Third Paper: Abstract Title Page

Title: Improving Quality and Child Outcomes in Early Childhood Education by Redefining the Role Afforded to Teachers in Professional Development: A Continuous Quality Improvement Learning Collaborative among Public Preschools in Chile

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Abstract Body

Background / Context:

Based on evidence derived from studies conducted mostly in the United States, many low- and middle-income countries are investing in early childhood education (ECE), with high expectations that it will improve academic outcomes, increase human capital, promote economic growth and reduce economic inequality. The impacts of ECE interventions depend on their quality (Camilli, Vargas, Ryan, & Barnett, 2010; Yoshikawa, 2014). An increasing amount of attention is being paid to quality in research and practice (Chavan, Yoshikawa & Bhadur, 2013; Sachs & Weiland, 2010), and to teacher professional development as a means to improve quality.

In Chile, there has been a great expansion of ECE provision. Still, children's language skills are below average, and there is a significant gap between socioeconomic groups. Several studies suggest that the quality of Chilean preschool environments may not be sufficient to address the disadvantages of low-income Chilean schoolchildren (Eyzaguirre & Le Foulon, 2001; Manzi, Strasser, San Martin, &Contreras, 2008; Noboa-Hidalgo & Urzua, 2012). There is a need for and interest in professional development programs and methodologies that enable teachers to learn, develop and deliver high quality educational interactions and experiences.

Un Buen Comienzo (A Good Start, UBC) was a cluster-randomized experiment of a two-year professional development program conducted in Chile that aimed to improve the quality of public preschool education and the outcomes of participating children. UBC provided 12 monthly workshops and 24 biweekly in-classroom teacher coaching sessions to promote adoption of strategies to improve children's language and literacy, with supporting interventions for children's health, socioemotional development and family involvement. UBC's impact analysis found positive impact on classroom quality with effect sizes in the moderate to large range (0.43-0.76) and null effects on child language and literacy skills (Yoshikawa et al, 2015).

UBC leadership at Harvard University and Chilean Fundacion Educacional Oportunidad, Ministry of Education and Universidad Diego Portales proposed to employ continuous quality improvement methodologies (CQI) to adapt and improve the UBC intervention, in order to maintain the positive impacts on classroom quality and increase impact on child outcomes. Continuous Quality Improvement is a practical approach that helps people learn about and change the systems at work in their organizations. CQI requires: 1) organizational changes to implement improvements, and 2) frequent and continuous measurement of quality and the commitment to use those measures transparently to guide organizational changes. Organizational changes usually involve giving frontline workers, those most knowledgeable about the processes under study, new responsibilities and power (Kritchevsky & Simmons, 1991), and are facilitated by formation of local CQI teams comprised of program leaders, staff, and recipients--in this case, school leadership, teachers, teachers' aides and parents.

We present the first study in South America to use CQI in the expansion of a preschool-based early childhood education intervention: UBC's adoption of the Institute for Healthcare Improvement's Breakthrough Series Collaborative (Institute for Healthcare Improvement, 2003).

Purpose / Objective / Research Question / Focus of Study:

Research Question 1: Can the Breakthrough Series Collaborative Methodology be applied to an early childhood education and in Chile?

Research Question 2: What is the impact of the UBC professional development in instructional strategies with CQI methods, as compared to the UBC professional development in instructional strategies alone?

Setting:

