

Malta 8-9 June 2018

The future in kindergarten: Unstructured Teaching improves social communication. An experimental research on the advantages of museum education

Luisa Bonfiglio*, Giulia Torregiani*, Francesco Peluso Cassese*,
*H.E.R.A.C.L.E. Lab — Niccolò Cusano Rome University

ABSTRACT

The paper aims to highlight the role of the teacher within a new vision of teaching, which considering the use of the body and the movement as the viaticum of knowledge, offers advantages for learning social skills in children. Already the studies of Piaget (1936) on children's cognitive development, as those of Neisser (1976), Bruner (1980), Stern (1998), later, have shown that, since the early years of life, individuals show themselves active in learning the regularity of elements within the context in which they live, through the body and the movement; this activity aims to the construction of the very first models about the tendency in the surrounding world. However, the focus in schools increasingly aims to logical-rational type issues that do not consider the cognitive-emotional-relational and corporal components (cross modal skills), needed to promote the learning of the students. The theory of Embodied Cognition recovers the sense of experience and recognizes the motor system no longer as a simple system dedicated to the execution of the action, but the means by which to interact with the outside world, understand the meanings and develop the logic of mind. Our experimental research is based on behavioral analysis through observation grids, developed on a category of subjects engaged in structured and unstructured didactic situations (museum education) with the aim of analyzing their differences. The reference sample includes two groups of children of different classes in the kindergarten (2-3 years and 3-6 years). The educational goal proposed here is to develop, from the earliest school years, logical communication skills by relating them to concrete and simple contexts, considering the treasure that an experiential learning can generate. Aspects of great importance for educators that aim to train qualified students, ethically informed and trained as world citizens.

KEYWORDS *Unstructured Didactic, Social Communication, Childhood, Educational Neuroscience, AEPS Assessment Evaluation and Programming System.*

INTRODUCTION

In recent years, the world of scientific research has opened up to new scenarios of didactic intervention, in view of developing, since the pre-school period, social-communicative skills. In fact, considering the child as an individual able of implementing, since the early days of life, relational forms of social communication, has led to conceive of childhood as a generating condition of specific "social precocity" (Camaioni, 1980a). Camaioni et al. (2004) identify the stages of communicative and linguistic development, in a continuum that goes from the gesture as "pre-intentional (0-9 months) and intentional (9-12 months) communication", to the "first language" phase (12-20 months), where the child begins to produce the first words, proceeding towards a lexical development. According to the authors, the "morphosyntactic development" phase, characterized by the first combinations of words, appears between 20 and 36 months of life of the child (Camaioni, Aureli, Perucchini, 2004). It is of increasing interest to consider the synergy between cognitive progress and social interaction, especially in preschool age, supporting that social exchanges to which children participate play a significant role in increasing their ability of comprehension. In this regard, the evidence shows the importance to the use of engaging, interactive, cooperative and experiential activities, that stimulate the natural desire for learning. A potential is recognized in them on the cognitive, relational, social and expressive level, because through this channel the child uses and perfects his verbal and non-verbal languages, creating the conditions for a better use and production of communication (Bonfiglio, Torregiani, Melchiori, 2018). Capone and McGregor (2004) have highlighted how gestures facilitate linguistic development, including learning of words. When the gesture accompanies the word in the child's communication, this gesture can help to make explicit visual representation or direct attention to salient aspects, moreover releasing neural resources (Goldin-Meadow et al., 2001). The approach of Educational Neuroscience (EN) shows a clear framework of the links between social and relational competences on the one hand, and cognitive domains on the other, in a vision of didactic experience that shapes the processes underlying cognitive abilities (Meares, 2012). This perspective defines the mind as incarnated and embedded, embodied in a bodily and internal context, and at the same time, constitutively inserted in an external relational context (Morabito, 2016). This represents the essence of the Theory of Embodied Cognition (EC), which incorporates the concept that the mind is no longer independent of the body but inscribed in it (Peluso Cassese, Torregiani, 2017). Therefore, the body takes both a cognitive and a social function, realizing a close relationship with the mechanisms of thought and knowledge made explicit by behavior, communication, participation, sharing and collaboration (Peluso Cassese, Torregiani, Bonfiglio, 2017). The Educational Neurosciences represent an attempt to build methodological and theoretical connections between Cognitive Neuroscience, Cognitive Psychology and Educational Practice, proposing a more scientific understanding of processes in the acquisition of educational skills (Howard-Jones et al., 2016). This interdisciplinary field considers how neural systems change in the course of learning and development, offering the opportunity to reformulate and adapt educational approaches to the specific needs of children. In fact, neuroscientific cognitive research on learning can give potential benefits to education, especially for pupils with special educational needs, investigating the neural mechanisms underlying an atypical development of skills (National Science Foundation, USA, 2007). In these terms, our work is a scientific contribution, moving in an innovative perspective of improvement, in the achievement of more appropriate teaching strategies, designing cutting-edge educational programs able to provide the development of cognitive processes and related executive functions in complicity with social-communicative skills.

