THE COGNITIVE IMPACT
OF SUCCESSIVE MONTESSORI PROGRAMS
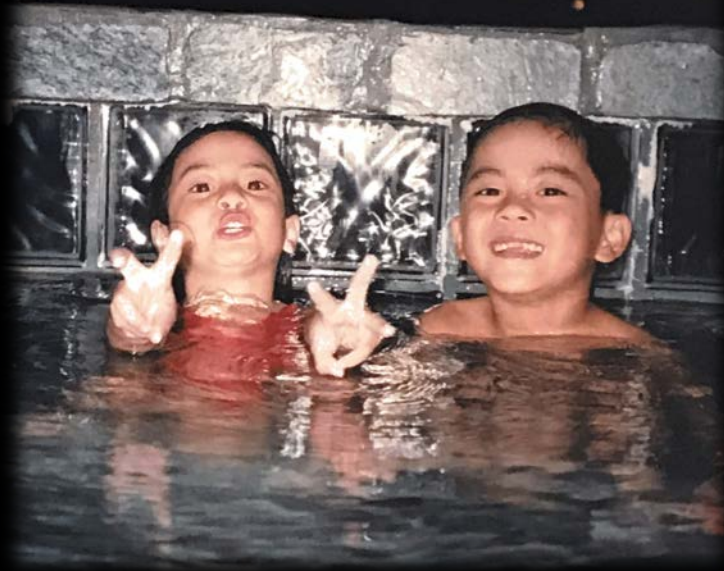
An Empirical Study

by

DR. ANN PAEZ-BARRAMEDA

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Amsterdam, The Netherlands
April 8, 2019

MY MONTESSORI JOURNEY

Primary AZ 1997

Nimal Vaz

Phyllis Pottish Lewis

Judi Orion

David Kahn & Jenny Hoglund

Two Main Questions:

1: How will a Montessori student perform at the end of a full spectrum Montessori education?

2. How will he perform cognitively after or outside Montessori?

STUDIES ON COGNITION
OF MONTESSORI STUDENTS

Comparative

- Clifford and Takacs (1991) Cleveland's Marotta Public School
- Miller Studies with Dyer (1975) 4 different preschool programs)
- Lillard and Else-Quest (2006) Executive Function
- Diamond and Lee (2011) Better performance; enjoyed learning
- Csikzentmihalyi (2005) "Flow," or optimal experience
- Rathunde- (2001) Motivation

