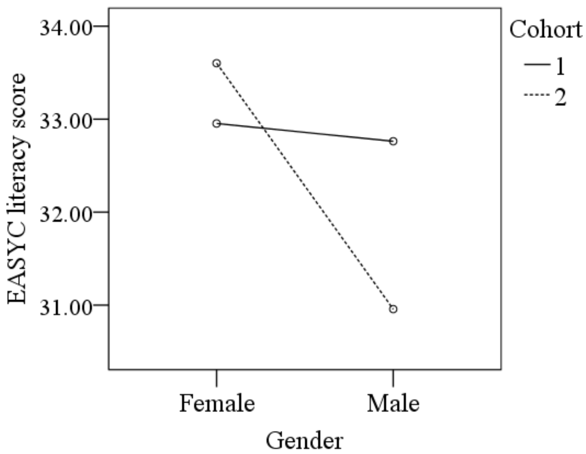

Figure 1. Parents EASYC literacy scores as a function of child's gender and cohort.

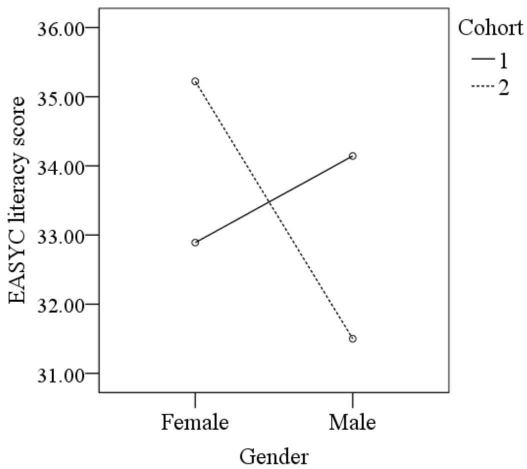

Figure 2. US parents EASYC literacy scores as a function of child's gender and cohort.

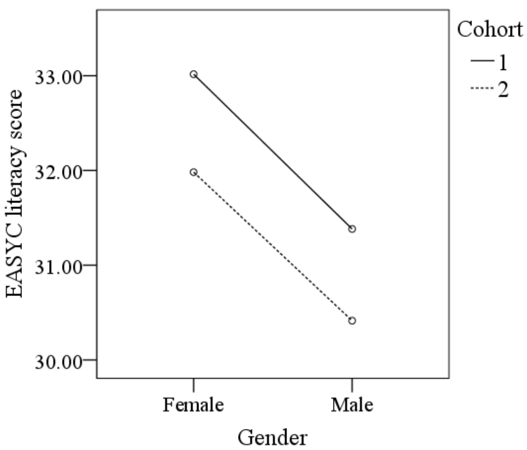

Figure 3. NZ parents EASYC literacy scores as a function of child's gender and cohort.

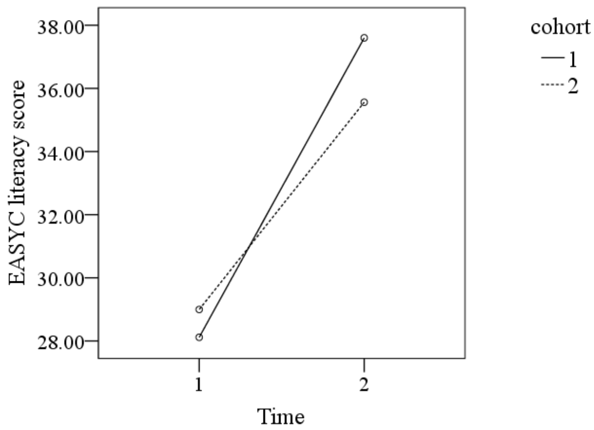

Figure 4. EASYC literacy scores as a function of child's cohort, across time.

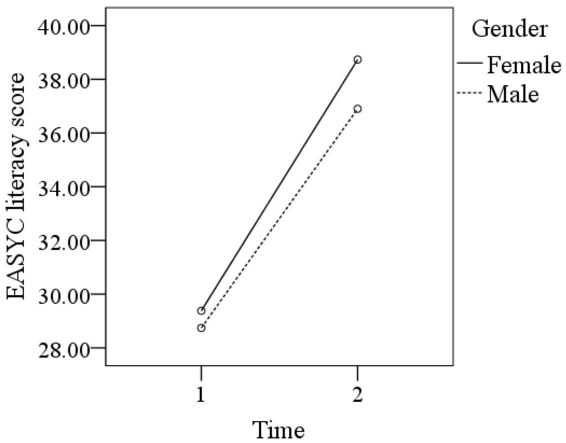

Figure 5. US EASYC literacy score as a function child's gender, across time.

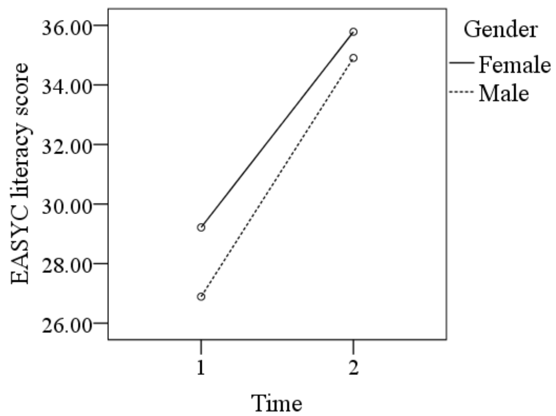

Figure 6. NZ EASYC literacy score as a function child's gender, across time.

differed as girls received more literacy attention in both cohort 1 (*M* = 33.02, SD = .77) and cohort 2 (*M* = 31.98, SD = .81) than the boys in cohort 1 (M = 31.38, SD = .73) and cohort 2 (*M*= 30.41, SD =.81), cohort 1 also manifested higher EASYC literacy scores for both genders compared with cohort 2. Thus, there appears to be a difference in the amount of literacy activities provided to girls between the US and NZ in that a gender bias changed between cohorts in the US, but in NZ the girls received more activities irrespective of the cohort.

There was a significant within subjects' main effect of time on the EASYC literature measure; literacy based activities performed by parents increased from time 1 to time 2. However, this main effect was qualified by a number of significant interactions. The first is between EASYC literature, time and cohort, $F(1, 214) = 28.31$, $p < .001$, $\eta^2 = .117$ (Figure 4). Both cohorts received more home literacy activities at time 2 than time 1, though cohort 1 showed a larger increase across time, having received less activities than cohort 2 at time 1 (cohort 1: *M* = 28.12, SD = .40; cohort 2: *M* = 29.00, SD = .43) but more activities at time 2 (cohort 1: *M* = 37.60, SD = .48; cohort 2: *M* = 35.56, SD = .52). Parents of children in cohort 1 increased the activities they implemented with their children across time to a greater extent than parents of cohort 2. There was also a significant interaction between EASYC literacy

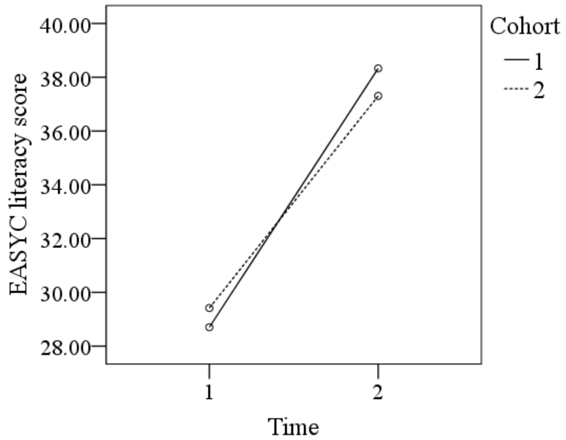

Figure 7. US EASYC literacy score as a function of child's cohort across time.

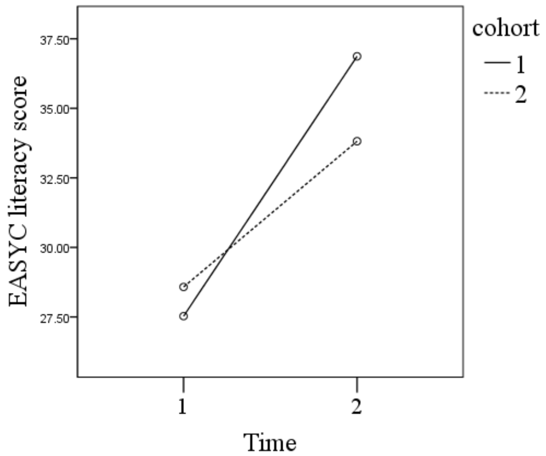

Figure 8. NZ EASYC literacy score as a function of child's cohort across time.

activities, time, country and gender, $F(1, 214) = 5.81$, $p < .05$, $\eta 2 = .026$ (Figures 5 and 6). In the US parents of boys and girls were similar in the number of literacy activities given to children at time 1 (Boys: *M* = 28.74, SD = .64; Girls: *M* = 29.38, SD = .63), however at time 2 US parents of girls gave slightly more literacy activities (Boys: *M* = 36.90, SD = .77; Girls: *M* = 38.73, SD = .75). The opposite pattern is evident within NZ. NZ girls receive more literacy activities at time 1 (Boys: *M* = 26.89, SD = .51; Girls: *M* = 29.22, SD = .55), and continue to receive more at time 2, however the difference tapers (Boys: *M* = 34.91, SD = .62; Girls: *M* = 35.78, SD = .67). Activity based gender differences seem to diminish over time for the NZ sample, but enlarge for the US sample. An interaction between time, country and cohort was also evident $F(1, 214) = 4.63$, $p < .05$, $\eta^2 = .0\ 21$(Figures 7 and 8). Both countries displayed the same pattern, the literacy activities given to cohort 1 increased at a higher rate across time, than for cohort 2. Cohort 1 reported less literacy activity than cohort 2 at time 1, but by time 2 a switch occurred and cohort 1 reported more literacy activity than cohort 2. However, this pattern is negligible for the US sample, time 1 (cohort 1: *M* = 28.70, SD = .60; cohort 2: *M* = 29.42, SD = .67) time 2 (cohort 1: *M* = 38.33, SD = .71; cohort 2: *M* = 37.30, SD = .81) and more striking for the NZ sample, time 1 (cohort 1: *M* = 27.53, SD = .53; cohort 2: *M* = 28.56, SD = .54) time 2 (cohort 1: *M* = 36.87, SD = .64; cohort 2: *M* = 33.82, SD = .65). Overall, it is evident that children are not exposed to literacy activities in the same way, in general US children and girls received more EASYC literacy activities and

Table 4
Mean Group Differences for the EASYC Numeracy

		M	SD	*F* (1,214)	η^2
Gender	Male	42.94	.60	2.65	.012
	Female	44.34	.61		
Cohort	1	43.64	.58	.001	.001
	2	43.64	.63		
Country	US	45.02	.66	10.42***	.046
	NZ	42.26	.55		
Time	1	45.02	.47	48.41***	.184
	2	42.26	.47		

Note: *p < .05. **p < .01. ***p < .001.

the number of literacy activities parents implemented improved across time.

EASYC numeracy. Table 4 gives descriptive statistics for the EASYC numeracy scores. Differences between countries produced the only significant main effect for EASYC numeracy. US parents practiced significantly more numeracy activities with their children than NZ parents. Main effects for gender or cohort were not found, nor were there any between subjects interactions.

Within subjects, there was a significant main effect of time on the EASYC numeracy measure, where numeracy-based activities performed by parents decreased from time 1 to time 2. A within subjects interaction between time and country was present for the EASYC numeracy, $F(1, 214) = 124.54$, $p < .01$, $\eta^2 = .034$ (Figure 9). Although the decrease in numeracy based activities is still evident, US parents manifested higher scores on the EASYC numeracy at both times (time 1: *M* =45.86, SD = .72; time 2: *M* =44.18, SD =.72) and the decline was less dramatic for the US than for the New Zealand sample (time 1: *M* =44.18, SD = .61; time 2: *M* = 40.33, SD = .61). As with the EASYC literacy, US parents implemented more EASYC numeracy activities to their children, however different to EASYC literacy, the number of maths activities parents implemented decreased across time.

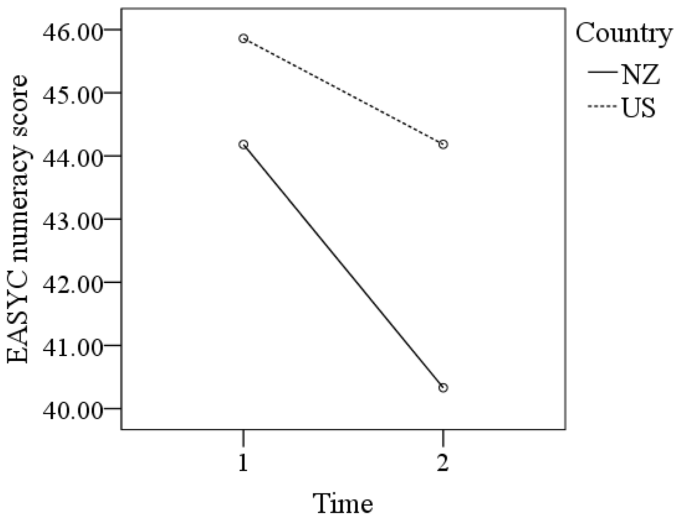

Figure 9. EASYC numeracy score as a function of country across time.

Table 5
Mean Group Differences for the TERA

		M	SD	*F* (1,214)	η^2
Gender	Male	43.72	.81	.67	.003
	Female	44.66	.83		
Cohort	1	36.75	.79	165.75***	.436
	2	51.63	.85		
Country	US	41.75	.89	17.82***	.077
	NZ	46.63	.74		
Time	1	35.83	.63	1145.97***	.843
	2	52.54	.63		

Note: *p < .05. **p < .01. ***p < .001.

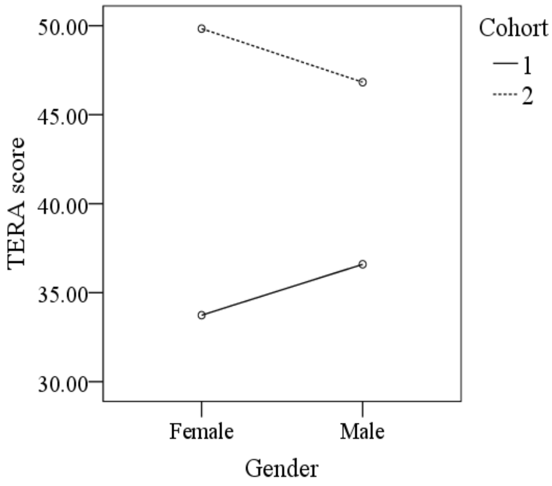

Figure 10. US TERA scores as a function of gender and cohort.

