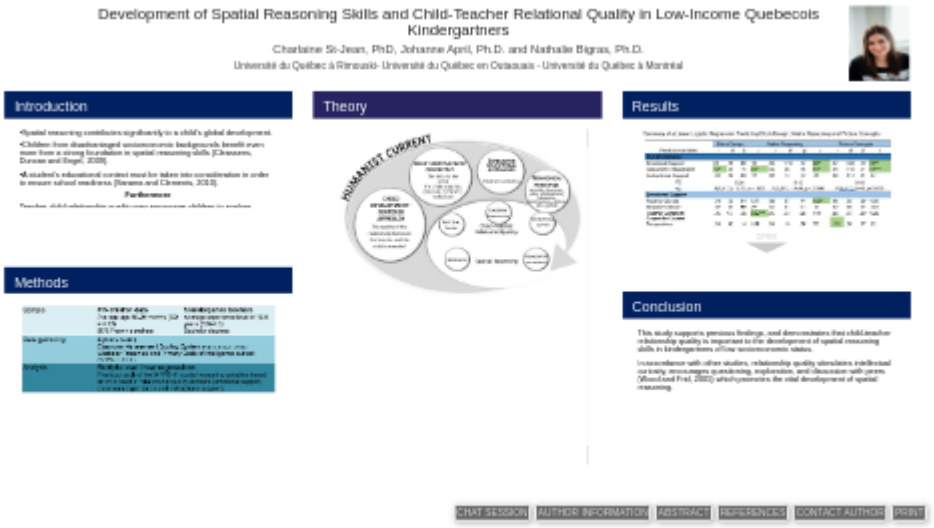
Development of Spatial Reasoning Skills and Child-Teacher Relational Quality in Low-Income Quebecois Kindergartners



Charlaine St-Jean, PhD, Johanne April, Ph.D. and Nathalie Bigras, Ph.D.

Université du Québec à Rimouski- Université du Québec en Outaouais - Université du Québec à Montréal

PRESENTED AT:

SRCD Society for Research in Child Development

2021 *Virtual* BIENNIAL MEETING

APRIL 7-9, 2021

INTRODUCTION

•Spatial reasoning contributes significantly to a child's global development.

•Children from disadvantaged socioeconomic backgrounds benefit even more from a strong foundation in spatial reasoning skills (Cleassens, Duncan and Engel, 2009).

•A student's educational context must be taken into consideration in order to ensure school readiness (Sarama and Clements, 2010).