Latent Learning

- Dohrmann, et.al. Cleveland Public School
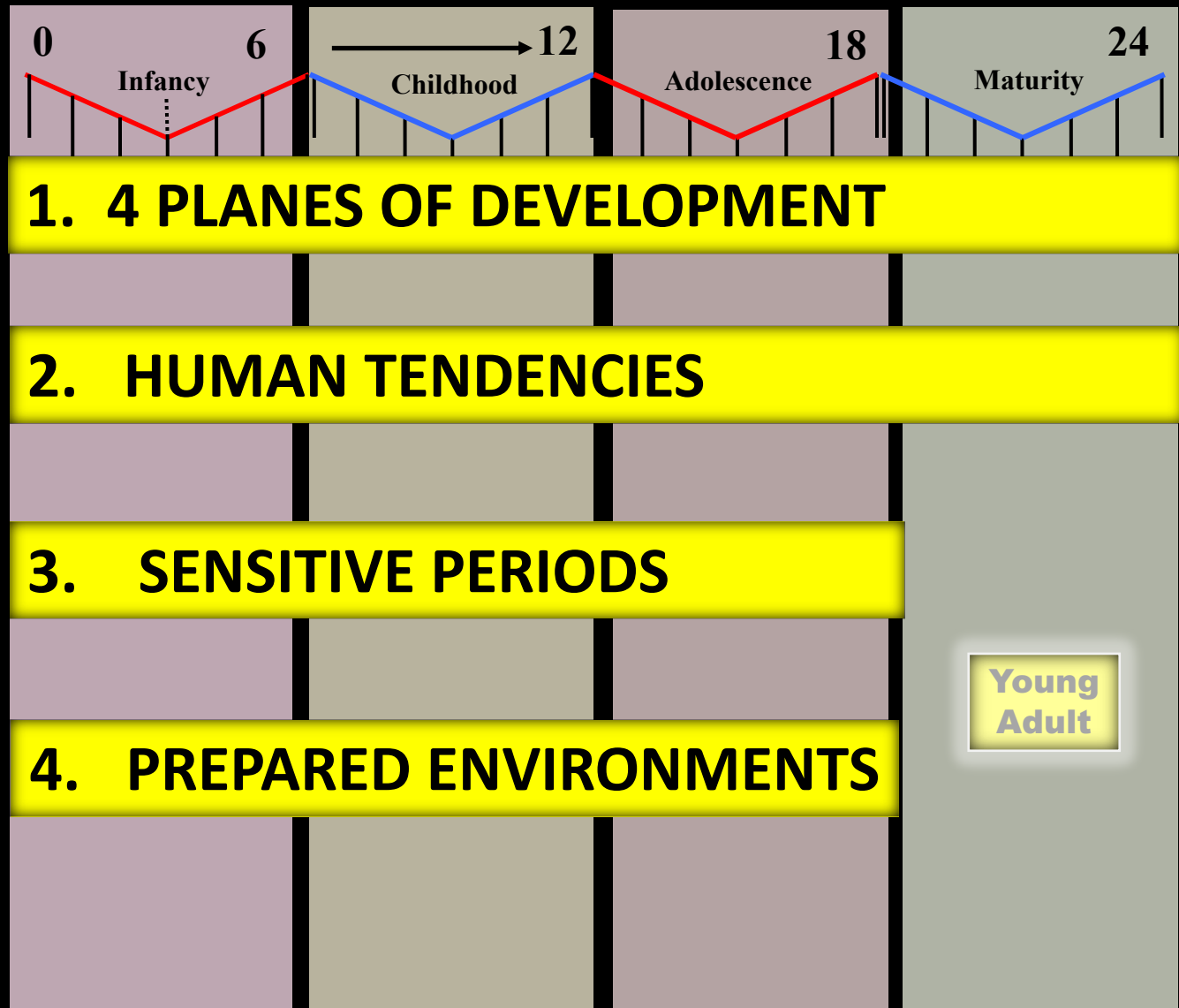- Miller & Bizell 1983
- Boehnlein (1990)
- Karnes

- Comprehensive, empirical basis

- Montessori public schools

- Parent education

- Template for further studies

- Replicating the study

FROM RESEARCH TO PRACTICE

- Whole spectrum Montessori

- Stringent program implementation

- Good scholastic performance

- Peace of mind

- Enhanced confidence

ANCHORING THE STUDY

0	6	12	18	24
Infancy		Childhood	Adolescence	Maturity

1. 4 PLANES OF DEVELOPMENT

2.   HUMAN TENDENCIES

3.   SENSITIVE PERIODS

4.   PREPARED ENVIRONMENTS

Young Adult

CONDUCTING THE STUDY

Research Design — Descriptive, quantitative

Data Source — Progress Report Cards

17 academic years (1999-2015)

PROGRAM	RATING	CODE	INTERVAL SCALE		DESCRIPTION
			From	To	
Primary	M	3	2.50	3.00	Mastered
	S	2	2.00	2.49	Strong Progress/Interest
	W	1	1.50	1.99	Working on with Normal Development
	NS	0	1.00	1.49	Needs Supplement
Cosmic Education	4	3	2.00	3.00	Secure
	3	2	1.00	1.99	Progressing
	2	1	0.10	0.99	Support Required
	1	0	0.00	0.09	New Presentation
Erdkinder	1.0	1.25	2.75	3.00	Mastered
	1.26	2.24	1.76	2.74	Secure
	2.25	2.99	1.75	1.01	Adequate
	3.0		1.00		Minimal