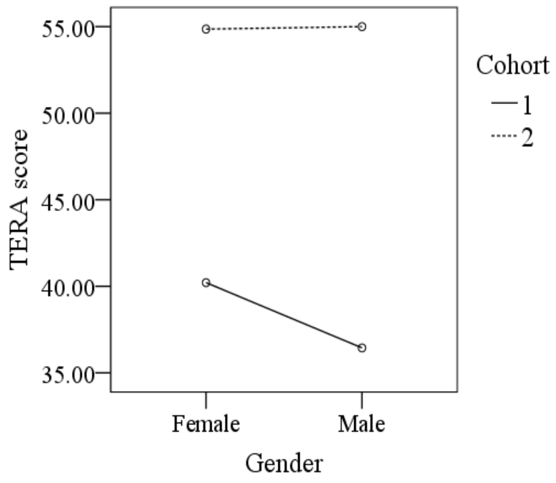

Figure 11. NZ TERA scores as a function of gender and cohort.

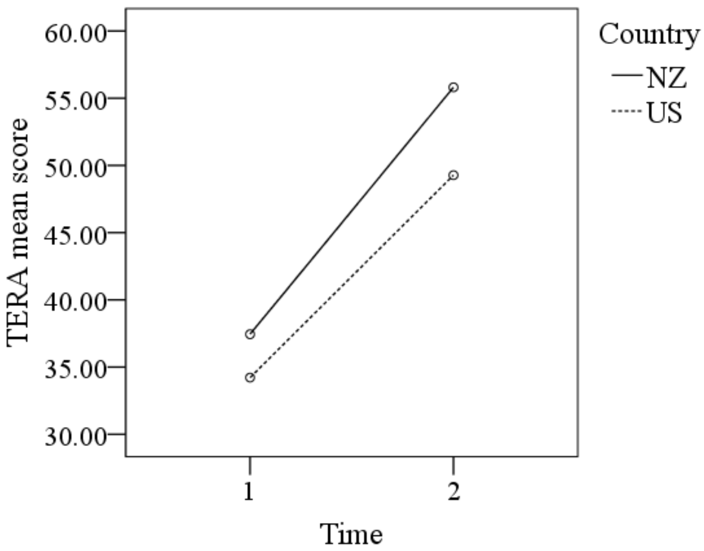

Figure 12. TERA scores as a function of country, across time.

Test of Early Reading Ability. Refer to table 5 for descriptive statistics of the TERA. Two between subjects' main effects were revealed on the TERA. Between countries, New Zealand children attained significantly higher literacy test results than US children. As was naturally expected between the cohorts, the older children of cohort 2 exhibited significantly higher literacy scores than cohort 1. Gender did not show a main effect on the TERA, suggesting boys and girls were performing at a similar level in literacy. However, when further unpacked, an interaction was found for the TERA between gender, cohort and country $F(1, 214) = 4.47$, $p < .05$, $\eta^2 = .02$ (Figures 10 and 11). The US sample boys in cohort 1 (*M* = 36.60, SD = 1.83) showed higher TERA scores than girls in cohort 1 (*M* = 33.73, SD = 1.48), however in cohort 2 the girls showed higher scores (*M* = 49.83, SD = .1.20) than the boys (*M* = 46.83, SD = 1.75). In the New Zealand sample cohort 1 girls demonstrated higher TERA scores (*M*=40.21, SD= 1.51) than cohort 1 boys (*M* = 36.44, SD = 1.44), and for cohort 2 the scores were similar between the genders (girls *M* = 54.86, SD = 1.59; boys *M* = 55.00, SD = 1.42). As expected, in both countries the TERA scores were shown to be higher for the older cohort 2 than cohort 1, and between countries the New Zealand sample had significantly higher literacy scores than US.

A significant within subjects' main effect was found for the TERA across time, children's literacy scores improved from time 1 to time 2. Additionally, a significant interaction between time and country was found, $F(1, 214) = 288.36$, $p < .001$, $\eta^2 = .050$ (Figure 12), mean scores were higher for the New Zealand sample at both time points (time 1: *M* = 37.45, SD = .80; time 2: *M* = 55.81, SD = .81) than the US sample (time 1: *M* = 34.22, SD = .96; time 2: *M* = 49.28, SD = .97) and New Zealand scores increased more rapidly than US scores.

Test of Early Maths Ability. Refer to table 6 for descriptive statistics of the TEMA. As expected due to age-based development of the children; maths scores for cohort 1 were lower than the older cohort 2. No main effects were found for the TEMA between country or gender, nor were there any significant interactions, suggesting children's maths abilities were similar between countries and genders.

A within subjects main effect was found for the TEMA across time. Overall, the children's numeracy scores improved from time 1 to time 2. There was also a within subjects interaction between time and gender, $F(1, 214) = 280.96$, $p < .001$, $\eta^2 = .094$ (Figure 13). Mean scores are very similar between the genders at time 1 (boys: $M = 24.26$, SD = .60; girls: $M = 24.55$, SD = .61), however at time 2 the boys' scores ($M = 37.99$, SD = .77) were higher than the girls' scores ($M = 35.01$, SD = .79). Unlike the literacy test results, New Zealand and the US were similar on tests of maths ability, and across time boys seemed to improve in maths at a greater rate to girls.

Overall, ANOVA analysis of the EASYC found that in general US parents reported implementing more literacy and numeracy based activities with their children than NZ parents did. Across time most parents increased the number of literacy activities they were giving to their children. Girls received more literacy activities than boys, however in the NZ sample activity based gender differences seem to diminish at time 2, but increase for the US sample. Accounting for separate cohorts illustrated that NZ parents of girls provided more

Table 6
Mean Group Differences for the TEMA

		M	SD	*F* (1,214)	η^2
Gender	Male	31.12	.65	2.10	.010
	Female	29.78	.66		
Cohort	1	25.42	.63	117.85***	.335
	2	35.48	.68		
Country	US	30.71	.71	.32	.001
	NZ	30.19	.60		
Time	1	24.40	.43	1218.45***	.851
	2	36.50	.55		

Note: *$p < .05$. **$p < .01$. ***$p < .001$.

EASYC literacy activities than parents of boys, and this was maintained in both cohorts. Differentially, US boys in cohort 1, but the girls in cohort 2 received more EASYC literacy activities.

As was developmentally expected, children in cohort 2 demonstrated higher scores in both maths and literacy. Despite receiving less home education, NZ children manifested significantly higher literacy test results than the US children. Numeracy scores were not significantly different between the countries or genders, indicating similar levels of attainment. However longitudinally, the numeracy scores of boys improved to a higher level than that of girls.

Hypothesis 3: The influence of at home activities on numeracy and literacy test scores will be similar within the Western culture

The US and New Zealand were expected to return similar results as they are both Western cultures with similar teaching methods. Separate path models (Figures 14 and 15) examining the EASYC, TERA and TEMA across time were created for the New Zealand and US samples, and results are displayed in table 7. The US sample displayed a weak correlation between parental practices and the child's TERA score at time 1, though this relationship is

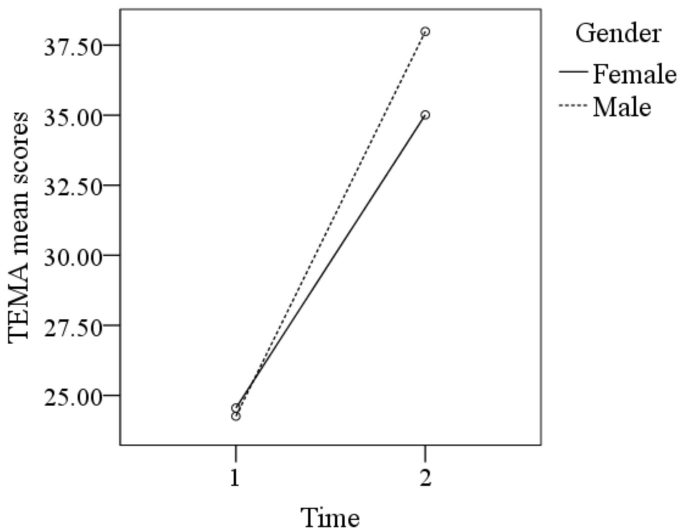

Figure 13. TEMA scores as a function of gender, across time.

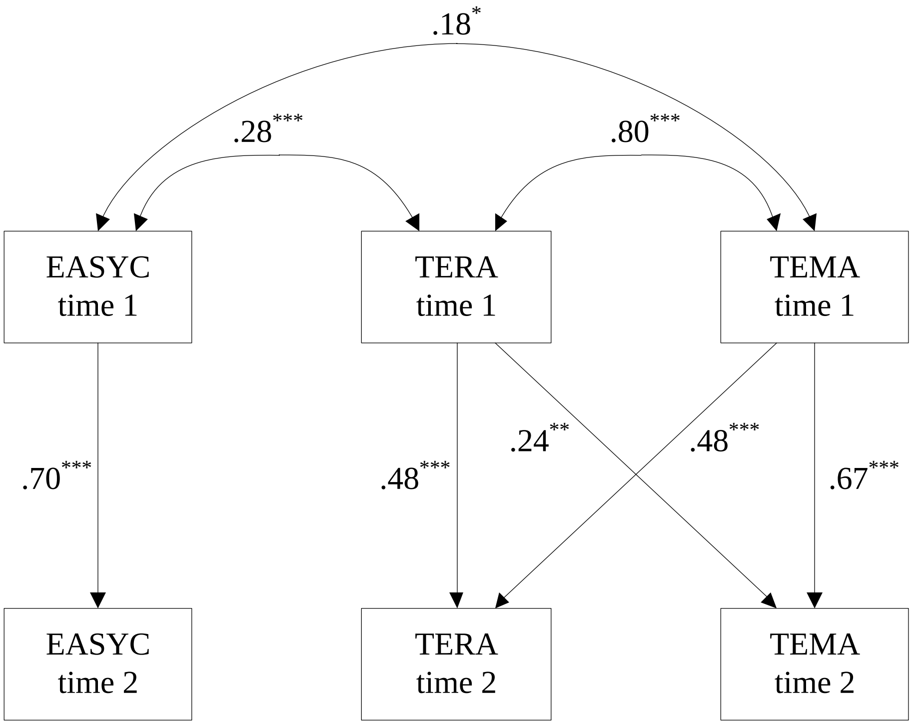

Figure 14. SEM analysis for EASYC, TERA, TEMA for the US sample
Note: A fully saturated model was tested. Only significant relationships are presented.

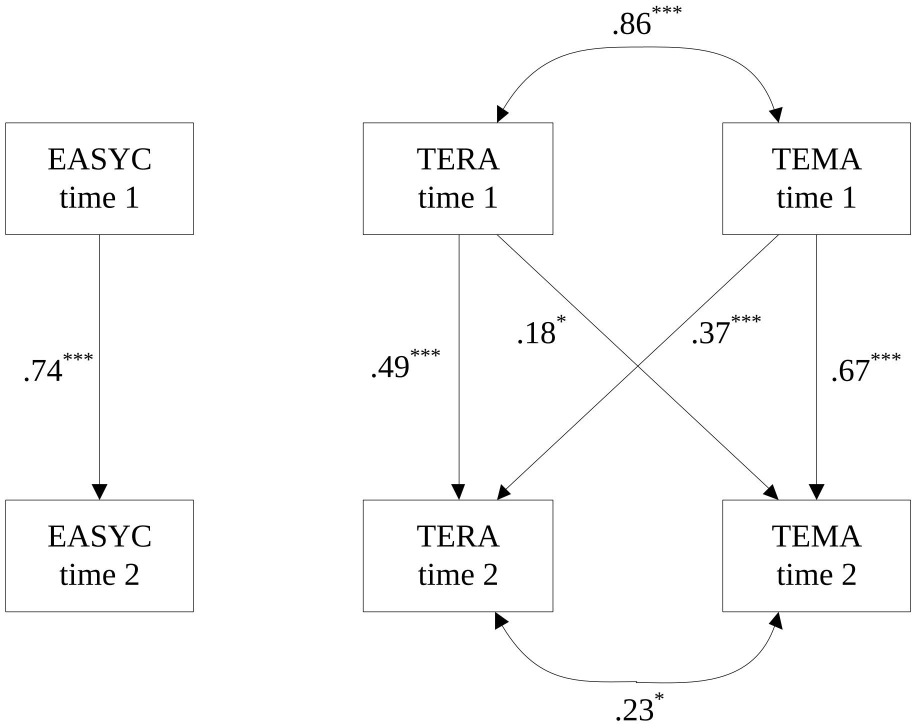

Figure 15. SEM analysis for EASYC, TERA, TEMA for the NZ sample
Note: A fully saturated model was tested. Only significant relationships are presented.

not significant at time 2. Likewise, the EASYC correlated weakly with TEMA scores at time 1 and the relationship was non-significant at time 2. In the first phase of testing, US EASYC practices were significantly related to child ability in both maths and literacy. In contrast, the New Zealand sample did not return significant correlations between the EASYC and the TERA or TEMA at time 1 or 2, suggesting that in New Zealand EASYC items were not related to child abilities. There were no predictive relationships found between the EASYC and TERA or TEMA scores for either country; parent activity did not seem to influence child literacy or numeracy knowledge across time.

On the surface, the EASYC seems to be more influential in the US sample. However, equality constraint analysis did not find any significant differences between countries regarding the EASYC, illustrating the similar influence of in-home activities between US and NZ cultures.

Table 7

Estimates and Equality Constraint Analysis for EASYC, TERA, TEMA by Country

Link	Estimate		χ^2	df	p-value
	US	NZ			
Covariance time 1					
EASYC – TERA	.28***	.14	1.00	1	.317
EASYC - TEMA	.18*	.08	1.30	1	.254
TERA - TEMA	.80***	.86***	4.60	1	.032
Covariance time 2					
EASYC – TERA	.14	-.06	2.10	1	.147
EASYC - TEMA	-.10	.01	.60	1	.438
TERA - TEMA	.10	.23*	1.60	1	.206
Stabilities					
EASYC –EASYC	.70***	.74***	.60	1	.438
TERA – TERA	.48***	.49***	1.90	1	.168
TEMA – TEMA	.67***	.67***	.50	1	.479
Cross-Lags					
EASYC 1 – TERA2	-.03	.01	.20	1	.655
EASYC1 – TEMA2	.07	-.04	2.10	1	.147
TERA1 – EASYC2	.11	-.04	.90	1	.343
TERA1 – TEMA2	.24**	.18*	1.70	1	.192
TEMA1 - EASYC2	-.21	-.18	.10	1	.752
TEMA1 – TERA2	.48***	.37***	1.50	1	.221

Note: *$p < .05$. **$p < .01$. ***$p < .001$.

