



Project:
**ENHANCING CHILDREN'S
WELL-BEING BY
SUSTAINABLE SCHOOL
FURNITURE DESIGN**

Leader

Danijela Domljan, Assist. Prof., PhD, MA in design
University of Zagreb Faculty of Forestry
Department of Furniture and Wood Products

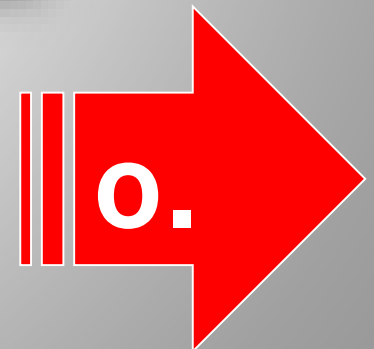
DEA's team co-leaders

John Elliott, Gary Evans and Nancy Wells
Cornell University, College of Human Ecology
Department of Design and Environmental Analyses



0. Introduction to previous work
1. Fundamental items / questions
2. Theoretical background
3. Why I'm here
4. Project results
5. Discussion/conclusion

INTRODUCTION to PREVIOUS WORK





... observations, 25 years ago...
...imagination and concept ...

University of Zagreb, Faculty of Architecture
Interfaculty School of Design

School furniture system
Didactic educational tool

Design of school desk - development of
children's creativity

MA Thesis

Zagreb, 1996.



School furniture ORLA
Tvin d.o.o. Wood Industry Virovitica
prototypes
1998



ORLA
still in mass production
1998 - 2019





University of Zagreb
Faculty of Forestry

The Design of Contemporary School Furniture as a Prerequisite for Maintenance of Pupils' Health

Ph.D. Thesis

Zagreb, 2011.

design concept of *dynamic sitting* by using ecological wooden materials



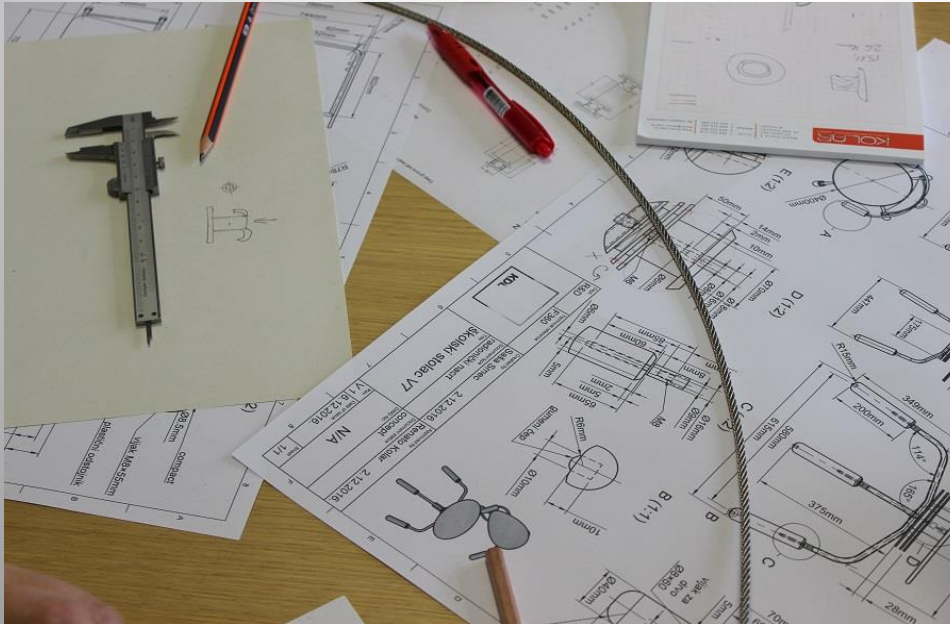
Croatian Ministry of Science and Education
University of Zagreb Faculty of Forestry

SCIENTIFIC PROJECTS

2013-14 _ *Development of new furniture for sitting in educational institutions.*

2015-16 _ *Development of school furniture by applying new forms and constructions.*

School chair aimed for dynamic sitting, tested in Lab for furniture quality, according to the standard EN 1729



University of Zagreb Faculty of Forestry
Croatian Chamber of Economy

SCIENTIFIC-PROFESSIONAL PROJECT

2013 – 1015_ *WOOD IS GOOD*

Creating a book of technical descriptions for wood products - educational institution (2012-2013)

Leader / editor: Danijela Domljan

Collaborators : Ivica Grbac, Vlatka Jirouš Rajković,
Zoran Vlaović, Vjekoslav Živković, Ivica Župčić

UNIVERSITY MANUAL

(2015)

Quality and Technical Descriptions of Wood Products - Volume I - Equipping Educational Facilities





FUNDAMENTAL ITEMS / QUESTIONS

1.