Chile is one of South America's most stable, prosperous and inequitable nations, with an average annual growth rate of 3.5 percent, the highest gross domestic product per capita in the region, and the largest Gini coefficient of economic inequality among OECD nations (IMF, 2008; OECD, 2011). Inequality is observed in Chile beginning in very early stages of children's development. Chilean children under age 5 from low socioeconomic backgrounds present significantly higher rates of socioemotional problems and language delays than children from families at the top of the country's income distribution (Behrman, Bravo, & Urzúa, 2010; Schady et al, 2014). Chilean policymakers are concerned about the country's large and growing inequality, and are well aware of the potential for early childhood education to improve outcomes for low-income children and to reduce societal economic inequality. Consequently, Chile is a global leader in early childhood policy. Since 2007, the Government of Chile established early childhood development policy as a key priority to close achievement gaps and address persistent economic inequality: it created a national integrated system for early childhood protection (Chile Grows with You) and expanded free early education opportunities for the poorest 40% of the population (Peralta, 2011; Silva & Molina, 2010). Early childhood education coverage for 4-year-olds expanded from 35% in 2003 to 45% in 2009 and 80% in 2012 (Ministerio de Educación, 2012). Despite access gains, however, concerns remain about preschool quality in Chile. The effectiveness of early childhood education (ECE) depends on its quality (Camilli et al, 2010), and several studies suggest that the quality of Chilean preschool environments may not be sufficient to address the disadvantages of low-income Chilean schoolchildren (Eyzaguirre & Le Foulon, 2001; Manzi, Strasser, San Martin, &Contreras, 2008).

Population / Participants / Subjects:

Forty teachers in low-income urban and rural preschool classrooms serving 1,349 four and five year-old children received UBC training in instructional strategies. A subset of 18 early adopters participated in a Learning Collaborative that taught CQI skills and facilitated shared learning.

Intervention / Program / Practice:

For all 40 participating teachers, UBC provided 12 monthly workshops and 24 biweekly in-classroom teacher coaching sessions to promote adoption of strategies to improve children's language and literacy, with supporting interventions for children's health, socioemotional development and family involvement. The 18 early adopting teachers that elected to participate in the Continuous Quality Improvement Learning Collaborative (CQI) also received training in CQI methods. Following the CQI methodology, the 18 early adopting schools formed improvement teams comprised of school leadership, teachers and parents. These teams worked together to identify specific areas for improvement, to test ideas they had that might lead to improvement via Plan-Do-Study-Act (PDSA) cycles, and to collect and reflect on data regularly as a team to modify their practices (Langley, Moen, Nolan, Nolan, Norman & Provost, 2009). The teams also participated in three Learning Sessions, large, two-day working meetings where

they presented their tests of change to one another, shared learning across schools, and received additional training in CQI skills.

Research Design:

Forty schools from three municipalities in the VI Region were recruited to participate in an expansion phase of UBC. All schools were public, municipal preschools serving a large majority of "priority students," as defined by a series of vulnerability criteria from the Ministry of Education. Preschool classrooms contained between 6 and 38 students, with 1 teacher and an additional teacher's aide in classrooms with more than 12 students. In 2011 and 2012, all 40 schools received the original two-year UBC intervention, with 12 trainings and 24 in-classroom coaching sessions. The 18 schools that elected to participate in the CQI Learning Collaborative, participated in CQI skills training beginning in 2011, and attended three Learning Sessions during the 2012 school year (in March, June and December).

We assessed the feasibility and fidelity of implementation of the Breakthrough Series Collaborative Methodology (RQ1) using program implementation data and end-of-intervention interviews and focus groups. We estimated the impact of an enhanced UBC + CQI intervention as compared to UBC alone (RQ2) using multilevel linear regression models that accounted for the nesting of students within classrooms. To minimize selection bias in this non-randomized design, we created propensity scores from pre-intervention baseline child, family and teacher characteristics that predicted each child's likelihood of participating in UBC+CQI.

Data Collection and Analysis:

Data for the impact analysis was collected at baseline and at the end of the second year of intervention. To measure classroom quality, we used a Spanish version of the Classroom Assessment Scoring System (CLASS; Pianta, La Paro, & Hamre, 2008), which focuses on interactions between students and teachers. The CLASS measure is predictive of child-level academic and nonacademic outcomes in prekindergarten and elementary school and is psychometrically validated in Chile (Leyva et al, 2015). Children's language and early literacy skills were assessed using the Woodcock-Munoz Language Survey, Revised Spanish Form (WMLS-R; Woodcock, Munoz-Sandoval, Ruef, & Alvarado, 2005).