Hypothesis 4: Both the in-home activities implemented, and the numeracy and literacy achievement of children would be different between cohort groups.

Two age-based cohorts were sampled; cohort 1 comprised children 4 years old and cohort 2 children who were 5 years old at initial data collection. Age-related differences were expected because the types and number of activities younger children engage in are probably different to those of older children. Additionally, marked cohort differences were expected in TERA and TEMA results based on developmental differences in children's knowledge. However, children aged 5 across the two cohorts (time 2 data collection for cohort 1, and time 1 data collection for cohort 2) were expected to be statistically similar as they were derived from the same sample populations.

As was seen in ANOVA analyses (Tables 3 and 4), there were no significant differences between cohorts in EASYC scores. This similarity negates the hypothesis and indicates that parents were presenting similar levels of in-home activities to their children, irrespective of their age at an overall summed level. It is possible that age differences would be noted at the item level within the EASYC, however analyses at item level was outside of the scope of the current thesis and therefore not investigated. In accordance with the hypothesis, there were marked cohort differences in the results of the TERA and TEMA; the older children of cohort 2 significantly out-scored cohort 1 in both measures.

The results of 5 year olds across the two cohorts were compared for equivalence and to establish the ability to make sequential predictions. The hypothesised similarity between 5 year olds did not hold; MANOVA tests of between subjects' effects show significant differences between cohorts in each of the measures. On the TERA, $F(1, 314) = 6.69$, $p < .05$, $\eta^2 = .018$, cohort 1 5 year olds (45.35) scored significantly higher than cohort 2 5 year olds (42.47). The same pattern was found for the TEMA, $F(1, 314) = 12.44$, $p < .001$, $\eta^2 = .035$, with cohort 1 5-year olds (31.20) out-scoring cohort 2 5 year olds (28.35). The significant difference between 5 year olds in each cohort means that we cannot consider the two cohorts to be identical. When the children of cohort 1 were 5 years old, it was the second point of data collection, therefore one explanation for the differences could be differential attrition. It is possible that participants who showed lower scores dropped out of the study at time 2 causing mean scores to improve and influencing the results of cohort 1 5-year olds. MANOVA was used to compare the time 1 TERA, TEMA and EASYC scores of those who were retained in the study with those who dropped out. No significant differences were found, indicating that those who dropped out had similar scores to those who continued with the study. Accordingly, the differences between the cohorts test-scores cannot be explained through differential attrition. Improved scores through practise are likely as the 5 year olds of cohort 1were sitting the EASYC for the second time, while it was the first exposure to the EASYC for those 5 year olds in cohort 2.

Path models (Figures 16 and 17) compared the EASYC, TERA and TEMA scores of each cohort across time, with results displayed in table 8. Covariate analysis for cohort 1 at time 1 showed the EASYC to be moderately correlated with the TERA and weakly correlated with the TEMA. However these correlations are not significant at time 2, when the children are 5 years old. Analysis of cohort 2 did not return any significant covariate correlations involving the EASYC at time 1 or 2, suggesting no relationship exists between the EASYC and literacy or numeracy abilities for children 5 and 6 years old. Analysis by cohort did not produce any significant predictive relationships concerning the EASYC; in both cohorts, in-home activities did not predict children’s maths or numeracy ability a year later.

Analysis of equality constraints was used to assess the apparent differences between cohorts for statistical significance. The correlation between the EASYC and TERA at time 1 was found to be significantly different between cohort 1 and cohort 2, $\chi^2(1, N = 406) = 5.3$, $p = .021$. A correlation between the EASYC and literacy ability was present in a 4 year old

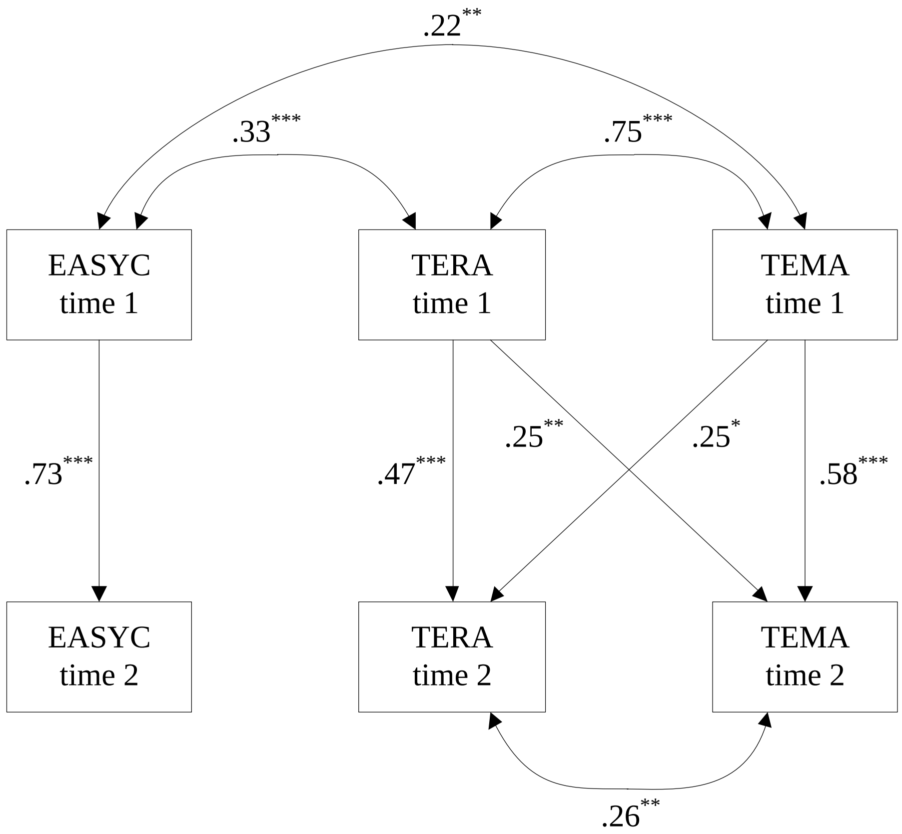

Figure 16. SEM path model for EASYC, TERA, TEMA for cohort 1

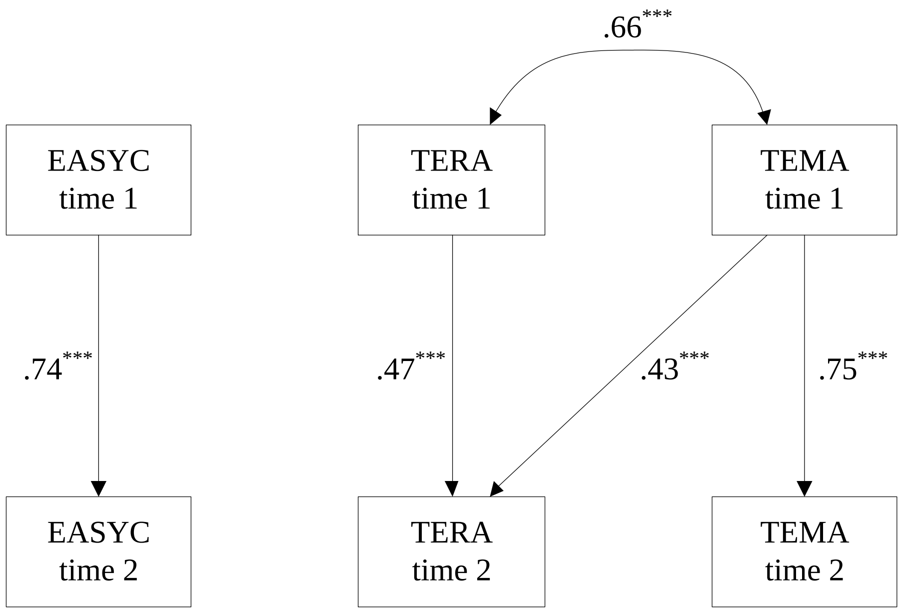

Figure 17. SEM path model for EASYC, TERA, TEMA for cohort 2

sample, but dissipated within the 5 year old cohort. Differences in the influence of in-home activities on academic development were found when analysing cohorts separately, however as hypothesised, the inconsistency can be explained by the effect of age rather than one cohort experiencing the EASYC differently to the other cohort. It seems that the EASYC is related to child ability in younger children only, as after age 5 no significant relationships were found in either cohort.

Hypothesis 5: Parents' differential use of literacy and numeracy activities will impact on the child's academic ability

To account for possible differences in activities parents implement with their children, the EASYC was divided into numeracy- and literacy-based activities. A natural progression was expected where children perform better in numeracy if their parent had implemented numerical activity, and the same pattern for literacy. It was hoped significant correlations would also be exhibited between literacy activities and numeracy ability and between

Table 8

Estimates and Equality Constraint Analysis for EASYC, TERA, TEMA by Cohort

Link	Estimate		χ^2	df	p-value
	Cohort 1	Cohort 2			
Covariance time 1					
EASYC – TERA	.33***	.07	5.30	1	.021
EASYC - TEMA	.22**	.03	3.00	1	.083
TERA - TEMA	.75***	.66***	.20	1	.655
Covariance time 2					
EASYC – TERA	.00	-.02	.00	1	-
EASYC - TEMA	.00	.03	.10	1	.752
TERA - TEMA	.26**	.05	2.60	1	.107
Stabilities					
EASYC –EASYC	.73***	.74***	.00	1	-
TERA – TERA	.47***	.47***	.00	1	-
TEMA – TEMA	.58***	.75***	4.90	1	.027
Cross-lags					
EASYC 1 – TERA2	-.01	-.04	.10	1	.752
EASYC1 – TEMA2	-.01	.05	.50	1	.479
TERA1 – EASYC2	.01	.01	.00	1	-
TERA1 – TEMA2	.25**	.06	2.30	1	.129
TEMA1 - EASYC2	.06	-.15	2.90	1	.088
TEMA1 – TERA2	.25*	.43***	2.70	1	.100

Note: *$p < .05$. **$p < .01$. ***$p < .001$.

numeracy activities and literacy ability over time. Separate path models, including the variables EASYC literacy, EASYC numeracy, TERA and TEMA were constructed, first comparing countries (Figures 18 and 19) and then cohorts (Figures 20 and 21) with the aim of eliminating possible confounded hidden effects. Analyses focused on the TERA and TEMA are the same as before separation of the EASYC, therefore significant relationships found are not repeated in this section but will be reported in Hypothesis 8, which looks at the interdependence of literacy and numeracy development.

Country comparison of literacy and numeracy based activities. Refer to table 9 for literacy and numeracy results by country. Analysis of time 1 results show that in both countries, parents' use of numeracy or literacy activities was strongly associated, namely EASYC literacy and EASYC numeracy are strongly correlated. Without separating the EASYC, the US sample had a high number of significant correlations at time 1 and this was maintained when looking specifically at numeracy and literacy EASYC items. The EASYC literacy was moderately correlated with the child's TERA scores and weakly correlated with TEMA scores. The EASYC numeracy was weakly correlated with both the TERA and the TEMA scores. In the US sample, use of both literacy and numeracy EASYC items was concurrently influential. The New Zealand sample did not show similar relationships with the overall EASYC and child test scores, however when the numeracy items were removed, EASYC literacy was weakly correlated with the TERA and the TEMA. These correlations are similar to the US EASYC literacy findings, and when coupled with the fact that the EASYC numeracy items remain unrelated to TERA and TEMA scores, a discrepancy between US and New Zealand parent practices seems plausible. EASYC literacy items, but not numeracy items seem to be influential in the New Zealand sample.

As has been the overall pattern, for both countries the high number of significant relationships was drastically reduced at time 2. Though the relationship weakens, the EASYC

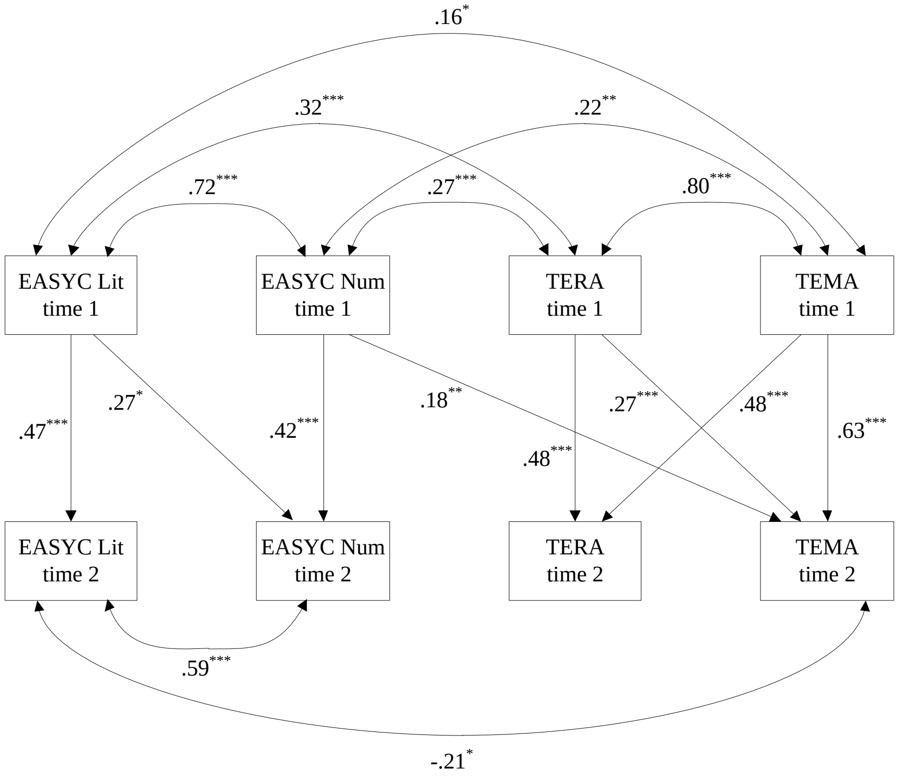

Figure 18. SEM path model for EASYC lit, EASY C num, TERA and TEMA for the US sample
Note: A fully saturated model was tested. Only significant relationships are presented.