METHODS

The hypothesis of this research is that educational plans based on an unstructured experiential didactics may foster the development of pre-school cognitive skills. The general objective of the research is to enhance the child's logical, deductive, intuitive and social skills, in order to have the means for a functional access to primary school. We intend to highlight, through the museum didactics, verbal and non-verbal behaviors belonging to the macro category of Social Communication: social reciprocity, social interaction, social skills, communication skills and linguistic abilities. The analysis involved two groups of participants, a group of 37 children between 3-6 years, of which 19 females and 18 males, and a group of 18 children between 2-3 years, of which 9 females and 9 males, all attending a kindergarten school in the province of Rome. Participants have been involved in structured and unstructured didactics activities (museum education), in different environments, to highlight their impact in learning social skills and to analyze their differences. The research has been defined with measures repeated in two stages with a time interval of twenty days, for both groups. Before starting the session, observers performed training to exclude subjective components in data collection by agreeing on a common observational language (Bakeman, Gottman, 1997). By analysing the registrations, there was a level of agreement between the assessors sufficient to support the reliability of the measurement (*percent summary agreement* greater than 70% on all the variables). At first, a direct observation of the structured didactics in children's classroom was conducted through observation form, with particular reference to social communication (verbal and non-verbal). At a later time, the observation of the unstructured didactics was performed on the same participants in Explora the Children's Museum in Rome.

INSTRUMENTS - TOOLS

The Social-Communication Observation Form (Strand B and Strand D), protocol 0-3 years, belonging to the fifth development area of the AEPS (Assessment, Evaluation and Programming System for Infants and Children), (Bricker, 2002). The methodological choice of the 0-3 year protocol, for both groups, is due from the need to trace easily observable aspects of social communication (gesture, vocalization, vocalizes/gestures, word approximation, words and word combination), having certify that the protocol for older age aimed to identify aspects more strictly related to the linguistic faculty. In fact, our interest is not to compose an overall analysis of syntactical-communicative skills, or to deduce deficit forms of communication, but to make an observation focused on social-relational communication skills in the classroom context (structured) and in the museum context (unstructured).