We used pre-intervention child, family, teacher, and community characteristics to create propensity scores and as covariates to increase the precision of impact estimates. Parent questionnaires measured baseline *child characteristics* (gender, age, prior participation in center-based care, special healthcare needs, asthma) and *family characteristics* (maternal education and employment, depression, health insurance, family composition, causes of child absences, parents' experiences in their child's classroom, parents' educational beliefs, hopes and expectations). Teacher surveys collected teacher demographic characteristics that are considered important in the literature on teacher-child interactions (Bierman, Nix, Greenberg, Blair & Domitrovich, 2008), including teacher age, private school teaching experience (a binary indicator), teaching experience (in years), and teacher postgraduate education (in years).

We estimated the impact of an enhanced UBC + CQI intervention as compared to UBC alone (RQ2) using multilevel linear regression models that accounted for the nesting of students within classrooms. We created propensity scores from pre-intervention baseline child, family and teacher characteristics to predict children's likelihood of participating in UBC+CQI, and used inverse propensity weights to minimize bias introduced by the non-random selection process.

Findings / Results:

Research Question 1: Can the Breakthrough Series Collaborative Methodology be applied to an early childhood education and in Chile?

The Breakthrough Series Methodology for CQI was implemented well. All schools that participated in the Learning Collaborative formed CQI teams that involved school leadership, teachers, and teachers' aides; most included parents. All CQI teams participated in all Learning Sessions, conducted tests of change using PDSA cycles (see Table 1), and reported and reflected on quality data monthly.

In focus groups, teachers reported that that their role, respect and visibility within the school had changed as a result of their work with the CQI team and because of the skills they developed through UBC+CQI. Many reported that prior to the program, they had felt isolated and sequestered in the preschool classrooms, and that because of the CQI team, school leaders entered preschool classrooms for the first time and were impressed that the teachers taught children they had thought too young to do more than play. School leaders noted that the preschool teachers became protagonists in the refinement of their own practices by developing their own hypothesis about how to improve an aspect of classroom quality and testing it through PDSA cycles. All schools that participated in CQI wanted to articulate the UBC instructional strategies and CQI methods with first grade teachers; many school principals asked the preschool teachers to teach their colleagues what they'd learned and some paid them for their time. School leaders and teachers reported that a cultural change occurred through the CQI work, away from a culture where quality data was used for judgment to a culture where quality data was used to facilitate learning and to identify opportunities for improvement. At the Learning Sessions, teachers shared their tests of change in which they adapted the language and literacy strategies to distinct contexts, and thus, they became protagonists in refining the UBC intervention as well.

Research Question 2: What is the impact of the UBC professional development in instructional strategies with CQI methods, as compared to the UBC professional development in instructional strategies alone?

The incorporation of CQI led to larger increases in classroom quality scores over time. The propensity scores that used baseline child, family and teacher characteristics to predict children's likelihood of attending a school that received UBC+CQI were balanced, and they did a good job of reducing observable selection bias (see Table 2). Impact analyses that incorporated these propensity scores showed that children in classrooms whose teachers received professional development in instructional strategies plus CQI methods had larger increases in language skills (vocabulary, effect size 0.31, $p<0.05$) than children whose teachers received instructional strategies alone (see Table 3).

Conclusions:

CQI may be a valuable addition to promote change via professional development in low-income schools in Chile and warrant further examination for early childhood interventions in diverse contexts globally. Findings suggest that CQI works in part through changing the role of teachers in the school, supporting their own leadership and collaboration, and moving away from a culture of strict accountability (i.e. judgment) to one of facilitated and shared growth.

Appendices

Appendix A. References

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Appendix B. Tables and Figures

Table 1. Sample Run Chart for one CQI Team's Plan-Do-Study-Act Test of Change to Increase the Number of Children Using New Words Without Adult Help By Introducing One New Vocabulary Word Each Day