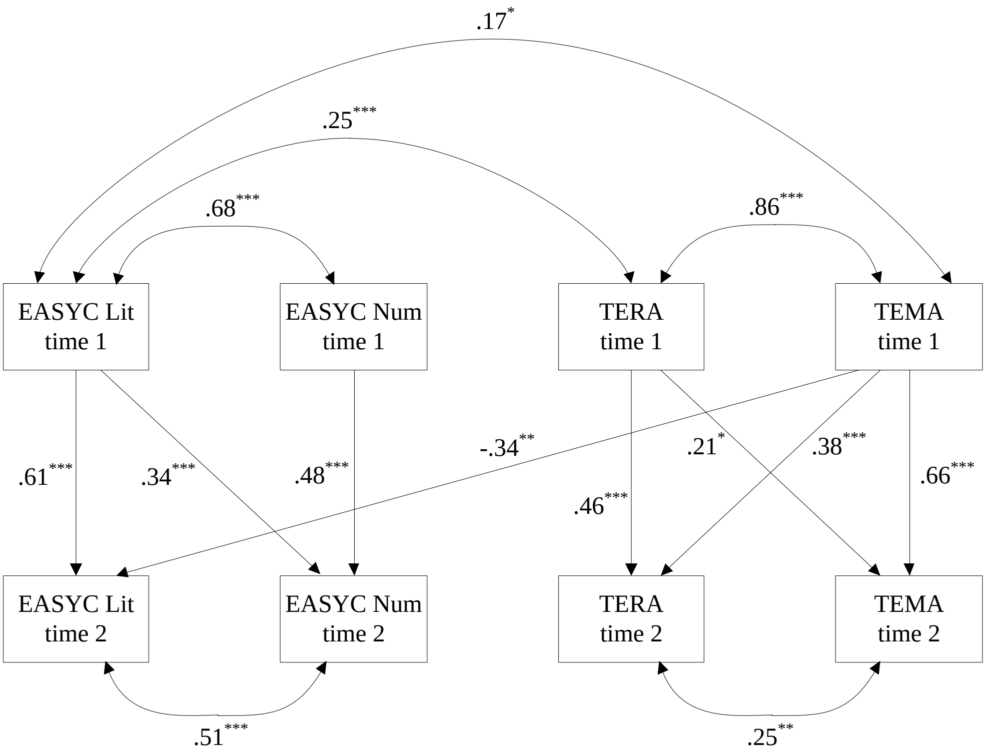

Figure 19. SEM path model for EASYC lit, EASY C num, TERA and TEMA for the NZ sample
Note: A fully saturated model was tested. Only significant relationships are presented.

literacy and EASYC numeracy correlation remain for both countries, showing a maintained relationship between the types of activities used. No other correlations were significant for New Zealand at time 2. Interestingly, a weak inverse relationship between the EASYC literacy and TEMA scores was present for US time 2 data, suggesting the better a child is at maths the less parental literacy support is given, or the more focus on literacy activities the weaker the child's maths score.

Table 9

Estimates and Equality Constraint Analysis for EASYC Literacy, EASYC Numeracy, TERA and TEMA by Country

Link	Estimate		χ^2	df	p-value
	US	NZ			
Covariance time 1					
EASYC lit – EASYC num	.72***	.68***	1.40	1	.24
EASYC lit – TERA	.32***	.25***	.00	1	-
EASYC lit – TEMA	.16*	.17*	.00	1	-
EASYC num – TERA	.27***	.13	1.50	1	.22
EASYC num – TEMA	.22**	.11	1.80	1	.18
TERA – TEMA	.80***	.86***	4.60	1	.03
Covariance time 2					
EASYC lit – EASYC num	.59***	.51***	3.50	1	.06
EASYC lit – TERA	.19	-.10	4.50	1	.03
EASYC lit – TEMA	-.21*	.00	2.40	1	.12
EASYC num – TERA	.03	-.04	.30	1	.58
EASYC num – TEMA	.08	.07	.00	1	-
TERA – TEMA	.11	.25**	2.00	1	.16
Stabilities					
EASYC lit 1 – EASYC lit 2	.47***	.61***	.80	1	.37
EASYC num1 – EASYC num2	.42***	.48***	.50	1	.48
TERA 1 – TERA 2	.48***	.46***	2.40	1	.12
TEMA 1 – TEMA 2	.63***	.66***	.30	1	.58
Cross-lags					
EASYC lit 1 – EASYC num2	.27*	.34***	.00	1	-
EASYC lit 1 – TERA 2	-.01	.09	1.00	1	.32
EASYC lit 1 – TEMA 2	-.12	-.13	.00	1	-
EASYC num 1 – EASYC lit2	.13	.14	.10	1	.75
EASYC num 1 – TERA 2	-.02	-.06	.20	1	.65
EASYC num 1 – TEMA 2	.18**	.08	1.10	1	.29
TERA 1 – EASYC lit 2	.03	.02	.00	1	-
TERA 1 – EASYC num 2	.15	-.09	2.00	1	.16
TERA 1 – TEMA 2	.27***	.21*	1.90	1	.17
TEMA 1 – EASYC lit 2	-.14	-.34**	1.30	1	.25
TEMA 1 – EASYC num 2	-.22	-.04	1.20	1	.27
TEMA 1 – TERA 2	.48***	.38***	1.20	1	.27

Note: **p* < .05. ***p* < .01. ****p* < .001.

Both countries had a significant predictive relationship between EASYC literacy activities at time 1 and EASYC numeracy at time 2, though this relationship is not bidirectional as EASYC numeracy at time 1 did not predict EASYC literacy at time 2. It seems that a parent's use of literacy activities is predictive of their use of numeracy activities 1 year later. Importantly, the US data displayed a weak predictive relationship between the EASYC numeracy at time 1 and TEMA at time 2, showing some variation in maths ability to be predicted by the parents' use of maths activities 1 year earlier. No such relationship was found in the New Zealand sample, however there was a moderate inverse relationship between New Zealand TEMA scores at time 1 and EASYC literacy at time 2, implying that in New Zealand the better a child is at maths at time 1 the less literacy focus from parents at time 2 or that poor maths ability leads to more focus on literacy at time 2.

Based on separate analyses, differences were expected between the US and New Zealand, particularly concerning the TEMA-EASYC correlations at time 1. Irrespective of expectations, equality constraint analysis did not return any notable significant differences between the countries, adding weight to the hypothesis that countries should have similar results. The covariance of EASYC literacy with the TERA was significantly different between the countries, however both base run correlations were initially non-significant, so this difference is trivial.

As hypothesised, in both countries, use of in-home literacy activities was associated with concurrent literacy ability of the children, and to a lesser extent maths ability. Use of in-home numeracy activities was related to concurrent maths and literacy development at similar levels but only in the US sample.

Cohort comparison of literacy and numeracy based activities. EASYC literacy and numeracy results by cohort are displayed in table 10. For cohort 1 covariate analysis returned significant correlations in all relationships at time 1. As with the country

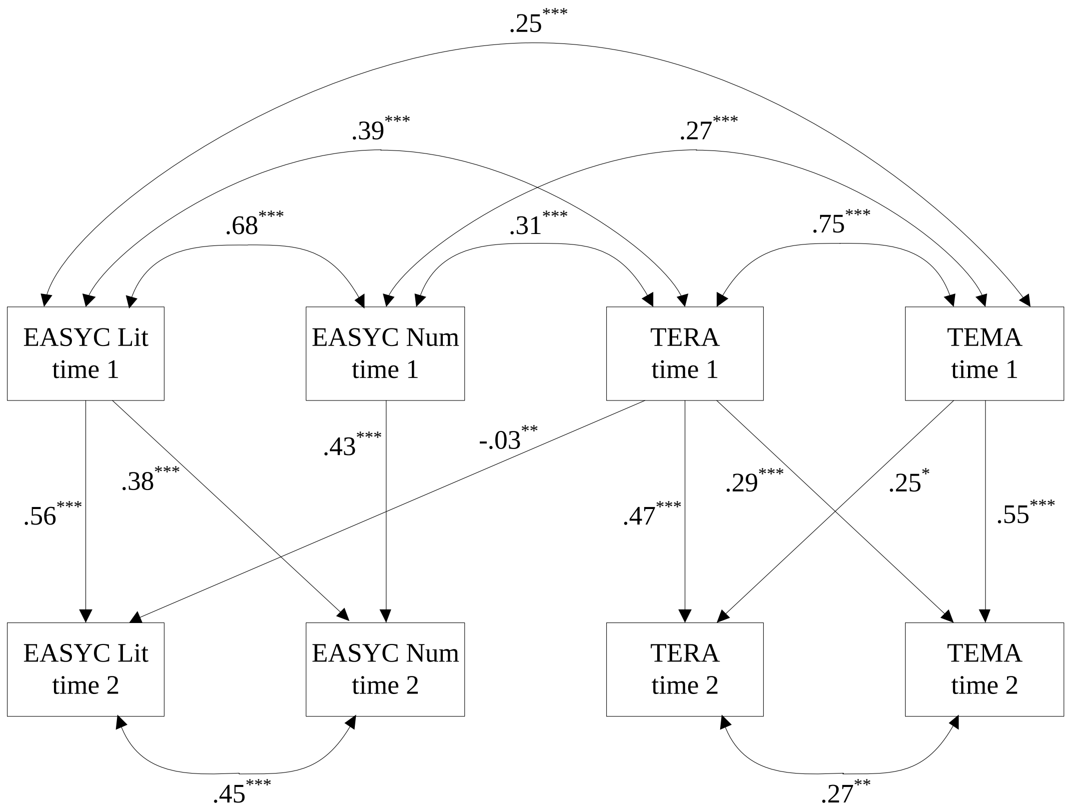

Figure 20. SEM path model for EASYC lit, EASY C num, TERA and TEMA for cohort 1
Note: A fully saturated model was tested. Only significant relationships are presented.

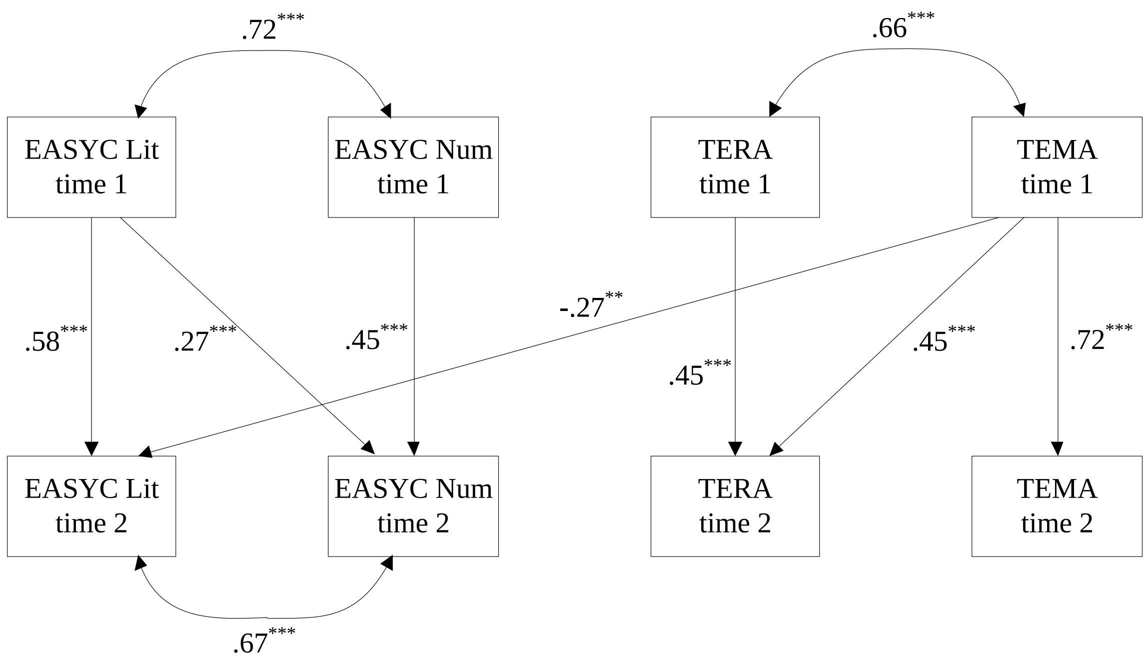

Figure 21. SEM path model for EASYC lit, EASY C num, TERA and TEMA for cohort 2
Note: A fully saturated model was tested. Only significant relationships are presented.

comparison, strong correlations were found between EASYC literacy and EASYC numeracy, i.e. the type of activities parents were doing with their children were highly related. The EASYC literacy correlated moderately with the TERA and weakly with the TEMA. Likewise, EASYC numeracy items showed moderate correlations with the TERA and the TEMA. In cohort 1, when the children are 4, there seems to be concurrent, interrelated relationship between literacy and numeracy activities and the child's abilities.

Table 10

Estimates and Equality Constraint Analysis for EASYC Literacy, EASYC Numeracy, TERA and TEMA by Cohort

Link	Estimate		χ^2	df	p-value
	Cohort 1	Cohort 2.			
Covariance time 1					
EASYC lit – EASYC num	.68***	.72***	.70	1	.40
EASYC lit – TERA	.39***	.10	7.00	1	.01
EASYC lit – TEMA	.25***	-.03	7.70	1	.00
EASYC num – TERA	.31***	.09	4.00	1	.04
EASYC num – TEMA	.27***	.09	2.70	1	.10
TERA – TEMA	.75***	.66***	.20	1	.65
Covariance time 2					
EASYC lit – EASYC num	.45***	.67***	2.20	1	.14
EASYC lit – TERA	.13	-.12	3.50	1	.06
EASYC lit – TEMA	-.01	-.04	.10	1	.75
EASYC num – TERA	-.09	-.03	.30	1	.58
EASYC num – TEMA	.06	.17	1.00	1	.32
TERA – TEMA	.27**	.07	2.30	1	.13
Stabilities					
EASYC lit 1 – EASYC lit 2	.56***	.58***	.00	1	-
EASYC num 1 – EASYC num 2	.43***	.45***	.10	1	.75
TERA 1 – TERA 2	.47***	.45***	.00	1	-
TEMA 1 – TEMA 2	.55***	.72***	5.30	1	.02
Cross-lags					
EASYC lit 1 – EASYC num 2	.38***	.27**	1.00	1	.32
EASYC lit 1 – TERA 2	-.02	.08	.60	1	.44
EASYC lit 1 – TEMA 2	.22	-.08	1.10	1	.29
EASYC num 1 – EASYC lit 2	.12	.13	.00	1	-
EASYC num 1 – TERA 2	.02	-.10	.90	1	.34
EASYC num 1 – TEMA 2	.20	.14	.10	1	.75
TERA 1 – EASYC lit 2	-.03**	.07	.50	1	.48
TERA 1 – EASYC num 2	-.02	-.04	.00	1	-
TERA 1 – TEMA 2	.29***	.08	2.80	1	.09
TEMA 1 – EASYC lit 2	.06	-.27**	5.70	1	.02
TEMA 1 – EASYC num 2	.06	-.09	1.20	1	.27
TEMA 1 – TERA 2	.25*	.45***	3.20	1	.07

Note: *$p < .05$. **$p < .01$. ***$p < .001$.