MAIN QUESTIONS:

Re: SITTING

Can a young body struggle with today's length of sitting and inactivity without minor / major psychophysical disorders ?!

Re: DESIGN

Why school furniture design hasn't changed for more than 300 years??

Re: WELL-BEING

How does school furniture affect pupil's health, willing to learn and well-being?



MAIN DESIGNER'S QUESTION:

- What are contemporary pupils' **needs and requirements** for healthy growth and development ...and *well-being*?
 - ergonomics / anthropometric
 - creativity (aesthetic - visual)
 - functionality
 - ecologically
 - social behaviour
 - safety
 - sustainability
 - feeling "good"
- How should look like the classroom of the future?





THEORETICAL BACKGROUND AND PROBLEM ANALYSIS

2.

CURRENT STATE:

- „...It is astonishing how little scientific literature dealing with the effects and consequences of school environments and furniture on children's health, perception, behavior and feelings (...)
- ...All the research so far has been conducted in environments based on the traditional chalk and panel attitude and the term standardized one size fits all (...)
- No one knows how to prevent learning-loss when you design a room “pedagogically”, whereas we know lots about designing for minimum heat (or light) loss” (...)
- ...This leads to the recurrence of the past and the transmission of the same mistakes into the future. ”

The Impact of School Environments, **Design Council, UK**
(Preview by Toby Greany: in Higgins et al., 2005)



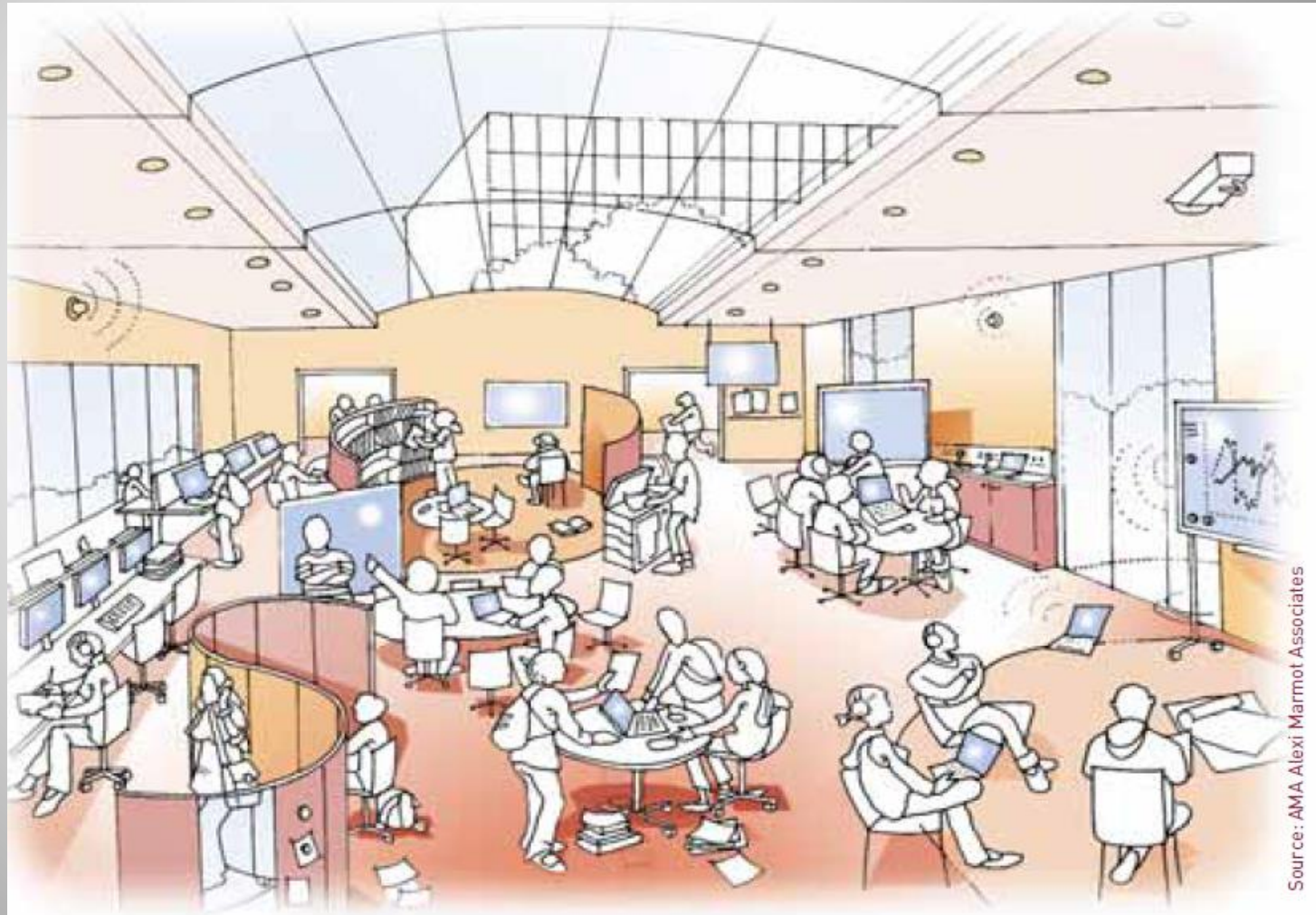
CURRENT STATE:

- *Design of school environment and school furniture represents a transdisciplinary insufficiently researched problem* (Domljan, 2019).
- *Renovated school classroom, including soft furnishings and designed to be more friendly and attractive, increase student participation* (Sommer and Olsen, 1980)
- *Although some results indicated that school furniture is not "the main problem" while learning or is considered as sub-factor, furniture layout has important influence on students learning outcomes and behaviour* (Wannarka and Ruht, 2008; Domljan, 2011; Baum, 2018; Azemati et al., 2018).
- *Many former results prove that furniture may cause a lot of physical and behavioural problems or disorders in future (MSD/LBP)* (Knight and Noyes, 1999; Hastings and Wood, 2002; Hedge and Lueder, 2007; Domljan et al., 2010).



design _ pedagogy _ anthropometry+ergonomy _ ecology+sustainability _ functionality+technology _ economy_...

- open schools
- learning environment
- active learning
- new technology
- nature / biofilia
- creativity



Source: AMA Alexi Marmot Associates

design _ pedagogy _ anthropometry+ergonomy ecology+sustainability _ functionality+technology _ economy_...



Research in City of Zagreb Elementary Schools. *Source: Domljan, 2011-2018*

design _ pedagogy _ anthropometry+ergonomy _ ecology+sustainability _ functionality+technology _ economy _...

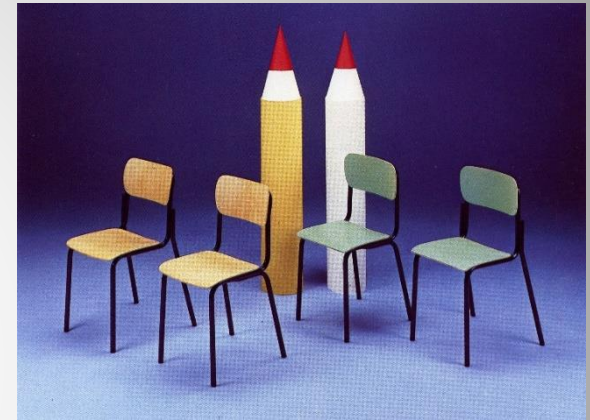
biofilia / wood / nature / ...vs... plastic / metal / melamine



design _ pedagogy _ anthropometry+ergonomy _ ecology+sustainability _ functionality+technology _ economy_...



design _ pedagogy _ anthropometry+ergonomy _ ecology+sustainability _ functionality+technology _ economy...



Source: Planet Ark, Wood housing health humanity report, 2015

Material	Perception					
	Creates a natural look and feel	Creates a warm and cosy environment	Visually appealing	Feels nice to touch	Environmentally friendly	Relatively cheap
Wood	93	92	88	87	68	31
Brick	61	62	58	30	47	30
Concrete	25	23	24	20	27	35
Steel	20	16	36	36	28	20
Aluminium	17	15	33	34	30	36
Plastic	14	18	24	36	14	71

WHAT IS THE OPTIMAL DESIGN OF SCHOOL FURNITURE?