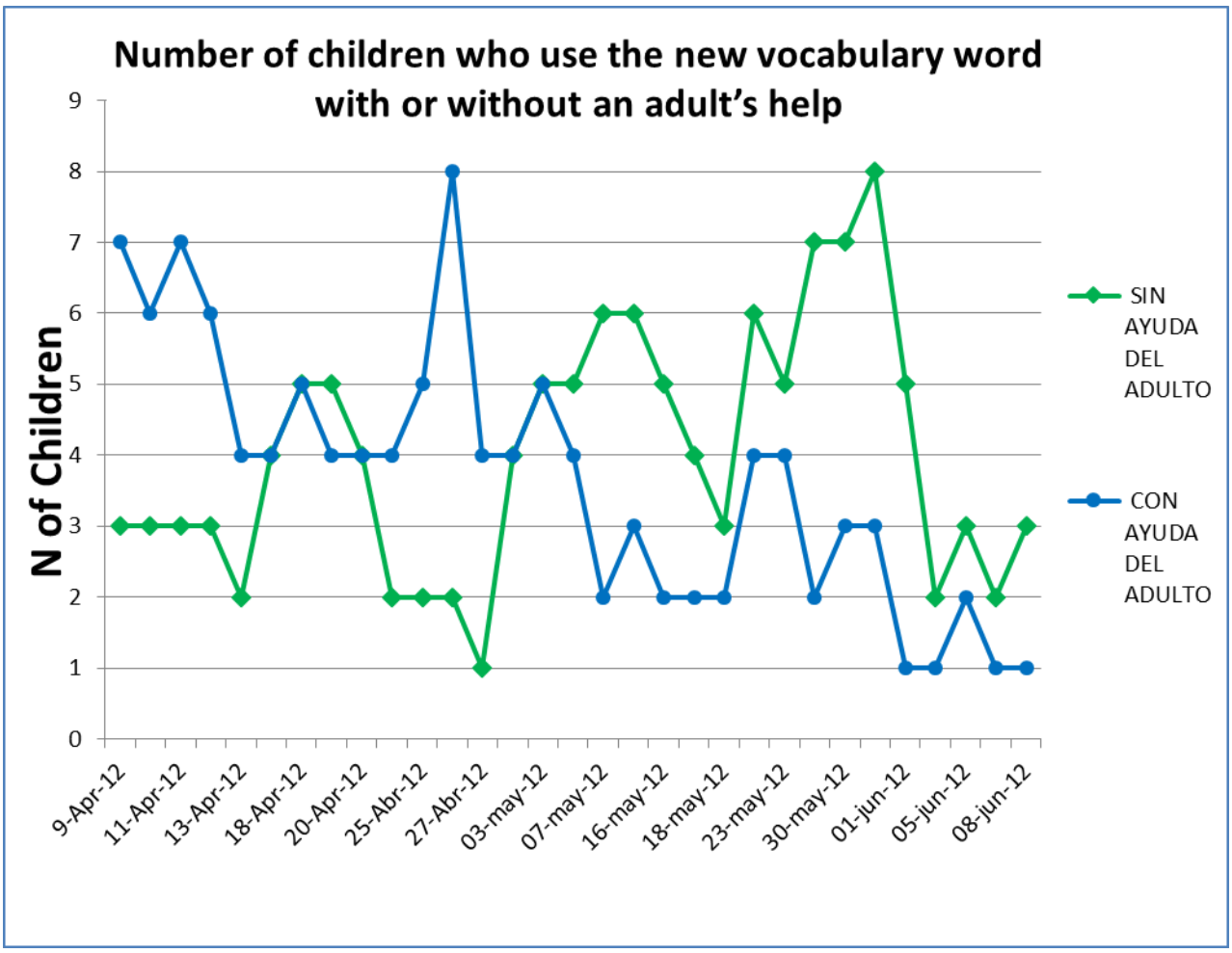

Table 2. Differences in baseline characteristics of children in schools that Receieved UBC + CQI as compared to schools that received UBC training in instructional strategies alone, before and after propensity score matching