In comparison, cohort 2 returned few significant correlations at time 1, i.e. a strong correlation between EASYC literacy and EASYC numeracy remained, though other relationships were not found.The relationship between EASYC literacy and EASYC numeracy was the only correlation to remain at time 2 for either cohort. Parents' use of literacy and numeracy activities is strongly related at all times and in all groups. All other correlations are non-significant at time 2.

Across time, EASYC literacy predicted EASYC numeracy in both cohorts. A parallel to results from the country comparison, it suggests use of literacy activity predicts the use of numeracy activity a year later. In cohort 2, a weak, negative relationship was seen between the TEMA at time 1 and the EASYC literacy at time 2, it seems that for cohort 2 the better the ability in maths at time 1, the less effort parents spent on home literacy activities at time 2. It is not apparent if the disparity between cohorts is due to cohort differences, or parents changing their practices as children age. It was hoped that by separating the EASYC literacy and numeracy items we would see predictive relationships between time 1 parental education and TERA and TEMA ability at time 2, however no such relationships were found in either cohort.

Comparing the cohorts using EASYC literacy and numeracy returned the most significant differences of all equality constraint analyses. As appeared on the surface, significant differences were found between the groups in correlations at time 1. Cohort 1 had a significant correlation between EASYC literacy and TERA at time 1, but cohort 2 did not, $\chi^2(1, N = 406) = 7.0$, $p = .01$, and the EASYC literacy and TEMA relationship was significant in cohort 1, but not for cohort 2, $\chi^2(1, N = 406) = 7.7$, $p = .001$. Likewise, cohort 1 yielded a significant correlation between EASYC numeracy and TERA, but cohort 2 did not, $\chi^2(1, N = 406) = 4.0$, $p = .04$. Significant correlations were more prolific for the youngest children

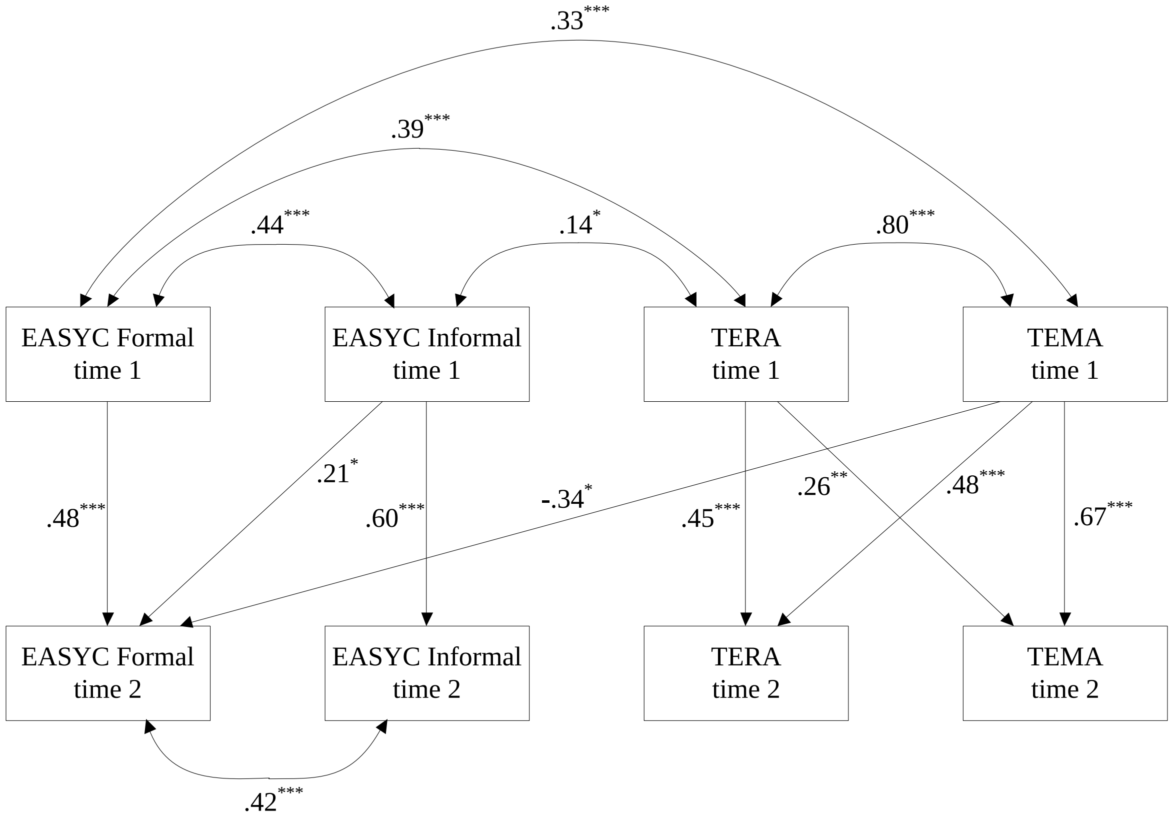

Figure 22. SEM path model for EASYC formal, EASY C informal, TERA and TEMA for the US sample
Note: A fully saturated model was tested. Only significant relationships are presented.

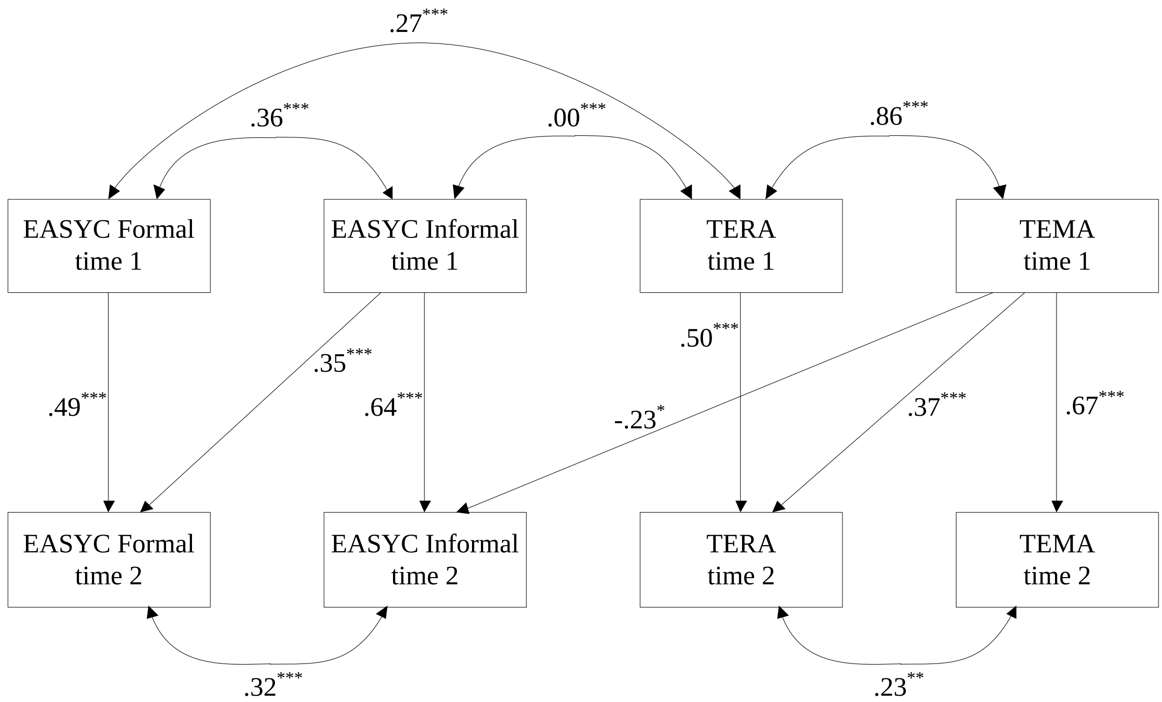

Figure 23. SEM path model for EASYC formal, EASY C informal, TERA and TEMA for the NZ sample

tested, and declined for older children. Additionally, in cohort 2 TEMA scores at time 1 negatively predicted EASYC literacy at time 2, but this relationship was not found in cohort 1 and equality constraint analysis supported this difference between the cohorts $\chi^2(1, N = 406) = 5.7, p = .02$,

The results of cohort 1 supported the hypotheses; in-home activities in literacy and numeracy were concurrently related to the children’s literacy and maths test scores. These findings were not supported in cohort 2, which suggests the EASYC is more influential in younger children.

Hypothesis 6: The use of formal and informal teaching methods will differentially impact child learning.

To investigate the methods of teaching parents use with their children, the EASYC was separated by formal and informal items. Formal, structured activities were expected to result in higher test scores than informal, play based activities. As with the literacy/numeracy analyses, separate path models were constructed to compare EASYC formal, EASYC informal, TERA and TEMA scores, on the basis of country (Figures 22 and 23) and age cohort (Figures 24 and 25). Likewise, isolated analyses of the TERA and TEMA in these path models give the same results as the initial country and cohort analyses and therefore are not reported.

Country comparison of formal and informal methods. Table 11 depicts the EASYC formal and informal results by country. Formal and informal EASYC approaches at time 1 were moderately correlated for both countries and this correlation was maintained at time 2. Parents’ use of formal and informal methods was related in both countries.

At time 1 formal EASYC items were correlated with TERA scores moderately in the US and weakly in NZ. The EASYC formal was moderately correlated with the TEMA in the US only. Neither country showed significant correlations between EASYC formal and the child test scores at time 2. Informal EASYC items showed very few significant correlations. In the US a very weak relationship was seen between informal items and the TERA and for New Zealand the relationship was significantly unrelated. EASYC informal was not related to the TEMA for either country, nor were any time 2 correlations found. Across the board, informal activities did not seem to strongly influence the academic scores of children. In general the hypothesis was supported as there were more relationships between EASYC

Table 11

Estimates and Equality Constraint Analysis for EASYC Formal, EASYC Informal, TERA and TEMA by Country

Link	Estimate		χ^2	df	p-value
	US	NZ			
Covariance time 1					
EASYC formal – EASYC informal	.44***	.36***	2.10	1	.15
EASYC formal – TERA	.39***	.27***	.20	1	.65
EASYC formal – TEMA	.33***	.25	.80	1	.37
EASYC informal – TERA	.14*	.00***	1.70	1	.19
EASYC informal – TEMA	.06	-.03	1.00	1	.32
TERA – TEMA	.80***	.86***	4.60	1	.03
Covariance time 2					
EASYC formal – EASYC informal	.42***	.32***	2.60	1	.11
EASYC formal – TERA	.17	-.08	3.50	1	.06
EASYC formal – TEMA	.06	.01	.20	1	.65
EASYC informal – TERA	.09	.00	.40	1	.53
EASYC informal – TEMA	-.03	-.04	.00	1	-
TERA – TEMA	.11	.23**	1.50	1	.22
Stabilities					
EASYC formal 1 – EASYC formal 2	.48***	.49***	.00	1	-
EASYC informal 1 – EASYC informal 2	.60***	.64***	.10	1	.75
TERA 1 – TERA 2	.45***	.50***	1.20	1	.27
TEMA 1 – TEMA 2	.67***	.67***	.50	1	.48
Cross-lags					
EASYC formal 1 – EASYC informal 2	.08	.09	.00	1	-
EASYC formal 1 – TERA 2	.08	-.05	3.00	1	.08
EASYC formal 1 – TEMA 2	-.01	.01	.10	1	.75
EASYC informal 1 – EASYC formal 2	.21*	.35***	1.70	1	.19
EASYC informal 1 – TERA 2	-.05	.02	1.10	1	.29
EASYC informal 1 – TEMA 2	.08	-.01	1.50	1	.22
TERA 1 – EASYC formal 2	.18	.04	.90	1	.34
TERA 1 – EASYC informal 2	.04	.03	.00	1	-
TERA 1 – TEMA 2	.26**	.17	2.20	1	.14
TEMA 1 – EASYC formal 2	-.34*	-.12	1.70	1	.19
TEMA 1 – EASYC informal 2	-.05	-.23*	.90	1	.34
TEMA 1 – TERA 2	.48***	.37***	1.40	1	.24

Note: *$p < .05$. **$p < .01$. ***$p < .001$.