INTERACTION OF INTERDISCIPLINARY FACTORS

HUMAN FACTOR

DESIGN

- functionality
- ergonomy
- anthropometry
- anthropology
- ecology
- aesthetic appearance
- colours, dimensions
- multifunctionality

ERGONOMICS

- relation user-product-environment
- working environment
- ergonomics surveys
- anthropometric measurements

SOCIAL FACTOR

PEDAGOGY

- new curricula
- flexibility and dynamics
- *moving school*
- polyvalence
- contemporary trends in school development (facilities, free time, playing, IT / computers, furniture,...)

SOCIOLOGY

- cognitive development
- social environmental impact
- neighbourhood / cultural background

PSYCHOLOGY

- psychic and physical development of the child
- work conditions
- interference (noise, light, air)

OPTIMAL SCHOOL FURNITURE DESIGN

MEDICINE**doctors & healthcare**

- Physical Therapists (PT)
- Physical Therapy Assistants (PTA)
- Occupational Therapists (OT)
- Occupational Therapy Assistants (OTA)
- child orthopedy
- Nurse Practitioners (NP)
- Anatomy

... **HOLISTIC APPROACH****ECOLOGY**

- environmental protection
- user's health
- raw material utilization
- energy
- recycling
- storage

PRODUCTION

- quality of production
- user's friendly materials
- usability
- maintenance
- ease of use
- durability and endurance
- safety
- hardness
- stability
- reliability
- service
- non-toxic
- mechanical safety

QUALITY

- standards
- EN 1729 – Furniture: Chairs and tables for educational institutions**
- functional dimensions
- safety requirements and test methods

CONSTRUCTION

- functional requirements
- technology and complexity
- standard elements
- controlling
- rationalization
- innovative solutions and materials
- finishing, surface treatment

FUNCTIONAL FACTOR

ECONOMY

- competitiveness of products
- product price list
- lower product price
- market innovation
- assembly, service
- parts replacement

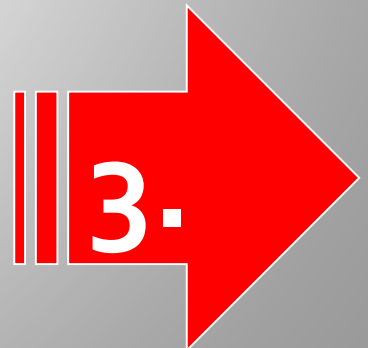
ECONOMIC FACTOR

MARKETING

- innovation
- branding
- promotion



WHY I'M HERE? ☺ PROPOSAL + PROJECT APPLICATION





College of Human Ecology

Title of the project :

ENHANCING CHILDREN'S WELLBEING BY SUSTAINABLE SCHOOL FURNITURE DESIGN

- **funded by:** Croatian Ministry of Science and Education + Croatian Science Foundation + University of Zagreb + Faculty of Forestry, Zagreb, Croatia
- **duration:** September 26 – November 26, 2019
- **collaboration with:** DE+A, College of Human Ecology, Cornell University + Central New York Public Elementary Schools + Science Center Ithaca +....
- **leader** of the project: Danijela Domljan
- **DE+A's collaborators / professors:** Jack Elliott, Gary Evans, Nancy Wells
- **DE+A's main participants:** students from DE+A, all classes/ levels, voluntary,... 😊
- **INTERDISCIPLINARY APPROACH**

MAIN GOAL

- **observing** the school environment
- **asking** children and meeting their needs
- **designing** new and innovative sustainable **concepts** of sustainable products (furniture, equipment, sensory-didactic elements etc.)
- **achieve a sense of well-being** at school



METHODOLOGY

- **Design methods:**
 - user-oriented approach / Mosaic method
 - **observing** daily activities at school environment
 - **photography, video-recording**
 - **questionnaire** on favorable things in school
 - **talks, interviews** with kids and teachers
 - **children's drawings** upon the title:
 - „Draw your ideal classroom“
 - „Design your desired school environment“