105 AOS Erdkinder Graduates   (2008-2015)

Research Setting: The Abba's Orchard School

13 campuses
4 farms
1337 students
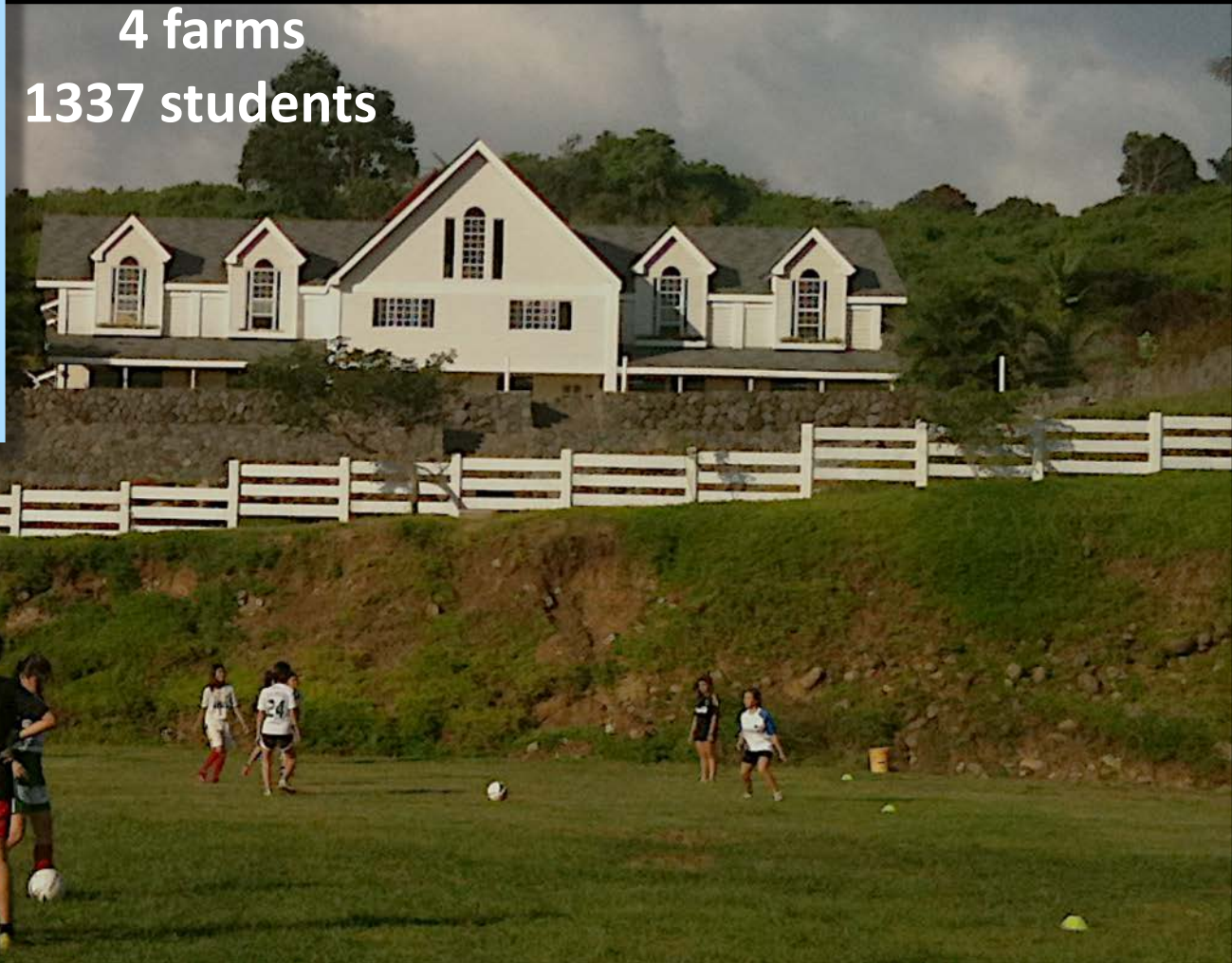
Quality Montessori

- Teacher education
- Parent education
- Montessori facility
- Program implementation

Statistical Design

Dr. Ester L. Raagas

- Dean of Research
  Xavier University

Dissertation Panel

Two Main Questions:

1: How will a Montessori student perform at the end of a full spectrum Montessori education?