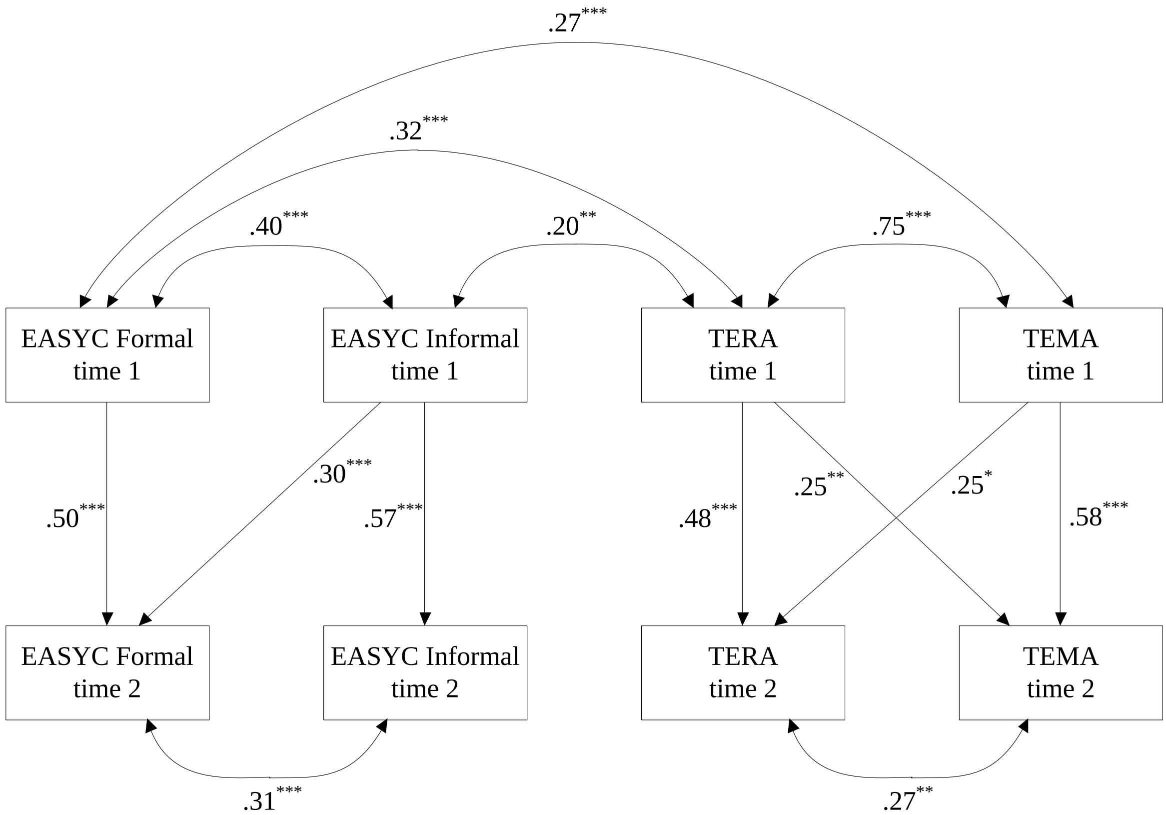

Figure 24. SEM path model for EASYC formal, EASY C informal, TERA and TEMA for cohort 1
Note: A fully saturated model was tested. Only significant relationships are presented.

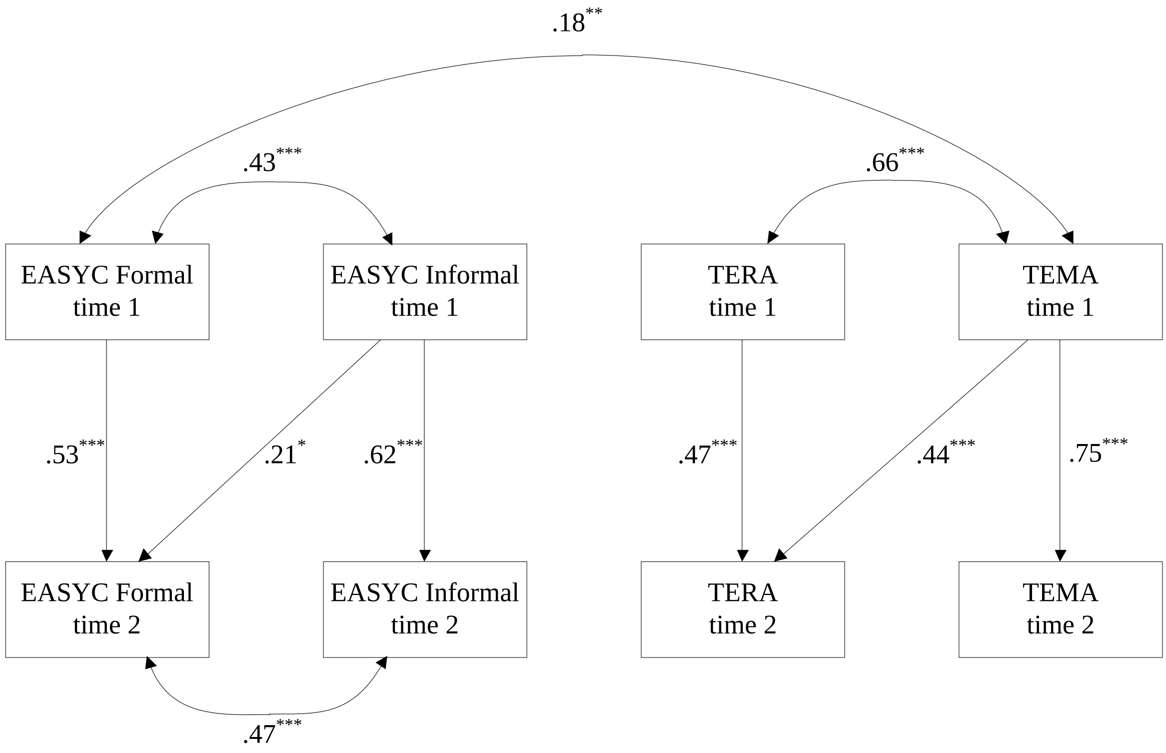

Figure 25. SEM path model for EASYC formal, EASY C informal, TERA and TEMA for cohort 2
Note: A fully saturated model was tested. Only significant relationships are presented.

formal items and test scores, than EASYC informal items and test scores. However, this conclusion is limited to time 1, activities of either teaching method did not seem to relate with older children's academic ability. Regression analysis showed EASYC informal at time 1 to predict EASYC formal items at time 2, weakly for the US and moderately for New Zealand.

Despite the lack of positive correlations involving informal methods, use of informal activities at time 1 is beneficial in that it predicts parents increased use of formal activities at time 2. Test scores were also seen to influence parent's use of activity. In the US there was a moderate negative predictive relationship between TEMA scores at time 1 and the EASYC formal. Similarly, the New Zealand sample showed a weak negative predictive relationship between TEMA scores at time 1 and EASYC informal at time 2. Parents seemed to increase the amount of formal activity they implemented if their child was struggling with maths, though the US favoured formal activities and New Zealand informal.

Despite appearances, equality constraint analysis returned no significant differences between the countries' use of formal or informal methods.

Cohort comparison of formal and informal methods. Refer to table 12 for EASYC formal and informal results by cohort. Covariate analysis showed EASYC formal and EASYC informal items to be moderately correlated for both cohorts and at both times, i.e. parents' use of formal or informal activities seemed to be related within both cohorts at each time point. In cohort 1 EASYC formal items were moderately correlated with TERA scores and weakly correlated with TEMA scores at time 1, though both relationships were non-significant at time 2. Cohort 2 returned a weak significant relationship between EASYC formal and TEMA scores only at time 1, but the formal-TERA relationship was not significant at either time. The only significant EASYC informal correlation was found at time 1, in cohort 1 with TERA scores, informal activities were weakly related to literacy abilities of the youngest group of children. In cohort 1 informal strategies were not related to the child's scores at time 2 or to maths scores in general, and in cohort 2 there were no significant relationships between EASYC informal and child abilities. As with the country analysis and supporting the hypothesis, formal activities showed a greater number of relationships with child academic ability than informal strategies did. In both cohorts EASYC informal activities at time 1 were predictive of EASYC formal activities at time 2. At both

Table 12

Estimates and Equality Constraint Analysis for EASYC Formal, EASYC Informal, TERA and TEMA by Cohort

Link	Estimate		χ^2	df	p-value
	Cohort 1	Cohort 2			
Covariance time 1					
EASYC formal – EASYC informal	.40***	.43***	.70	1	.40
EASYC formal – TERA	.32***	.12	2.30	1	.13
EASYC formal – TEMA	.27***	.18**	.20	1	.65
EASYC informal – TERA	.20**	.03	2.90	1	.09
EASYC informal – TEMA	.13	-.02	2.20	1	.14
TERA – TEMA	.75***	.66***	.20	1	.65
Covariance time 2					
EASYC formal – EASYC informal	.31**	.47***	1.00	1	.32
EASYC formal – TERA	-.15	.05	2.40	1	.12
EASYC formal – TEMA	.02	.07	.20	1	.65
EASYC informal – TERA	.07	-.05	1.00	1	.32
EASYC informal – TEMA	.02	.03	.00	1	-
TERA – TEMA	.27**	.05	2.90	1	.09
Stabilities					
EASYC formal 1 – EASYC formal 2	.50***	.53***	.80	1	.37
EASYC informal 1 – EASYC informal 2	.57***	.62***	.30	1	.58
TERA 1 – TERA 2	.48***	.47***	.00	1	-
TEMA 1 – TEMA 2	.58***	.75***	4.90	1	.03
Cross-lags					
EASYC formal 1 – EASYC informal 2	.14	.14	.10	1	.75
EASYC formal 1 – TERA 2	-.08	-.03	.30	1	.58
EASYC formal 1 – TEMA 2	.05	-.01	.50	1	.48
EASYC informal 1 – EASYC formal 2	.30***	.21*	.80	1	.37
EASYC informal 1 – TERA 2	.03	.00	.10	1	.75
EASYC informal 1 – TEMA 2	-.03	.10	2.30	1	.13
TERA 1 – EASYC formal 2	.12	-.07	2.00	1	.16
TERA 1 – EASYC informal 2	-.02	-.02	.00	1	-
TERA 1 – TEMA 2	.25**	.06	2.10	1	.15
TEMA 1 – EASYC formal 2	-.10	-.08	.00	1	-
TEMA 1 – EASYC informal 2	.08	-.15	2.90	1	.09
TEMA 1 – TERA 2	.25*	.44***	2.70	1	.10

Note: $*p < .05$. $**p < .01$. $***p < .001$.

age levels, implementation of formal activities was preceded by the use of informal activities, though the opposite was not true. No predictive relationships between formal or informal activities and child test scores were found.

Despite appearances, equality constraint analyses demonstrated that none of the apparent differences between cohort 1 and cohort 2, identified through separating EASYC formal and EASYC informal, were found to be significant.

Hypothesis 7: Overall, engaging in activities in the home will have a positive influence on the test results of children.

It was hoped there would be a general illustration of at home educational activities benefiting the numeracy and literacy scores of children. Firstly, an overall SEM model assessed residualised relationships between the EASYC, TERA and TEMA of all children combined. Analysis of covariates at time 1 indicated that parent education practices were weakly correlated with the child's literacy scores, TERA $r = .19$, $p = .001$, and numeracy scores, TEMA $r = .14$, $p = .007$, however no such relationships were found at time 2. The EASYC was not found to predict TERA or TEMA scores across time. This initial analysis does not support the prediction that in home activities are beneficial for the academic development of children. As has been illustrated, separating the EASYC for analysis produces significant results that were previously confounded.

There are examples of EASYC activities being positively associated with literacy and numeracy test results reported in the results of previous hypotheses which use subgroupings to analyse the sample. To summarise the positive influences found, literacy activities were concurrently associated with higher maths and literacy scores of children in both countries, and similarly the use of numeracy activities was associated with abilities, but in the US only. EASYC literacy and numeracy activities were also concurrently beneficial to the maths and literacy scores of the 4 year olds in cohort 1 at time 1. The use of formal in-home activities was also found to be beneficial, being associated with higher literacy scores in both countries and in cohort 1, and related to higher maths scores in the U.S and in both cohorts. Additionally, the literacy scores of the youngest children in cohort 1 were weakly related to informal activities. When taken together these examples provide evidence for the overall benefit of using EASYC activities with children. However, it should be noted that these examples were predominately in the first testing phase with concurrent data and with younger children. In addition, the positive influence of in-home activities did not seem to impact the future achievement of children, aside from numeracy activities predicting future maths ability in the US, no other significant predictive relationships were found. In a few cases the opposite hypothesis was supported, where the child's ability predicted the future use of in-home activities. A significant, negative relationship was found where maths test scores predicted parent's use of literacy activities in NZ and for cohort 2. For these demographic groups it seems the better their child was at maths, the less literacy activity that was implemented. Likewise, maths ability at time 1 negatively predicted future formal in-home activities in the US and informal in-home activities in NZ. When a child was doing worse in

Table 13

Relationships Between TERA and TEMA Test Scores

		TERA-TEMA *r*		TERA-TERA β	TEMA-TEMA β	TERA-TEMA β	TEMA-TERA β
		Time 1	Time 2				
Overall analysis		.81***	.17**	.52***	.71***	.16**	.37***
Country analysis							
	United States	.80***	.10	.48***	.67***	.24**	.48***
	New Zealand	.86***	.23*	.49***	.67***	.18*	.37***
Cohort analysis							
	Cohort 1	.75***	.26**	.47***	.58***	.25**	.25*
	Cohort 2	.66***	.05	.47***	.75***	.06	.43***

Note: Column 3 depicts covariate correlations at time 1 and a year later at time 2. Columns 4 and 5 are the stabilities of the TERA and TEMA across time. Column 6 is the regression weight of TERA scores predicting TEMA scores across 1 year and column 7 is the regression weight of TEMA scores predicting TERA scores across 1 year.

*$p < .05$. **$p < .01$. ***$p < .001$.

maths at time 1, US parents increased the number of formal activities, and NZ parents increased their use of informal activities. It would seem that the likelihood of parents using in-home activities with their children was influenced by the abilities of their child just as much as child ability was affected by the effort parents exerted in EASYC activities.

Hypothesis 8: Abilities in literacy and numeracy will be interdependent.

Using the results from all analyses, the relationship between literacy and numeracy development was explored, with the hypothesis that a child's ability in one area will be influential on the other. Table 13 gives an overview of the relationships between child literacy and numeracy test scores. In most divisions, maths and literacy abilities were strongly correlated at time 1, however weakened or became non-significant at time 2, suggesting literacy and numeracy abilities become more independent as children age. Across time, TERA and TEMA scores were moderately stable in all groups, indicating that time 1 literacy ability was predictive of time 2 literacy ability, and the same for numeracy. Interdependence between numeracy and literacy is further supported through predictive relationships across time. The child's TERA scores weakly predicted TEMA scores at time 2 in all subsamples except cohort 2, showing that literacy ability explained some of the variance in numeracy ability one year later for all groups, apart from the oldest sample of children. Stronger predictive relationships are found between TEMA to TERA scores at time 2 in all groups, indicating that maths ability was a good foundation for later literacy ability. As was hypothesised, a child's level of achievement in one discipline was predictive of their ability in the other, indicating a close developmental relationship between literacy and numeracy in young children.

Discussion

Parental support in an educationally stimulating home environment is proposed as a beneficial influence on the academic achievement of young children. The current study utilised the Encouragement of Academic Skills in Young Children scale (EASYC) to assess the day-to-day educational activities parents implement with their 4-6 year old children. The effect of in-home educational activities was explored by comparing the results from the EASYC with numeracy and literacy test scores of the children. Two main goals of the present study were identified: 1) to validate the EASYC as a reliable instrument in measuring parents' at-home education practices and 2) to illustrate the importance of providing a stimulating home educational environment for young children and to identify what types of educational activity are most beneficial to child learning development. To unpack these goals, eight hypotheses were proposed.