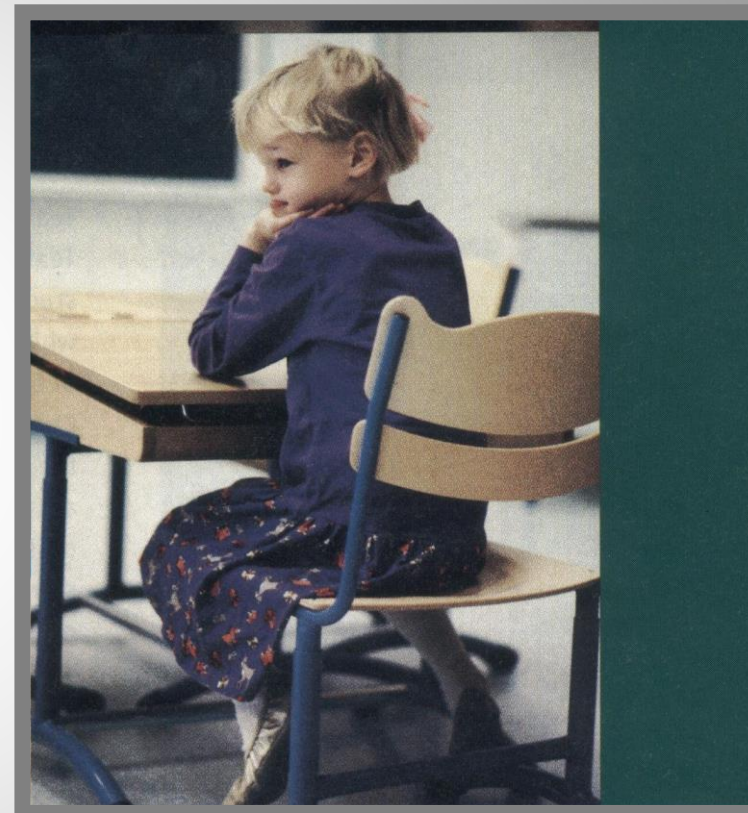
POLYGONS / VISITS

- Visiting the **elementary schools** 😊
- Workshop at **schools** and **Science Center Ithaca** (??)
- Visiting the **Community Playthings factory**, Ulster Park, NY 😞



EXPECTED OUTCOMES

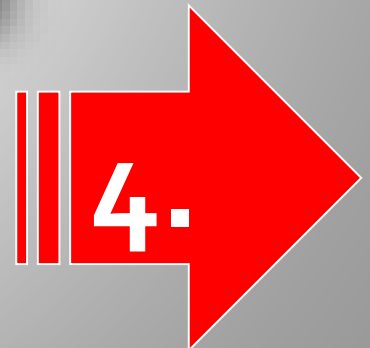
- **new product concepts** in terms of human/children oriented design
 - children's drawings, students ideas, ...
- **student's conceptual sketches / models & prototypes** produced at Design Studio DE+A
- **published brochure** about the project
- **exhibition at DE+A** – children's drawings and student's concepts / prototypes
- **dissemination** of the project results – journals and international conferences
 - ICWST conference, December 13-14, 2019, Zagreb
- **production of new innovative school products** in cooperation with Croatian / US wood companies





- 4.1. introductory project presentation
- 4.2. starting point
- 4.3. meetings with D+EA students
- 4.4. some new ideas & concepts
- 4.5. visiting schools
- 4.6. children's drawings

PROJECT RESULTS (UNTIL NOW) 😊



4.1. Introductory project presentation

10/07/2019 ; MVR 1428



invitation to a project presentation
**ENHANCING CHILDREN'S WELL-BEING
BY SUSTAINABLE SCHOOL FURNITURE
DESIGN**