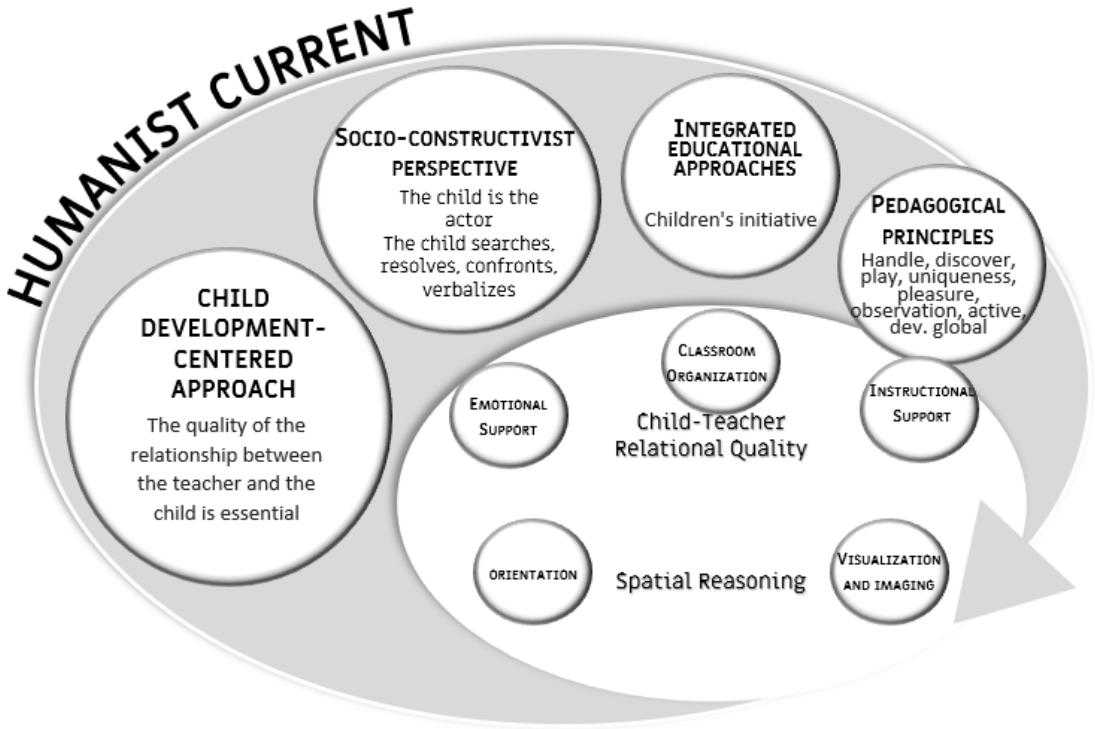
Furthermore

Teacher-child relationship quality may encourage children to explore, discover, and develop greater curiosity and, as a result, promotes the development of spatial reasoning (Verdine and al., 2017).

METHODS

Sample	**415 children data** Average age 58.29 months (SD = 4.93) 50% French speakers	**5 kindergarten teachers** Average experience level of 19.6 years (SD=4.3) Bachelor degrees
Data gathering	**4 years study** Classroom Assessment Scoring System (Pianta and al., 2008) Wechsler Preschool and Primary Scale of Intelligence subtest (WPPSI-III, 2015).	
Analysis	**Multiple level linear regressions** Predicted each of the WPPSI-III spatial reasoning variables based on child-teacher relationship quality domains (emotional support, classroom organization and instructional support).	

THEORY



RESULTS

Summary of a Linear Logistic Regression Predicting Block Design, Matrix Reasoning and Picture Concepts

	Block Design				Matrix Reasoning				Picture Concepts			
Predictor variables	*r*	*B*	β	*t*	*r*	*B*	β	*t*	*r*	*B*	β	*t*
CLASS domains												
Emotional Support	.07	.46	.06	.40	.05	1.18	.17	.02*	.07	1.30	.19	.01**
Classroom Organization	.12*	.86	.15	.02*	.06	.86	.16	.01*	.09	1.10	.21	.01***
Instructional Support	.61	.25	.08	.17	.02	.14	.47	.42	.08	.014	.01	.94
R2			0.28				0.13				0.18	
sig.	F(3,411) = 3.31, p < .002				F(3,411) = 5.55, p < 0.000				F(3,411)=5.44, p<0.000			
Emotional Support												
Positive Climate	.23	.53	.81	1.23	.08	.87	.14	2.03*	.60	.58	.09	1.38
Negative Climate	.87	.07	.55	.78	.01	.01	.01	.10	.07	.09	.07	1.02
Teacher Sensitivity	.35	1.7	.30	3.86***	.05	.54	.09	1.17	.08	.54	.09	1.20
Regard for Student Perspectives	.03	.52	.14	1.85	.08	.19	.05	.70	.12*	.25	.07	.92
R2			0.02				0.09				0.02	
sig.	F(4,410) = 4.60, p < 0.000				F(4,410) = 5.99, p < 0.000				F(4,410) = 5.551, p < 0.000			
Classroom Organization												
Behavior Management	.13**	.68	.17	2.36**	.09	.79	.21	2.75**	.12*	.86	.23	3.09**
Productivity	.09	.10	.02	.22	.02	.03	.01	.05	.04	.16	.03	.35
Instructional Learning Formats	.16**	1.49	.29	3.81***	.01	.19	.04	.50	.01	.16	.03	.40
R2			0.04				0.09				0.02	
sig.	F(3,411) = 4.85, p = 0.003				F(3,411) = 5.64, p < 0.000				F(3,411)=5.08, p<0.000			
Instructional Support												
Concept Development	.02	.42	.17	1.54	.03	.07	.03	.26	.09	.18	.08	.70
Quality of Feedback	.14**	1.08	.37	3.54***	.09	.08	.12	2.02*	.04	.13	.05	.46
Language Modeling	.02	1.94	.54	4.32***	.02	.24	.07	.55	.09	.32	.09	.76
R2			0.07				0.02				0.02	
sig.	F(3,411) = 9.91, p < 0.000				F(3,411) = 13.01, p < 0.000				F(3,411) = 13.84, p < 0.000			

* $p < 0.05$, ** $p < .01$, *** $p < .001$.

CONCLUSION

This study supports previous findings, and demonstrates that child-teacher relationship quality is important to the development of spatial reasoning skills in kindergartners of low socioeconomic status.

In accordance with other studies, relationship quality stimulates intellectual curiosity, encourages questioning, exploration, and discussion with peers (Wood and Frid, 2005) which promotes the vital development of spatial reasoning.

AUTHOR INFORMATION

Charlaine St-Jean, Ph.D.