Summary of Results

1. **Reliability and validity of the EASYC as an instrument in measuring parent and child home education practices.** Reliability and validity of the EASYC was evident within the US sample and for pre-school children.
2. **Descriptive statistics of parent-reported activities and child test results.** Mean group differences were found across time, between age cohorts and between countries. Across time the number of literacy-based EASYC activities parents implemented increased, but numeracy-based activities decreased. As would be expected, children's test scores improved with age, and older children outperformed younger children. Between countries, US children received more EASYC activities than NZ children, however NZ children out-performed US children on measures of literacy.
3. **The influence of at-home activities on numeracy and literacy test scores would be similar within the Western culture.** US and NZ results were similar in that neither displayed correlational relationships between the EASYC and child test scores at time 2, and the EASYC did not longitudinally predict academic performance in either

country. However, differences were seen between the countries as the EASYC was related to child test scores at time 1 in the US, but this relationship was not seen in NZ.

4. **The use of in-home activities and the numeracy and literacy development of children would be different between cohort groups.** In support of the hypothesis, the general finding was that EASYC activities related to the academic abilities of younger children in cohort 1, with no significant relationships found between the EASYC and child test scores for cohort 2.

5. **The differential use of home literacy and numeracy activities would impact on the child's ability.** Hypothesis 5 was mostly supported. The use of in-home literacy activities was related to child literacy ability in both countries and in cohort 1, likewise the use of maths activities was related to numeracy test scores in the US and in cohort 1. In addition, weaker, but nonetheless significant concurrent relationships were found between literacy activities and maths test scores, and numeracy activities and literacy test scores. However, evidence of longitudinal prediction of children's academic skills by EASYC scores was lacking.

6. **The use of formal and informal teaching methods would differentially impact child learning.** In support of the hypothesis and prior findings (Aunio et al., 2008; Huntsinger et al., 2000), stronger relationships were found between formal, structured learning activities and academic development, than for informal play-based activities.

7. **Overall, engaging in activities in the home would have a positive influence on the test results of children.** On the whole, the positive influence of a supportive educational environment for young children was shown. Concurrent relationships between the EASYC and child test results were found, particularly in younger children and those from the US. Disappointingly, predictive patterns where a high use

of EASYC activities relates to the academic success of children one year later were not found.

8. **Abilities in literacy and numeracy would be interdependent.** Hypothesis 8 was supported in that a child's abilities in numeracy and literacy were found to be highly related in most sub-samples. A general pattern was found where numeracy and literacy were strongly related in 4 year old samples but the relationship weakened as the children got older. Predictive patterns were also seen, where early numeracy ability predicted future literacy ability and vice versa.

Several main themes were identified in these results which illuminate the two main goals of the study, and provide useful information for parents, education groups and directions for future research.

Goal 1: Validating the EASYC as a Reliable Measure of Parents at Home Practices

In support of hypothesis 1, the EASYC was demonstrated as a valid and reliable measure of the in-home activities parents' use with their children. To ensure the EASYC had good face validity and measured proximal, relevant parent-child activities, items were derived through parent interviews and videos of parent-child interaction. Additionally, the items yielded good internal consistency, with acceptable Cronbach's alphas ranging between .70 and .90. In comparison, current testing of the Home Learning Environment measure did not return an acceptable alpha level (the current study found an alpha of .48) detracting from its use as a reliable, replicable measure. The EASYC weakly correlated with the HLE which shows the measures are somewhat related though it is a poor demonstration of convergent validity. However, the lack of convergence was probably influenced by the low reliability and distal items of the HLE, compared with the acceptable reliability, broader scope and proximal items of the EASYC. Parents' use of items on the EASYC was maintained over one year, demonstrating good test-retest reliability. Disappointingly, the EASYC did not predict the future academic abilities of young children in a residualised longitudinal design. However a demonstration of predictive reliability may have been mitigated by the finding that the EASYC may be better suited to younger children and the US sample.

Age-specific use of the EASYC. Hypothesis 4 predicted marked differences in the activities used with children of different ages. Across the majority of analyses results suggest that the EASYC as a measure is better suited to younger children. The study considered the relevance of the EASYC with children aged 4-6 years, derived from two age cohorts and measured across two time points, set a year apart, and throughout all the subgroupings there were more significant results in younger sample groups. The suitability of the EASYC for use with younger children was demonstrated in numerous results. Between groups differences showed that the implementation of EASYC numeracy activities significantly decreased across time. Between time 1 and time 2 parents are either reducing the number of numeracy activities they implement, or numeracy activities change as children age and the EASYC is not capturing this new level of development. ANOVA analyses indicated that the EASYC numeracy items may be best suited to measuring what is going on with younger children. Furthermore, the most substantial evidence that the EASYC is better suited to younger children comes from SEM analysis of predictive relationships between the EASYC and child numeracy and literacy abilities. There were more, and stronger relationships found between all EASYC sub-scales (literacy, numeracy, formal and informal) and child abilities when the sample of children was younger. For example, at time 1, cohort 1 had the youngest sample of children (4 years) and yielded many significant relationships between the EASYC and child abilities. Comparatively, cohort 2 had older children at time 1 (5 years) and manifested fewer and less significant relationships concerning the EASYC, which completely disappeared at time 2 when the children were the oldest of those sampled (6 years). As the child sample increased in age, the associations between EASYC-measured parent activities and the child’s ability declined. Parents' efforts are either less influential on child outcomes as they get older, or the EASYC fails to capture different activities that parents use with older children. Because children learn and grow at a fast rate, developing a single measure to adequately assess the learning outcomes of children in a 3 year age range may have been too ambitious. A revised version of the EASYC may be necessary for use with older children. Either way, the EASYC in its current state seems to be a valid construct for measuring the in-home activities parents implement with preschool children under the age of 5, or before they reach formal schooling.

Country-specific use of the EASYC. As stated in hypothesis 3, the EASYC was expected to be relevant in the US and NZ as they are both Western countries with relatively similar approaches to teaching. Results showed the EASYC to be useful in both countries, though perhaps more relevant to the US sample. US parents reported using significantly more EASYC activities than NZ parents, total scores for the EASYC literacy and numeracy were an average of 2-3 points higher in the US sample. Furthermore, in SEM analyses, the US sample displayed more and stronger relationships between EASYC activities and numeracy and literacy development in children. Correlations between the EASYC and the numeracy and literacy abilities of children were significant for younger children in all US analyses, but in New Zealand analyses only EASYC literacy items were related to academic scores. It could be that US parents genuinely utilize a greater number of in-home activities and that their efforts are more often related to child outcomes than NZ parents efforts, however, because the EASYC was developed using US-collected resources, it is likely the EASYC does not adequately capture the activities NZ parents use with their children. Academic encouragement by NZ parents, particularly in numeracy-based activities, needs further investigation in order to gauge different activities NZ parents might be using. Associations between in-home help and child abilities were found in the US sample and if the EASYC better depicted the activities used by NZ parents, similar associations could also be identified in a NZ sample.

In sum, the EASYC seems to be most applicable for describing young children's development in the US. Fewer significant relationships concerning samples of older children and those from NZ were found compared to younger children and US families. Despite these gaps, the current form of the EASYC is a valuable resource for use with younger children in the US, and has the potential to be adjusted to suit older children and the NZ population.

Goal 2: Showing the Importance of a Stimulating Home Environment for Young Children and Identifying Beneficial Educational Activities

Parental involvement in a child's academic development was concurrently related to numeracy and literacy abilities in younger samples of children. Such correlations provide evidence that parents in-home efforts are positively related to their child's ability at the time of taking the test, however to show the long term benefit of parents assisting their children's learning, predictive relationships across time are required. Overall, the ability of EASYC-implemented activities to predict future child academic outcomes was not demonstrated. This finding fails to support hypothesis 7, namely that engaging in activities at home will positively influence child academic ability in the future. However, because there are concerns about the applicability of the EASYC in older samples of children we cannot globally conclude that all in-home parental encouragement is ineffectual on the future academic achievement of children. It may be that the previously detailed limitations of the EASYC prevented a significant predictive link between parental effort and future child success. Additionally, item-level analyses (e.g. individual analyses of board-game or storybook usage) may manifest significant longitudinal relationships and are an area worthy of future investigation, with the aim of identifying singular activities parents use that positively influence literacy and numeracy development across time.

The second aspect of goal 2 was to give parents insight into what activities are beneficial to the literacy and numeracy development of their children. The EASYC incorporated a range of activity types (literacy, numeracy, formal and informal) so that the benefits of each could be seen in relation to child ability. The results from all analyses produced a number of key implications that reflect what activities are most beneficial, how activities are best implemented and external factors that may be influential in the home education environment. These implications may be helpful for parents and educational facilities when shaping attitudes towards in-home education: 1) the rapid rate that children learn, 2) the co-dependence of literacy and numeracy development, 3) that formal activities relate to academic outcomes, 4) that early parental educational involvement is predictive of parent's future behaviour, and 5) the influence of culture on parental encouragement. Through encouraging development in these areas we may begin to see stronger empirically substantiated links between in-home activities and the long term success of children, which were not seen in the current study.

Rapid academic development. The speed at which young children learn is captured by the findings of the current study. As predicted in hypothesis 4, older children performed significantly better in measures of literacy and numeracy between age-cohorts and across time points. The passage of time was only a year, but the difference in academic ability was pronounced and is a clear example of how quickly children acquire new knowledge. Additionally, as was previously discussed, analyses supported use of the EASYC with pre-school children only, indicating that older children may have progressed from the scope of the currently measured tasks and have a more advanced set of academic needs. The valuable lesson parents can learn is that the activities and environments they expose their children to need to evolve to meet the rapidly changing needs of their child. This notion is supported in previous research which has shown that preschool learning and development is enhanced through exposing children to activities and education programmes that are appropriate to the individual child and respond to their specific needs, (Howes et al., 2008) which includes the need for more challenging tasks. If in-home help is going to be beneficial to learning outcomes parents need to be aware that as their child ages, particularly as they reach formal schooling at age 5 or 6, they will require more challenging tasks which stimulate the child's developing academic ability and respond to the individual needs of the child. A more detailed analysis of the EASYC at the item level might clarify this matter by highlighting specific activities that are benefiting children across time, compared with those which are no longer beneficial to older children.

Literacy and numeracy development is co-dependent. In general society, numeracy and literacy are often thought of as very separate skill areas, people often identify themselves as preferring or being better at either maths or literacy, and disliking the other. In accordance with this view, previous literature and measures of in-home educational activities have addressed the development of each separately (e.g. Griffin & Morrison, 1997; LeFevre et al., 2009; Sénéchal & LeFevre, 2002; Senechal et al., 1998). However, there is evidence that the development of early literacy and numeracy in children is co-dependent (e.g. Duncan et al., 2007; Senechal, 2006). The current study investigated numeracy and literacy in unison and found that in young children the two domains were closely associated. In the first phase of testing, all samples yielded strong correlations between the children's tests of early reading and mathematical ability, i.e. the child's skill level in one area was positively related to their ability in the other. In addition, maths ability moderately predicted the child's literacy ability one year later and vice versa, literacy scores predicted some of the variance in maths skill the following year. The overall picture shows that learning in pre-school children is not confined to one skill set, if a child is doing well in one area they are likely to achieve in the other, and moreover this co-dependence of ability is influential to the future ability of the child. In contrast, literacy and numeracy test scores were not correlated in year two of the study. It seems that as children age, their abilities become more focused and the development of literacy and numeracy diverge. From these findings there are two clear messages, the first is that teaching numeracy and literacy to pre-school children needs to be seen as a unified process. It is easy for adults to assume children will be stronger in one skill area and therefore weaker in the other area, and as consequence of this belief focus on *either* numeracy or literacy. An example of this either-or focus is seen in the current study. A negative correlation was found in the US sample between EASYC literacy activities and child math results. As maths ability improved, parents efforts in literacy activities went down, or as maths results got worse literacy activities were increased. Furthermore, in older children a weak, negative predictive relationship was found between maths ability and parents' efforts in literacy activities. If the child was good at maths, parents spent less time on literacy activities; if they were not good at maths, parents spent more time on literacy activities. It is the belief of the present author that this separation of literacy and maths should be avoided; parents and teachers need to be aware that the development of numeracy and literacy go hand-in-hand in the early years. Even though adults may feel more competent in one area or the other, it is not naturally the case for young children. It is important that children receive educational activities in both literacy and numeracy; with the added bonus that assisting in one area seems to influence positive development in the other. It is possible that by maintaining the support of both maths and literacy development, children would retain abilities in both areas as they age and we would not see relationships between numeracy and literacy decline. Following from this, the second message is that numeracy and literacy development should be studied in unison. Research and measures that focus on just one skill set are not portraying the whole picture of academic development and how different skills interact. The EASYC is an important achievement in the development of measures targeting in-home education encouragement as it adequately addresses both numeracy and literacy, highlighting the importance of both and allowing for analyses of literacy and numeracy co-dependence.

Formal activities are more beneficial than informal. As was predicted in hypothesis 6 and reported in previous studies (e.g. Aunio et al., 2008; Huntsinger et al., 2000), formal, structured activities were found to be more beneficial than informal, play-based activities as methods of teaching children. Relationships were found between formal activities and child achievement in maths and literacy, whereas informal activities did not prove to be as influential. EASYC formal activities were significantly related to children's literacy scores in both countries and in cohort 1, and to maths scores in the US and in both cohorts. In comparison, informal activities were weakly associated with literacy ability in 4 year olds, but were not sufficiently related to academic ability in any other group- very weakly associated with US literacy scores, not significantly related to NZ literacy scores, and not significantly related to maths ability. Results clearly show there is a relationship between the structured in-home activities parents implement and child success, but in most cases the informal activities used are not associated with child ability, this disparity highlights the benefit of using formal activities over informal. However, focusing solely on parent behaviour shows the benefit of implementing informal activities in pre-school. Across time, parents' initial use of informal activities predicted the use of formal activities; parents who used informal activities with their young children were more likely to implement formal activities in the future. In light of this finding, pre-school parents' who would otherwise not be inclined to use any form of in-home education with their children may benefit from encouragement to use informal activities at least initially. Instilling the use of fun, play-based activities into such families may encourage a progression to the future use of formal activities, which in turn would encourage academic growth in their children. In general, informing parents that formal activities are related to the academic performance of children may help them to decide what activities they should be using at home. While play-based activities are fun, they are not strongly related to literacy and numeracy ability. Using structured lessons to assist pre-school learning seems to be more beneficial and should be implemented by parents preparing a child for a formal schooling environment.