Monday, October 7, 2019, 3:30 pm
MVR, first floor, East Wing meeting room

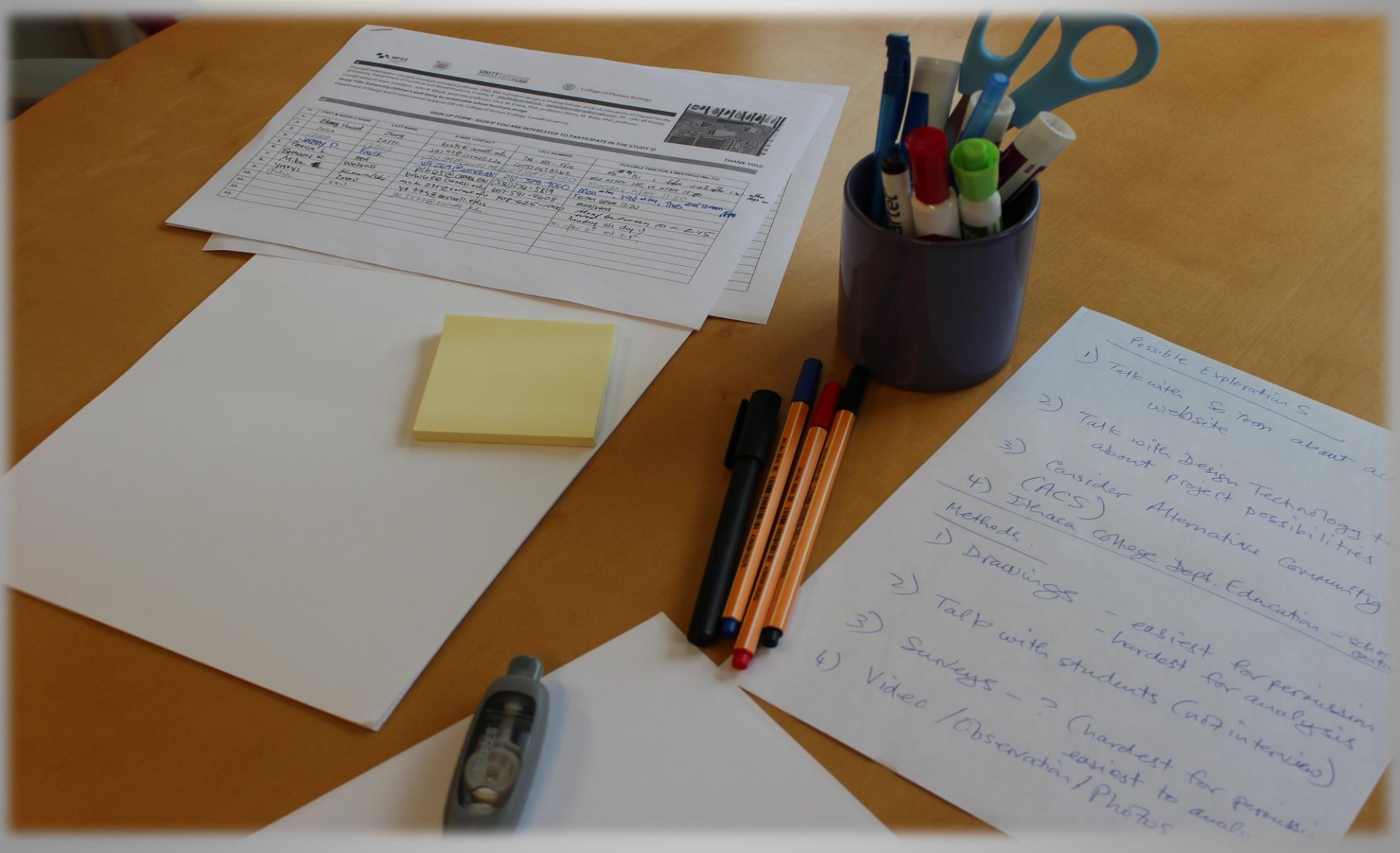
Danijele Domijan, Assit. Prof., PhD, MA in design
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Department of Furniture and Wood Products
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Cornell University, College of Human Ecology,
Department of Human Factors and Ergonomics



4.2. Start

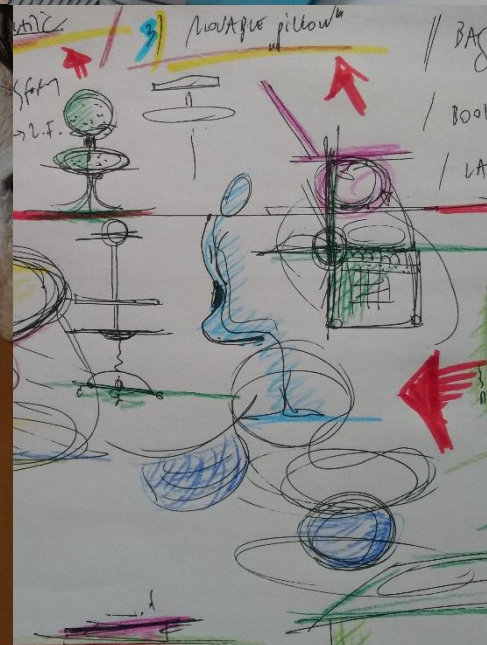
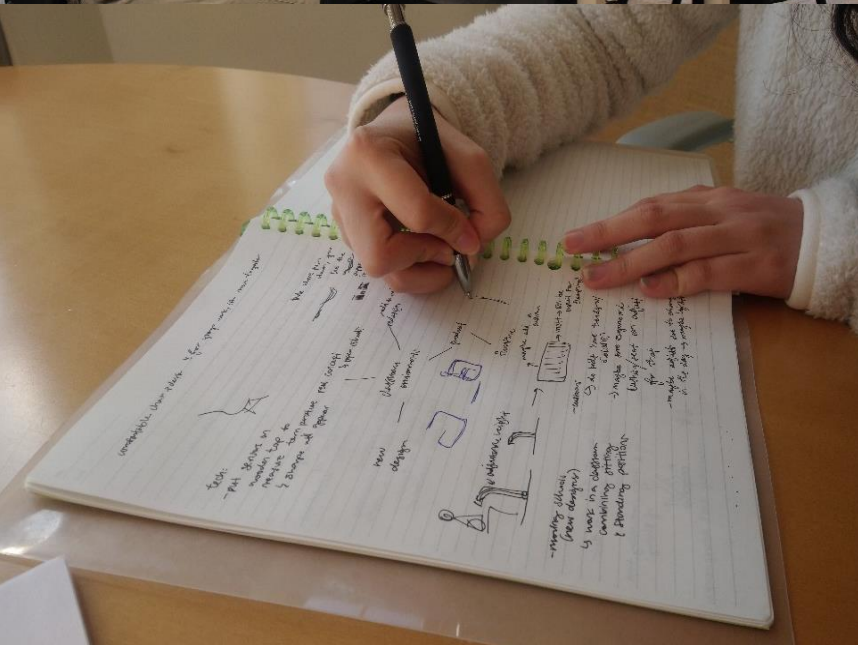