2. How will he perform cognitively after or outside Montessori?

Is it important for the learner to go through the full Montessori Program?

- *Will the Casa experience impact performance in Elementary?*

- *Will the Casa and Elementary experience impact performance in Erdkinder ?*
  - What if he starts only in elementary?
  - What if he starts only in Erdkinder?

Is it important for the learner to go through the full Montessori Program?

- *Will the **Casa experience** impact performance in **Elementary**?*

- *Will the Casa and Elementary experience impact performance **in Erdkinder** ?*
  - What if he starts only in elementary?
  - What if he starts only in Erdkinder?

Will *the Casa experience* impact performance in **Elementary**?

Group A
With Primary & Elementary
n= 37

Group B
With Elementary only
n= 48

Will *the Casa experience* impact performance in ***Elementary***?

COMPARISON of LEARNERS' COGNITION IN Elementary (n=85)							
Learning Area	**Group A w/Primary & Elem n=37**			**Group B w/ Elem only n=48**			**Mann-Whitney statistic U**
	mean	sd	desc	mean	sd	desc	
Math	2.06	0.21	secure	2.00	0.09	secure	1108*
Geometry	2.05	0.20	secure	2.00	0.02	secure	953.5 ns
Geography	2.03	0.16	secure	2.00	0.00	secure	912 ns
Biology	2.03	0.16	secure	2.00	0.00	secure	912 ns
History	2.03	0.16	secure	2.00	0.00	secure	912 ns
Language	2.04	0.18	secure	2.00	0..01	secure	919.5 ns
ns-not significant (alpha≥ 0.05). * - significant (alpha ≤ 0.05) **- highly significant (alpha≤ 0.01)							

*Will the Casa experience impact performance in **Elementary**?*

FINDING 1 :

There is a significant difference in the performance of Group A and B in Math. Group A significantly performed better than Group B.

Math	2.06	0.21	secure	2.00	0.09	secure	1108*

What does this tell us?

- Strong scaffold
- Materialized abstractions
- H O T S
- Flow

Will the Casa experience impact performance in Elementary?

FINDING 1 :

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Math	2.06	0.21	secure	2.00	0.09	secure	1108*

Other corroborating studies
- Powell - Manchester preschool
- Donabella & Rule – On Math Materials
- Brown - African American children

*Will the Casa experience impact performance in **Elementary**?*

FINDING 2:

There is NO significant difference in the performance of Group A and B in Geometry, Geography, Biology, History and Language.

What does this tell us?

Students will be able to absorb presented concepts in the above learning areas even if coming from a different learning background.

Other corroborating studies

- Dohrmann (2007) language and social studies
- Miller & Bizell (1983) – emergent effect
- Boenlein (1990), Karnes (1979) – Primary impact
- Hendron (2012) -key lessons

" *They give what is sufficient and are limited to what is necessary.*"

Maria Montessori

- *Will the Casa experience impact performance in Elementary?*

Two Findings :

1. In Mathematics; Yes.

2. In Geometry, Geography, Biology, History, and Language; No.

Is it important for the learner to go through the full Montessori Program?

- *Will the Casa experience impact performance in **Elementary**?*

- *Will the Casa and Elementary experience impact performance **in Erdkinder** ?*
  - What if he starts only in elementary?
  - What if he starts only in Erdkinder?

Will the *Casa and Elementary* experiences impact performance *in* **Erdkinder** ?

Area	Group A w/Primary, Elem, Erd n=37			Group B w/ Elem, Erd n=48			Group C w/ Erd only n=20			F value	P value
						me			desc		
OSE							2.5		cure	0.66	0.518
CD							2.0		cure	9.99	0.000 **
GE							1.95	0.52	secure	7.85	0.001 **
PD	2.56	0.22	secure	2..60	0.24	secure	2.51	0.41	secure	0.81	0.446
Over all	2.29	0.19	secure	2.42	0.23	secure	2..25	0.28	secure	7.71	0.001 **

ns-not significant (alpha≥ 1.0)
* - significant (alpha ≤ 0.05)
**- highly significant (alpha≤ 0.01)

Will the _Casa and Elementary_ experiences impact performance *in Erdkinder* ?