Early involvement predicts future parent behaviour. In general, parents who used educational activities with their 4 year old children were more likely to maintain use of activities in the future, as seen through the maintenance of EASYC activities across time in both countries and age cohorts. This finding suggests that parents who engage their preschool children in educational activities were more likely to continue their encouragement of in-home academic support, whereas those parents not using many in-home activities were unlikely to increase the amount of activity as their child aged. Future research is needed to determine if parental encouragement continues to later primary school and high school; does starting out as a supportive parent predict the level of support in later primary and high school? Previous research (McCoach et al., 2010) has demonstrated that a key feature of academically successful schools is that they have a network of supportive parents who are involved and take responsibility for their child's education, whereas under-achieving schools are more likely to have uninvolved parents. This disparity highlights the importance of continued parental involvement in education, and when coupled with the results of the present study, calls for parents to initiate their involvement early in life, while their children are in preschool.

The EASYC could be implemented to encourage parents to be actively involved in their child's education. Current results showed that previous exposure to the EASYC increased parents' use of in-home activities across time. When comparing 5 year olds in separate cohorts, parents of those in cohort 1 reported using significantly more in-home activities than those of cohort 2. An obvious explanation is that for the parents of 5 year olds in cohort 1 it was the second time they had filled out the EASYC, whereas it was the first time for cohort 2 parents. It is possible that the increased use of activities by cohort 1 parents one year later is a result of prior exposure to the EASYC acting as positive inspiration for increased academic encouragement. Using a measure like the EASYC may suggest and promote activities mentioned in the questionnaire and make parents more likely to use them. The EASYC could be used as a tool for drawing parents' attention to the academic needs of their children at an early age, thereby encouraging parents to take responsibility for in-home activities that promote literacy and numeracy achievement and in turn ensure children are prepared for formal schooling.

The influence of culture on parental encouragement. It is possible that the inability of EASYC activities to predict a child's future numeracy and literacy ability stems from the activities Western parents are currently using with their children. To ensure the EASYC was a proximal measure, items were sourced from parent interviews and videoed interactions and are therefore measuring culturally embedded activities. It is possible that the common activities parents are currently using, which the EASYC endeavours to measure, are not adequately stimulating children and therefore links to future child abilities are not seen. Perhaps, in a culture where the formal development of numeracy and literacy is held important from an early age, such as the Chinese culture (Aunio et al., 2008; Huntsinger et al., 2000), the activities parents are using are better suited for encouraging early academic achievement, such as those previously mentioned, and we would see in-home activities predict academic success. It would be interesting to adapt the EASYC to a culture such as the Chinese with the hope that culture-specific Chinese in-home activities would predict the future academic success of their children. Such findings would suggest that taking the activities Chinese parents use and implementing them in the Western culture would lift the standard of Western parents’ in-home practices and result in improved numeracy and literacy test scores for Western children.

An example of cultural difference in the approach parents take towards assisting their children is seen in the current study. In response to a child’s poor performance in numeracy, parents in both the US and NZ were seen to increase their level of EASYC activities, but the structure of teaching significantly differed between the country samples. Predictive relationships were found, where numeracy test scores of children were low in the first year, US parents responded by increasing their use of formal activities in the following year. Alternatively, NZ parents responded to low numeracy scores by using more informal activities with their children. As has been previously shown (e.g. Aunio et al., 2008; Huntsinger et al., 2000), and was found in the current study, formal activities seem to be more beneficial to the learning outcomes of children. Therefore, the inclination of US parents to use formal activities may have a greater impact on children who need numeracy assistance and could be demonstrated through follow-up studies showing US children experienced greater improvement in numeracy tests than NZ children. It is likely that the approach parents take to academic encouragement of children is culturally embedded (Aunio et al., 2008). An example of different approaches can be seen in the current study, and further research across cultures would likely support this notion. It is important parents are aware that their approach to assisting their child likely has a cultural foundation and that the strategies used in other countries may be more beneficial to the on-going development of their children. The numeracy and literacy success of children could be improved through adopting the in-home activities already used in other countries.

Limitations and Future Directions

In developing the EASYC, Huntsinger and Jose aimed to adequately measure the proximal activities that young children are exposed to in the home environment. Results substantiated the EASYC as applicable to the US sample and for use with younger children, however results were not as promising for the NZ sample or groups where children were older. US and NZ samples were expected to be similar in their approach to child education, therefore in the current study the same EASYC measure that was developed using US samples was implemented in NZ. However, results suggest that conducting parent interviews and observing parent-child interactions within NZ is necessary in order to modify the EASYC to better suit the NZ population.

As with cultural applicability, the EASYC was expected to suit children across a range of ages, hence children aged 4 to 6 years were included in the study. However, significant results became increasingly rare as the sample groups of children aged. Though the EASYC was related to the abilities of 4 year olds, relationships became weaker for 5 year olds, and unsubstantiated within the 6 year old sample. The rapid development of children's abilities is the likely reason for this finding and it seems that modification of the EASYC so that it is more age specific would be useful. It is possible that older children simply out-grew the activities currently covered by the EASYC. Another implication is that the relevance of the EASYC to children younger than 4 years should be investigated. Testing the EASYC with parents of children aged 2-3 years may show results similar to those found with 4 year olds in the current study, and if so, predictive relationships may exist where the efforts of parents with their toddlers is beneficial to the future academic ability of children when they are 4. Such a finding would support the recommendation that parents begin encouraging academic activities with their children from a very young age.

Many of the significant results reported in this study are correlational, and therefore restrictive as causality cannot be inferred; we cannot tell if the parent's implementation of EASYC activities is improving numeracy and literacy ability in children, or if the child's natural ability is influencing parent's use of more or less educational activity. Testing of the

EASYC would benefit from investigations of younger children, 2-3 years old, and repetition of the study at shorter time intervals. These changes would move the age range of children tested to a plausibly more suitable group, allow a more detailed portrayal of child development across the ages and hopefully provide evidence that early encouragement by parents predicts the future educational abilities of their child.

In alignment with the findings of Duncan and colleagues (2007), the current investigation uses child numeracy and literacy test scores as indicators of competency in learning and development. Using child test scores is sufficient for examining the influence of parent educational encouragement on the academic ability of the child, but it is likely that in-home activities have a broader impact on the development of children than purely academic achievement. Factors such as social and emotional growth (e.g. Fantuzzo et al., 2007; Raver & Zigler, 1997; Sheridan et al., 2010) and physical and motor development (Piotrkowski et al., 2000) have been linked to a child's successful transition into formal schooling. Parent assistance and the home environment are prime opportunities for not only academic growth but social and physical development as well. Therefore, future research should compare the EASYC with measures of social, emotional and physical child development to establish a range of factors that benefit from a nurturing home environment and give more evidence for the importance of parental involvement in the development of healthy and successful children. In accordance, factors that were not identified as influential to numeracy and literacy development may be established as beneficial in other areas. For example, relationships between play-based activities and child academic performance were not found in the current study, but informal interaction may nurture other fundamental areas of child development, such as social interaction and physical well-being. In essence, a broad foundation of research associated with parent in-home encouragement of children will extend current knowledge, exemplify the need for parents to be involved in their children's development and provide practical steps towards ensuring children are ready for formal schooling and capable of long-term achievement in education.

Conclusions

The current study investigated the academic benefit of parents providing in-home educational activities to their young children. In a longitudinal study, a newly developed measure, the Encouragement of Academic Skills in Young Children (EASYC), was associated with the numeracy and literacy test results of 4 to 6 year old children, in the US and New Zealand. Overall this study aimed to: 1) validate the EASYC as a reliable instrument in measuring parents' at-home education practices, and 2) demonstrate the importance of providing a stimulating home educational environment for young children. The EASYC was found most applicable to 4 year old children and the US sample, with future development and modification recommended if the EASYC is to be used in NZ or with older children. Overall, the key findings highlight the rapid rate at which children learn, the co-dependence of literacy and numeracy in child development, the superior influence of formal over informal activities on academic outcomes, that early parental involvement is maintained across time, and that culture is influential in the way parents encourage learning in their children. The EASYC could be developed as a helpful pre-school screening tool aimed at assessing parent involvement in early education and increasing the awareness of parents and educational facilities on these key findings. The broad scope of the EASYC makes it the best choice for use in practical settings as no other measure that attempts to assess parent in-home activity adequately assesses literacy, numeracy, formal and informal activities in one questionnaire. Likewise, the scope of the EASYC means it is equipped for further research with social, emotional and physical developmental factors. Implementing the EASYC in pre-school families may lead to improved development of education in homes, help to ensure preschool children are well prepared for formal schooling and in turn assist the long-term success of education in children.

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Appendix A

Questionnaire Demographics

1. Adult completing questionnaire (Circle one) mother father ________ (other)

2. Please describe your ethnic group membership: (Circle one)
   a. European New Zealander/Pakeha
   b. Maori
   c. Pacific Nations
   d. Asian
   Other: ______________________________

3. Child's Birthdate ___ ___ ____ (day/month/year)

4. Gender of child (Circle one) male female

5. How many adults are in your household? (Circle one) 1 2 3 4 or more

6. Has your child participated in any other structured or formal educational settings?

   music sports art dance religion class library programs

   other __________

7. How much does your child like counting and mathematics-related activities? (Circle one)

   Not at all a little moderately fairly well very much

8. How much does your child like stories and writing activities? (Circle one)

   Not at all a little moderately fairly well very much

9. Is there a computer in the home that your child can use? Yes Sometimes No

10. How many hours per week does your child use it? ____________________

11. What are your child's favorite computer programs? ___________________________

12. How would you rate your child's reading and writing abilities? (compared to other similar aged children)

    Excellent Very good Average Fair Poor

13. How would you rate your child's mathematics abilities? (compared to other similar aged children)

    Excellent Very good Average Fair Poor

14. How far can your child count accurately? ___________

15. List siblings' gender and age: ____

Appendix B

Encouragement of Academic Skills in Young Children (EASYC)

Parents do a lot of different things with their children that may or may not prepare them for school activities and subjects. Below is a list of things that you may or may not do. Please tell us how much you and/or your spouse ***actually*** *do these things.*

	Never do it	Sometimes do it	Do it a lot
1. Buy our child workbooks or practice books.	1	2	3
2. Limit our child's TV viewing to educational programs.	1	2	3
3. Give our child maths challenges while traveling in the car.	1	2	3
4. Point out letters and words in the environment.	1	2	3
5. Teach our child to add small quantities by counting on his or her fingers.	1	2	3
6. Tell our child that it is important to do well in school.	1	2	3
7. Assign our child words to copy.	1	2	3
8. After reading part of a book, ask questions about the story.	1	2	3
9. Encourage our child to complete workbooks that teach proper letter formation.	1	2	3
10. Try to improve our child's vocabulary by defining new words.	1	2	3

<u>Have you ever done any of these things?</u>

11. Enroll our child in a formal maths program (such as Kumon or Numberworks).	No	Yes
12. Buy books through a children's book club.	No	Yes
13. Have numbers depicted around the house (e.g., placemat, poster, pictures, calendar).	No	Yes
14. Teach my child to tell time.	No	Yes

How frequently does your child do each of the following activities at home?

	Never	Occasionally	Often	Very Often
15. Play with maths-related board and card games.	1	2	3	4
16. Play with maths toys, i.e., shape sorters, counting toys.	1	2	3	4
17. Play with blocks or construction toys.	1	2	3	4
18. Do origami (paper folding) or paper cutting.	1	2	3	4
19. Use prereading computer software, e.g., Bailey's Book House or Blue's Clues.	1	2	3	4
20. Do art activities involving pattern or symmetry.	1	2	3	4
21. Listen to stories read by parent or grandparent.	1	2	3	4
22. Play made-up games involving maths, e.g., counting stairsteps or counting stuffed animals.	1	2	3	4
23. Reading counting or shape books.	1	2	3	4
24. Do alphabet workbooks or worksheets.	1	2	3	4
25. Sing or listen to songs or fingerplays that use maths, e.g., Five Little Pumpkins.	1	2	3	4
26. Practice adding and subtracting single digit numbers.	1	2	3	4
27. Watching TV shows or videos that teach maths.	1	2	3	4
28. Play word-rhyming games.	1	2	3	4
29. Use maths in home routines, e.g., measuring ingredients for cooking.	1	2	3	4
30. Do maths-related workbooks or worksheets.	1	2	3	4
31. Use maths software on the computer, e.g., Millie's Math House.	1	2	3	4
32. Attend a story time at a library or bookstore.	1	2	3	4
33. Practice writing his or her name.	1	2	3	4
34. String beads using a repeating pattern.	1	2	3	4
35. Draw with crayons or markers.	1	2	3	4

36. Our child asks how to spell words.	1	2	3	4
37. Trace or copy words on paper.	1	2	3	4
38. Count actual objects or pictures.	1	2	3	4
39. Read books checked out from the library.	1	2	3	4
40. Practice writing numerals 1-10 and beyond.	1	2	3	4
41. Play with wooden or cardboard puzzles.	1	2	3	4
42. Play with Tangrams (Japanese puzzle).	1	2	3	4

Appendix C

The Home Literacy Environment

1. How many hours per day of television does your child watch?
   - Mon-Fri ______
   - Sat ______
   - Sun ______

2. Does anyone in the home have a library card? Who?
   - Father ______
   - Mother ______
   - Child ______

3. How often do you check library books out for your child?
   - Never ______
   - Once a month or less ______
   - More than once a month ______

4. Does your family subscribe to newspapers or magazines?
   - Yes ______
   - No ______

   If so, how many newspapers? ______
   If so, how many magazines for the parents? ______
   If so, how many magazines for the children? ______

5. How often do you read to yourself?
   - Daily ______
   - Several times per week ______
   - Weekly or less ______

6. How often does your spouse read to him or herself?
   - Daily ______
   - Several times per week ______
   - Weekly or less ______

7. Who reads to your child? ____________________

8. How often does this person read to your child?
   - Weekly or less ______
   - Several times a week ______
   - Daily ______

9. Approximately how many books does your child own?
   - Less than 10 ______
   - 10-30 books ______
   - More than 30 ______