Baseline Variables	UBC+CQI Schools		UBC only Schools		Sig	UBC+CQI Schools		UBC only Schools		Sig
Male	39.8%	(4.3)	48.2%	(1.4)	~	44.9%	(7.8)	47.4%	(1.61)	
Child asthma	1.7%	(1.2)	5.6%	(0.66)	**	3.31%	(2.5)	5.4%	(0.74)	
Child age (months)	51.6	(0.37)	52.6	(0.11)	*	52.8	(0.67)	52.4	(0.12)	
Maternal Education: incomplete primary	13.3%	(3.0)	9.6%	(0.84)		9.11%	(4.15)	10.0%	(0.96)	
Maternal Education: complete primary	18.8%	(3.5)	13.0%	(0.96)		19.7%	(6.04)	14.2%	(1.16)	
Maternal Education: inc. secondary	18.8%	(3.5)	18.7%	(1.1)		21.0%	(6.00)	19.7%	(1.28)	
Maternal Education: complete secondary	27.3%	(4.0)	33.7%	(1.3)		23.9%	(5.81)	33.5%	(1.51)	
Maternal Education: some superior	21.9%	(3.7)	24.7%	(1.2)		26.2%	(7.98)	22.4%	(1.33)	
Maternal employment	41.6%	(4.8)	50.4%	(1.5)	~	50.8%	(8.18)	50.9%	(1.72)	
Health Insurance: Public Tier 1-2	54.1%	(4.8)	64.4%	(1.4)	*	72.5%	(7.44)	64.5%	(1.55)	
Health Insurance: Public Tier 3-4	14.4%	(3.4)	25.9%	(1.3)	**	19.6%	(7.55)	24.6%	(1.36)	
Health Insurance: Blocked	31.5%	(4.4)	7.1%	(0.75)	** *	7.85%	(2.19)	8.49%	(0.99)	
Health Insurance: Private	0.0%	(0.0)	2.6%	(0.46)	** *	0.00%	(0.00)	2.43%	(0.47)	** *
N Children in Household	1.22	(0.1)	1.4	(0.03)	** *	1.32	(0.16)	1.43	(0.03)	
Parents' educational expectations: University	53.9%	(4.4)	56.4%	(1.4)		51.3%	(7.7)	56.0%	(1.60)	
Parents' educational aspirations: university	93.9%	(2.2)	97.0%	(1.3)		88.1%	(5.71)	96.8%	(1.40)	
Parents feel welcome in classroom: very	90.4%	(2.8)	79.2%	(1.2)	** *	90.2%	(4.43)	81.0%	(1.30)	*
Parent has been in classroom	88.7%	(2.9)	82.7%	(1.1)	~	90.0%	(4.85)	82.2%	(1.27)	
Teacher experience: 5 years or less	6.3%	(2.2)	9.6%	(0.84)		12.8%	(7.53)	7.54%	(0.85)	
Teacher experience: 6-15	24.2	(3.8)	25.4	(1.3)		26.3	(6.55)	20.2	(1.2	

years	%		%			%	)	%	9)	
Teacher with postgraduate	77.2		37.8		**	58.3	(8.25	40.0	(1.5	
education	%	(4.1)	%	(1.5)	*	%	)	%	9)	*
		(0.5		(0.21			(0.92		(0.2	
Teacher Age	45.4	0)	46.1	)		46.3	)	47.2	2)	
		(0.4		(0.15			(0.64		(0.1	
Child baseline vocabulary	17.6	3)	18.3	)		18.1	)	18.0	6)	
Child baseline letter-word		(0.2		(0.07			(0.24		(0.0	
ID	4.8	3)	5.42	)	~	4.92	)	5.27	8)	
		(0.2		(0.06			(0.27		(0.0	
Child baseline dictation	5.37	0)	5.83	)	*	5.62	)	5.77	7)	
Child baseline		(0.1		(0.03	**		(0.23		(0.0	
comprehension	2.07	2)	2.92	8)	*	2.38	)	2.82	5)	~

*** p<0.001, ** p<0.01, * p<0.05, ~ p<0.1.

Table 3. Adjusted Mean Language Outcomes for Children in Schools that Received UBC + CQI as compared to Children in Schools that Received UBC alone.

	UBC+CQI Schools	SE	UBC only Schools	SE	Difference	Effect Size	Sig.
Vocabulary	28.068	0.539	26.620	0.158	1.449	0.307	*
Letter Word ID	13.379	1.132	13.063	0.226	0.316	0.129	
Dictation	10.061	0.345	9.914	0.072	0.147	0.073	
Passage Comprehension	3.903	0.065	4.328	0.354	0.426	0.332	