	COMPARISON of LEARNERS' COGNITION IN ERDKINDER (n=105)										
Area	**Group A w/Primary, Elem, Erd n=37**			**Group B w/ Elem, Erd n=48**			**Group C w/Erd only n=20**			**F value**	**P value**
	mean	sd	desc	mean	sd	desc	mean	sd	desc		
OSE	2.56	0.24	secure	2.58	0.22	secure	2.51	0.81	secure	0.66	0.518
CD	2.46	0.27	secure	2.27	0.36	secure	2.03	0.45	secure	9.99	0.000 **
GE	2.38	0.36	secure	2.23	0.40	secure	1.95	0.52	secure	7.85	0.001 **
PD	2.56	0.22	secure	2..60	0.24	secure	2.51	0.41	secure	0.81	0.446
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*Will the <u>Casa and Elementary</u> experiences impact performance in **Erdkinder** ?*

Finding 1:

The results show that the three groups differ highly significantly in the overall performance in the learning areas (F=7.71).**

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ns-not significant (alpha≥ 1.0) * - significant (alpha ≤ 0.05) **- highly significant (alpha≤ 0.01)											

Finding 2:

The same **highly significant** difference was noted among the three groups in the following learning areas:
Character Development and
General Education (p-value 0.001)

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CD	**2.46**	0.27	secure	2.27	0.36	secure	2.03	0.45	secure	9.99	0.000 **
GE	**2.38**	0.36	secure	2.23	0.40	secure	1.95	0.52	secure	7.85	0.001 **
	2.29	0.19	secure	2.42	0.23	secure	2.25	0.28	secure	7.71	

Where are the academic subjects here?

Montessori Adolescent Syllabus

A. Opportunities for Self Expression

    Music, Language, Arts

B. Psychic (*Character*) Development

    1. Moral Development

    2. Language

    3. Math

C. Preparation for Adult Life (*General Education*)

    1. Study of the Earth & Living Things

    Geology, Geography, Biology, Cosmology, Botany, Zoology, Physiology, Astronomy, Anatomy

    2. Study of Human Progress &

        Building up of Civilization

        Physics, Chemistry, Engineering, Mechanics, Genetics

    3. Study of the History of Mankind

D. Physical Development

Will the <u>*Casa and Elementary*</u> *experience impact performance* ***in Erdkinder*** *?*

Finding 3

The analysis also showed **no significant** statistical differences in the three groups

	mean	sd	desc	mean	sd	desc	mean	sd	desc		
OSE	2.56	0.24	secure	2.58	0.22	secure	2.51	0.81	secure	0.66	0.518
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in the learning areas of Opportunities of Self-Expression and Physical Development.

Is it important for the learner to go through the full Montessori Program?

Will the Casa experience impact performance in the Elementary?   **YES, SIGNIFICANTLY**

Will he perform well at the end of the Erdkinder Program?   **YES, SIGNIFICANTLY**

- *What if he starts only in elementary?*
- *What if he starts already in Erdkinder?*