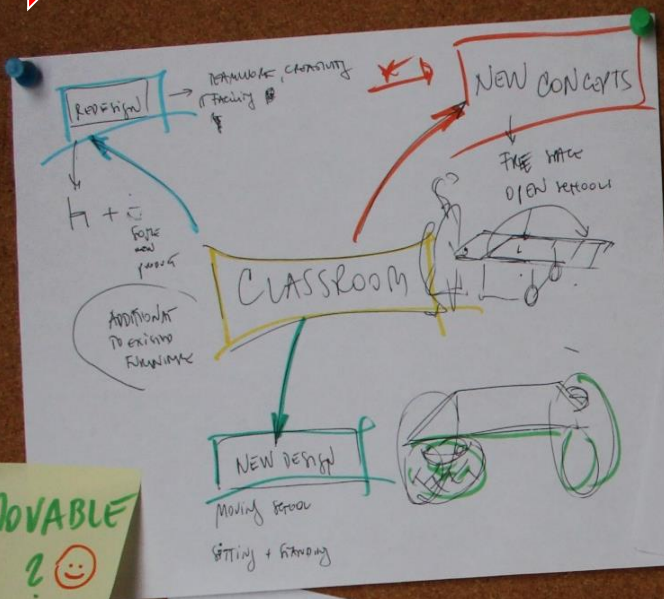
student's list ☺ empty sheets ☹ Alan's inputs ☺ IRB application ☹



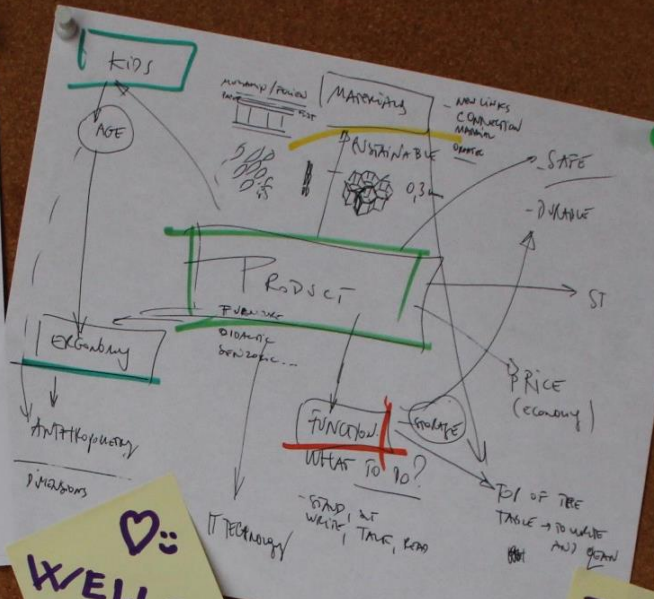
4.3. meetings with D+EA students

brainstormngs, talks, first ideas...