Université du Québec à Rimouski

charlaine_st-jean@uqar.ca

ABSTRACT

Many studies show that spatial reasoning contributes significantly to a child's global development. Children from disadvantaged socioeconomic backgrounds benefit even further from a strong foundation in spatial reasoning skills than their more privileged peers (Claessens, Duncan and Engel, 2009). A student's educational context must be taken into consideration in order to ensure school readiness (Eckhoff, 2017). Also, teacher-child relationship quality may encourage children to discover, explore and develop greater curiosity and, as a result, promotes the development of spatial reasoning (McGuire, 2010).

This study explores the development of children's spatial reasoning and child-teacher relational variables. The sample included kindergarten-age children from disadvantaged socioeconomic regions in Quebec, Canada. Of the 415 children data, average age of 58.29 months (SD = 4.93) with fifty percent French speakers. Involved in the study were five kindergarten teachers (average experience level of 19.6 years (SD=4.3), with bachelor degrees.) The teachers were observed twice a year during the course of the four year study, with the Classroom Assessment Scoring System (Pianta and al., 2008) by certified raters. In order to measure the children's spatial reasoning skills, we used the block design, matrix reasoning, and picture concepts modules from the Wechsler Preschool and Primary Scale of Intelligence subtest (WPPSI-III, Clifford, 2009; Gerber, 2015).

Multiple level linear regressions significantly predicted each of the WPPSI-III spatial reasoning variables based on child-teacher relationship quality domains (emotional support, classroom organization and instructional support). Block design, $F(3,411) = 3.31$, $p < .002$, $R2 = 0.28$, was positively related to classroom organization, while matrix reasoning, $F(3,411) = 5.55$, $p < 0.0001$, $R2 = 0.13$, and picture concepts, $F(3,411) = 5.44$, $p < 0.0001$, $R2 = 0.18$, were positively related to emotional support and classroom organization domains. A second series of multiple linear regression significantly predicted each of the WPPSI-III spatial reasoning variables based on emotional support predictors (positive and negative climate, teacher sensitivity and regard for student perspective) and show that the block design subtest, $F(4,410) = 4.60$, $p < 0.000$, $R2=0.02$, was positively related to teacher sensitivity. Matrix reasoning $F(4,410) = 5.99$, $p < 0.000$, $R2=0.09$ was positively related to positive climate. For the classroom organization predictors (behavior management, productivity and instructional learning formats), we found that block design, $F(3,411) = 4.85$, $p = 0.003$, $R2=0.04$, matrix reasoning $F(4,410) = 5.99$, $p < 0.000$, $R2=0.09$ and picture concepts $F(4,410) = 5.551$, $p < 0.000$, $R2=0.02$, were positively related to behavior management and that block design, $F(3,411) = 4.85$, $p = 0.003$, $R2=0.04$, was also positively related to instructional learning formats. Finally, with the instructional support predictors (concept development, quality of feedback and language modeling), we found that block design $F(3,411) = 9.91$, $p < 0.000$, $R2=0.07$, was positively related to the quality of feedback and language modeling.

REFERENCES

Bronfenbrenner, U., & Morris, P. A. (2006). The Bioecological Model of Human Development. In R. M. Lerner & W. Damon (Eds.), Handbook of child psychology: Theoretical models of human development (pp. 793-828). Hoboken, NJ, US: John Wiley & Sons Inc.

Claessens, A., Duncan, G., & Engel, M. (2009). Kindergarten skills and fifth-grade achievement: Evidence from the ECLS-K. Economics of Education Review, 28(4), 415–427.

Clements, D. H., & Sarama, J. (2009). Learning and teaching early math: the learning trajectories approach. New York: Routledge.

Sarama, J., et Clements, D. H. (2010). The mathematical lives of young children. Children of 2020 : Creating a Better Tomorrow, 81–84.

Pianta, R. C., La Paro, K. M., & Hamre, B. K. (2008). Classroom Assessment Scoring System™: Manual K-3. Baltimore, MD, US: Paul H Brookes Publishing.

Verdine, B. N., Golinkoff, R. M., Hirsh-Pasek, K., et Newcombe, N. S. (2017b). Iii. Results-Considering The 2-D And 3-D Trials Of The Tosa Separately And Together. Monographs of the Society for Research in Child Development, 82(1), 56–70. https://doi.org/10.1111/mono.12282

Wechsler Preschool and Primary Scale of Interlligence, 3e édition. (2002). Canadian Manual (Pearson). Toronto.

Wood, K., et Frid, S. (2005). Early Childhood Numeracy in a Multiage Setting. Mathematics Education Research Journal, 16(3), 80–99.