RESULTS

The statistical hypothesis on which we proceeded is: $H_0: \mu_2 > \mu_1$. The design of the research in this case would not allow us to apply this type of test because we are not in an experimental situation. However, we believe that the results obtained with this approach are useful as an indication for the opportunity to invest (or not) of resources in the planning of an experiment based on an intervention of Unstructured Didactics. The results of the sample 3-6 years (table 1) are promising and without prejudice to the previous warnings, allow us to accept the alternative hypothesis as defined above in almost all comparisons. Concerning the differences on the Interpretable Gesture variable (GEST_I) ($t(31) = -5.961, p < .001, d = -1.054$) and Interpretable Gesture / Vocalization (GEST / VOC_I) ($t(31) = -5.682, p < .001, d = -1.004$), a statistically significant increase in the mean is observed, which translates into an increase (very high effect size) of the specific behavior observed in the Unstructured condition. The same trend is observed for the other comparisons, all with statistically significant mean increases and with a medium to high effect size (in these cases there is a convergence between the T-Test values and the Wilcoxon test for paired data). The only comparison relative to the Initiative Approximation (APPROX_IS) ($W(29) = 33, p = 0.115$) did not present a statistically significant difference. The results of the sample 2-3 years also are positive to the starting hypothesis and without prejudice to the previous warnings, allow us to reject the null hypothesis in almost all comparisons. Concerning the differences on the Interpretable Gesture variable (GEST_I) ($t(16) = -4.239, p < .001, d = -1.028$), Interpretable Vocalization (VOC_I) ($t(16) = -2.110, p = 0.026, d = -0.512$), Interpretable Gesture / Vocalization (GEST / VOC_I) ($t(16) = -5.168, p < .001, d = -1.253$), a statistically significant increase is observed of all averages in line with the observation of 3-6 years group. This is translatable into an increase (dimension of the effect very high and higher than 3-6 sample) of the specific behavior observed in the deconstructed condition (table 2). The trend observed on production of verbal signals (table 3) is determined by increases in the average all non-statistically significant, Interpretable Approximation (APPROX_I) ($t(16) = 1.810, p < .955$), Interpreting Word (WORDS_I) ($t(16) = 1.197, p < .876$), Interpretable Combination (COMBIN_I) ($t(16) = -0.066, p < .474$).

Paired Samples T-Test 3-6 YEARS											
Gest/ID	VOC/ID	APPROX/ID	WORDS/ID	COMBIN/ID	Test	Statistic	df	p	Effect Size	95% CI for Effect Size	
										Lower	Upper
GEST_ID	GEST_IU	Student	-5.961	31	< .001	-1.054	∞	-0.683			
VOC_ID	VOC_IU	Student	-2.366	30	0.012	-0.425	∞	-0.113			
		Wilcoxon	54.000		0.009	-0.782	∞	-0.612			
GEST/VOC_ID	GEST/VOC_IU	Student	-5.682	31	< .001	-1.004	∞	-0.640			
APPROX_ID	APPROX_IU	Student	-1.353	29	0.093	-0.247	∞	0.060			
		Wilcoxon	33.000		0.115	-0.858	∞	-0.736			
WORDS_ID	WORDS_IU	Student	-3.524	29	< .001	-0.643	∞	-0.308			
		Wilcoxon	32.500		0.001	-0.860	∞	-0.740			
COMBIN_ID	COMBIN_IU	Student	-2.934	29	0.003	-0.536	∞	-0.210			

Note. For the Student t-test, the effect size is calculated through Cohen d; for the Wilcoxon test, the effect size is calculated through the Biserial Rank Correlation. For all tests, the hypothesis is that measurement 1 is less than measurement 2. In gray the differences for which it is necessary to consider the value of the Wilcoxon test, for the violation of the normality of the distribution of errors verified with the Shapiro test -wilk.

TABLE 1

CONCLUSIONS

The results obtained show significant effects in the production of Gestures, Vocalizations and Gestures/Vocalizations for both groups, in Unstructured Didactic conditions. A different research hypothesis led the analysis of the data for the production of verbal signals, since previous studies (Camaioni, Aureli, Perucchini, 2004) suggested that for children between 2 and 3 years this function is not yet sufficiently developed to be able to determine a change, conditioned only to the educational context. In fact, significant effects of the linguistic function have been identified only in children 3-6 years (table 1) and not in children 2-3 years (table 2). However, an increase in Gesture, seen as a predictor of the word, indicates that the 2-3 year group can also benefit from Unstructured Didactic, if it subjected to longer training. Overall, these evidences support the initially defined research hypothesis that unstructured training contexts can favor the development of skills belonging to the sphere of Social Communication. Starting from this exploratory survey, we must consider the opportunity to develop further studies able to support the causal link between factor and variable outcome, to reduce and identify the variables that actually determine the change obtained.