YES, BUT NOT AS MUCH AS WHEN THE CHILD STARTS IN CASA

Attending the *three Montessori Programs* from preschool to high school significantly influences the cognitive development of the individual.
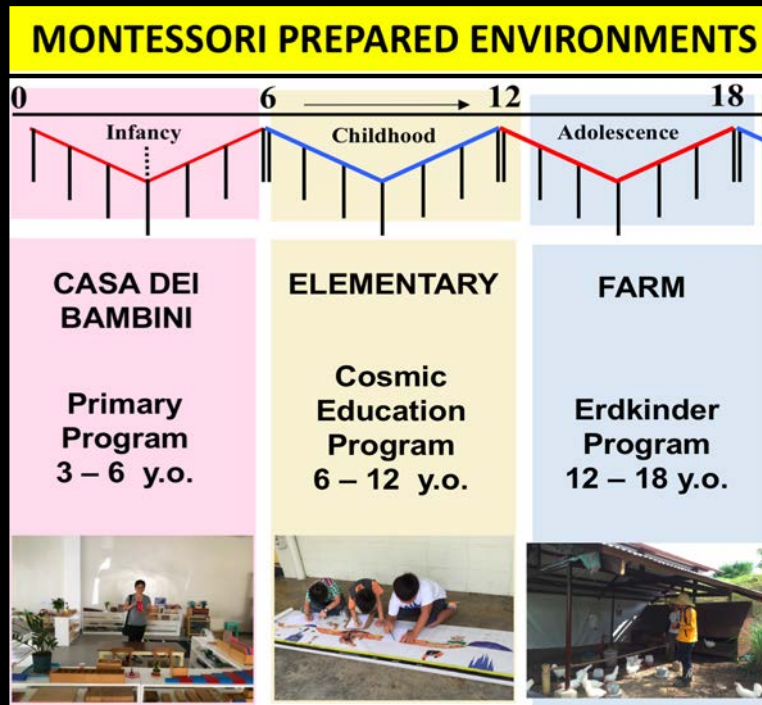
"*The adult is the result of the child. Every adult is the achievement of a grown-up child; the causes of good or evil in the adult must all be sought in the very short period of the child's growth.*"

Dr. Maria Montessori
From Childhood to Adolescence

Now, we ask,

Will the learner be able to hurdle stringent qualifying examinations given by top universities?

Will it matter if he starts in Casa?   Or in Elementary? Or in Erdkinder?

Top 3 Philippine Universities

**University of the Philippines
1908**

**Ateneo De Manila University
1859**

**De La Salle University
1911**

Table 3. Results of Statistical Analysis Between Adolescents' Performance in University Entrance Tests (UET) and the Identified Independent Variables (IV) (n=105)

1. Number of Montessori Programs Attended (MPA)

2. Erdkinder Academic Rating (EAR)

1. Number of Montessori Programs Attended (MPA)
2. Erdkinder Academic Ratings (EAR)

Independent Variables	B	S.E.	Wald	df	Sig.	Exp (B)
X1: MPA	1.24	0.37	11.220	1	**0.001**	3.464
X2: EAR	3.34	1.146	8.501	1	**0.004**	28.23
Constant	-11.141	2.801	13.106	1	0.000	.000

Omnibus Tests of Model Coefficients:

"Model chi-Square" statistic =32.52 where df=2 and prob< 0.01

** highly significant (p≤ 0.01)

Main Model:

logit(py)= -10.141 +1.24x_1 +3.34x_2.   equation 1

ρ = exp <u>-10.141 +1.24x_1 +3.34x_2.   </u>equation 2

         1+exp -10.141 = 1.24x_1 +3.34x_2

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University	DLSU CET	ACET	UPCAT	Passed at least one UET	
University Entrance Test (UET) Performance Table					
Total #_graduates	105	105	105		
Passed	55	32	35		
Failed	35	61	61		
Did not take	15	12	9		
%passed	*61%*	*34%*	*36%*		
%failed	*39%*	*66%*	*64%*		
Programs Attended (n)				#	%age
Casa/Elem/Erdkinder (37)	93%	63%	56%	**33**	**89%**
Elem/Erdkinder (48)	52%	13%	24%	**25**	**52%**
Erdkinder (20)	28%	31%	21%	**7**	**35%**

"If 'the formation of man' becomes the basis of education, then the **coordination of all schools from infancy to maturity**, from nursery to university, arises as a **first necessity**: for man is a unity, an individuality that passes through interdependent phases of development.

Each preceding phase prepares the one that follows, forms its base, nurtures the energies that urge towards the succeeding period of life".