Paired Samples T-Test 2-3 YEARS													
Gest/ID	VOC/ID	APPROX/ID	WORDS/ID	COMBIN/ID	t	df	p	Mean Difference	SE Difference	95% CI for Mean Difference		95% CI for Cohen's d	
										Lower	Upper	Cohen's d	Lower
GEST_ID	GEST_IU	-4.239	16	< .001	-6.294	1.485	∞	-3.702	-1.028	∞	-0.519		
VOC_ID	VOC_IU	-2.110	16	0.026	-1.353	0.641	∞	-0.233	-0.512	∞	-0.079		
GEST/VOC_ID	GEST/VOC_IU	-5.168	16	< .001	-5.706	1.104	∞	-3.778	-1.253	∞	-0.701		

Note. Student's t-test.
Note. All tests, hypothesis is measurement one less than measurement two.

TABLE 2

Paired Samples T-Test 2-3 YEARS										
APPROX/ID	WORDS/ID	COMBIN/ID	t	df	p	Mean Difference	SE Difference	Cohen's d	95% CI for Cohen's d	
									Lower	Upper
APPROX_ID	- APPROX_IU	1.810	16	0.955	1.118	0.618	0.439	∞	0.851	
WORDS_ID	- WORDS_IU	1.197	16	0.876	0.882	0.737	0.290	∞	0.694	
COMBIN_ID	- COMBIN_IU	-0.066	16	0.474	-0.059	0.893	-0.016	∞	0.383	

Note. Student's t-test.
Note. All tests, hypothesis is measurement one less than measurement two.

TABLE 3

REFERENCES

- Bakeman, R., Gottman, J.M. (1997). *Observing interaction: an introduction to sequential analysis* (2nd ed). New York: Cambridge University Press.
 Bricker, D. (2002). *Assessment, Evaluation, and Programming System for Infants and Children (AEPS)* (2nd ed., 4 vols.). Baltimore: University Park Press.
 Bonfiglio, L., Torregiani, G., Melchiori F.M. (2018). Analisi dell'impatto di didattica destrutturata sulla comunicazione sociale nell'infanzia. In: *Formazione & Insegnamento. European Journal of Research on Education and Teaching*, Anno XVI, supplement N.1.
 Camaioni, L. (1980a). *La prima infanzia*. Bologna: il Mulino.
 Camaioni, L., Aureli, T., Perucchini, P. (2004). *Osservare e valutare il comportamento infantile*. Bologna: il Mulino.
 Capone, N.C., McGregor, K.K. (2004). *Gesture Development: A Review for Clinical and Research*. *Practices Journal of Speech, Language, and Hearing Research*, Vol. 47.
 Goldin-Meadow, S., et al. (2001). Explaining math: gesturing lightens the load. *Psychological Science*, 12(6).
 Howard-Jones, et al. (2016). *The Principles and Practices of Educational Neuroscience: Commentary on Bowers*. *Psychological Review*, vol.123.
 Meares, R. (2012). *A dissociation Model of Borderline personality disorder*. N.Y: Norton.
 Morabito, C. (2016). *Neuroscienze Cognitive: plasticità, variabilità, dimensione storica*. In Greco, P., *Scienza e Società. Mente e corpo: il cervello non è una macchina* (p.13-16). Milano: Egea.
 Peluso Cassese, F., Torregiani, G. (2017). *Corpo e neurodidattica. From Body Language to Embodied Cognition*. Roma: Edizioni Universitarie Romane.
 Peluso Cassese, F., Torregiani, G., Bonfiglio, L. (2017). The role of body in didactics: Scientific reflections and areas of application. In: *Formazione & Insegnamento. European Journal of Research on Education and Teaching*, anno XV, N.2.

CONTACT

Laboratorio di Ricerca Scientifica H.E.R.A.C.L.E.
 Università degli Studi Niccolò Cusano – Telematica Roma
 Via Don Carlo Gnocchi 3 00133 Roma
 Tel. 0670307312
 luisa.bonfiglio@unicusano.it ;
 giulia.torregiani@unicusano.it



**UNIVERSITÀ
NICCOLÒ CUSANO**



**GIORNALE ITALIANO EDUCAZIONE alla SALUTE, SPORT e
DIDATTICA INCLUSIVA**
**ITALIAN JOURNAL HEALTH EDUCATION, SPORT e
INCLUSIVE DIDATTICS**