Dr. Maria Montessori
From Childhood to Adolescence
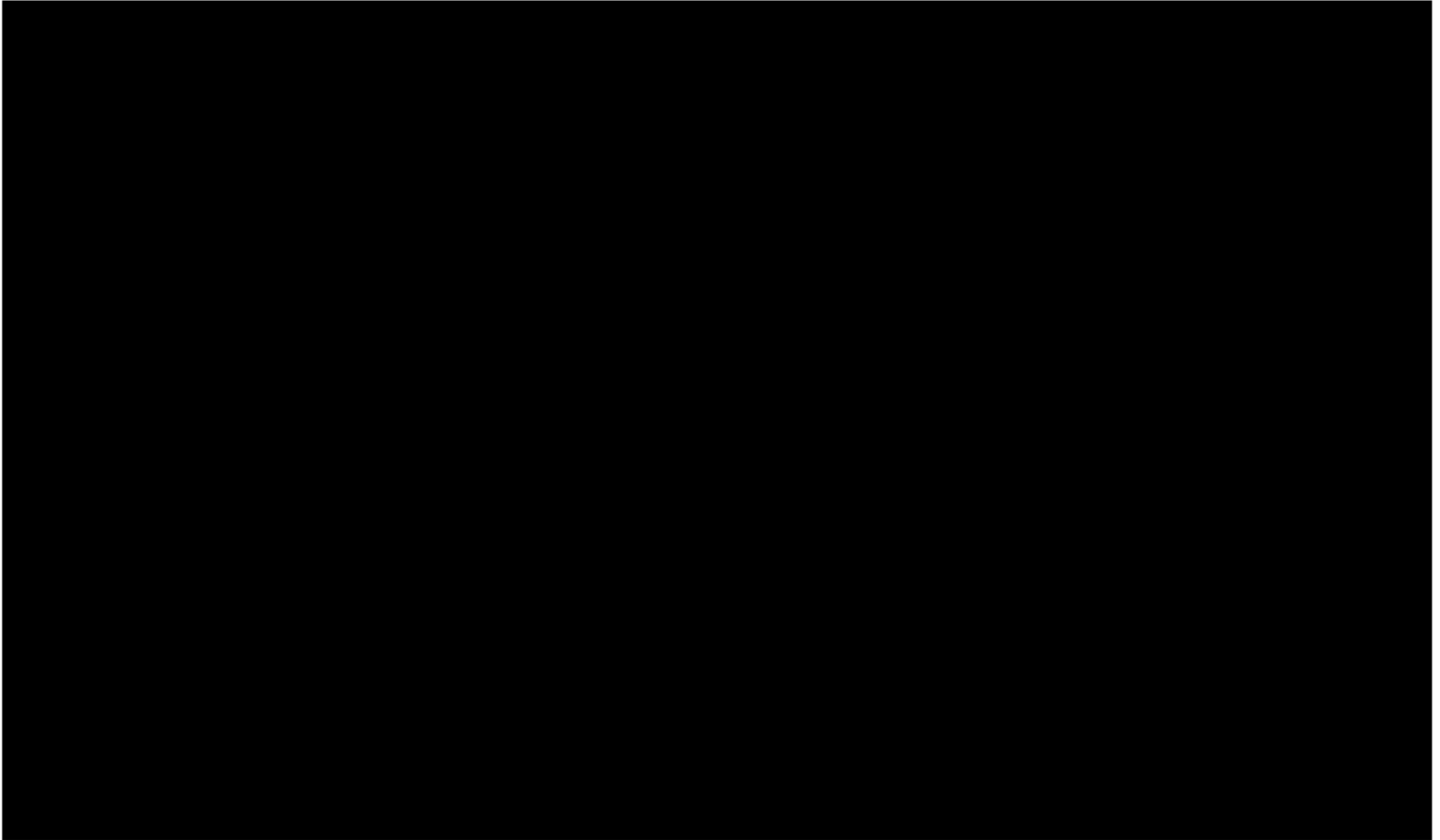
University of the Philippines

BS Mathematics

University of the
Philippines

What has become of these children?

What has become of these children?

- **RESPONSIBILITY**
- **EMPATHY**
- **LOVE FOR LEARNING**
- **ADAPTABILITY**
- **EXCELLENCE**

*"The vision of the teacher should be at once **precise** like that of a **scientist**, and **spiritual** like that of the **saint**."*

Dr. Maria Montessori
Advanced Montessori Method

Thank you for listening !