MOVABLE ? 😊



WELL-BEING



FEELINGS 😊😊



SUSTAINABLE 🌱

ADAPTABLE



SENSORY 😊



4.4. some new ideas / concepts

design _ pedagogy _ anthropometry+ergonomy _ ecology+sustainability _ functionality+technology _ economy_...



design _ pedagogy _ anthropometry+ergonomy _ ecology+sustainability _ functionality+technology _ economy _...



design _ pedagogy _ anthropometry+ergonomy _ ecology+sustainability _ functionality+technology _ economy_...



4.5. visiting schools



Today is a good day
to have
a good day



When it rains
look for Rainbows
When it's dark
look for Stars



4.5. visiting schools

observations..... classrooms / libraries / hallways ...









Groton Elementary School

Think Tank Rooms & The Wonder Space



10 Things That Require
Zero Talent

Being on Time

Work Ethic

Effort

Energy

Being Coachable

Body Language

Doing Extra

Attitude

Passion

Being Prepared

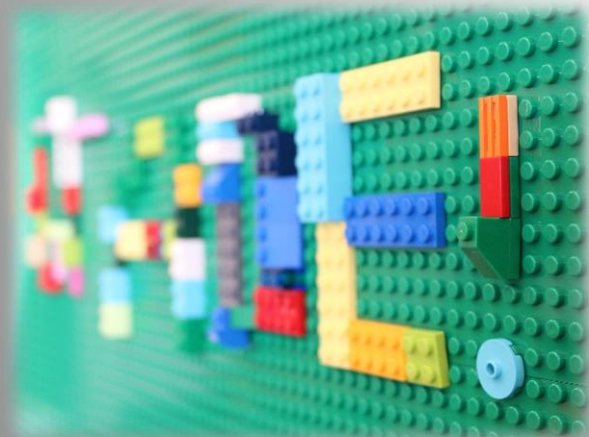


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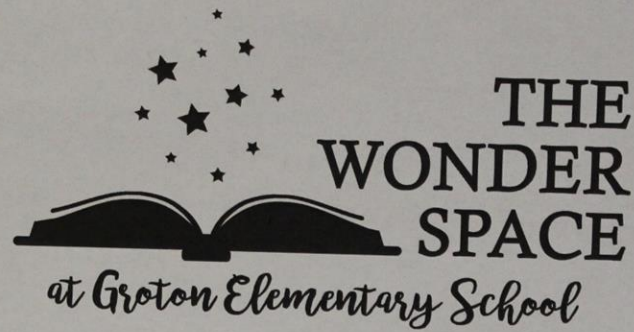
Groton Elementary School
Think Tank Rooms







4.5. visiting schools

Groton Elementary School
The Wonder Space

...is currently under construction!

A grand-opening will be scheduled very soon!

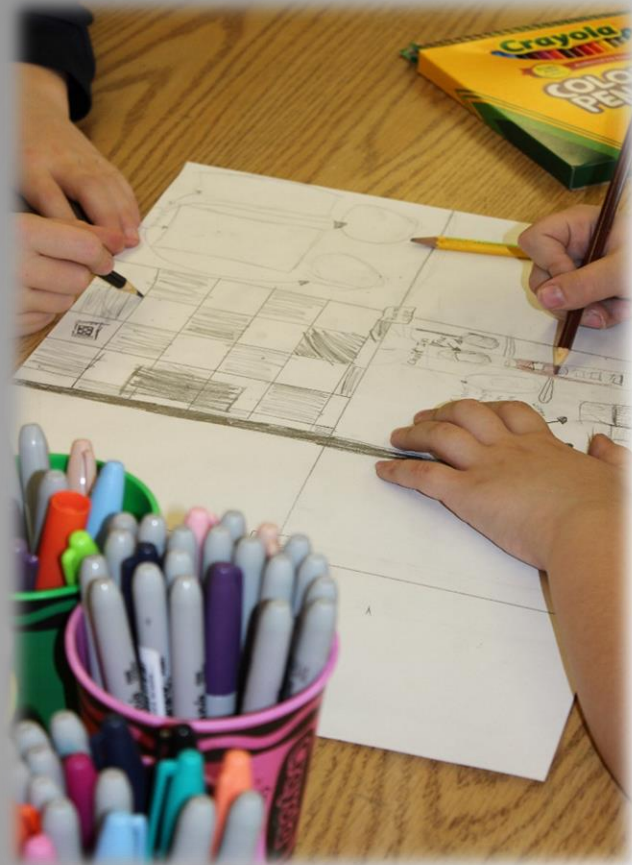
Thank you for your patience!



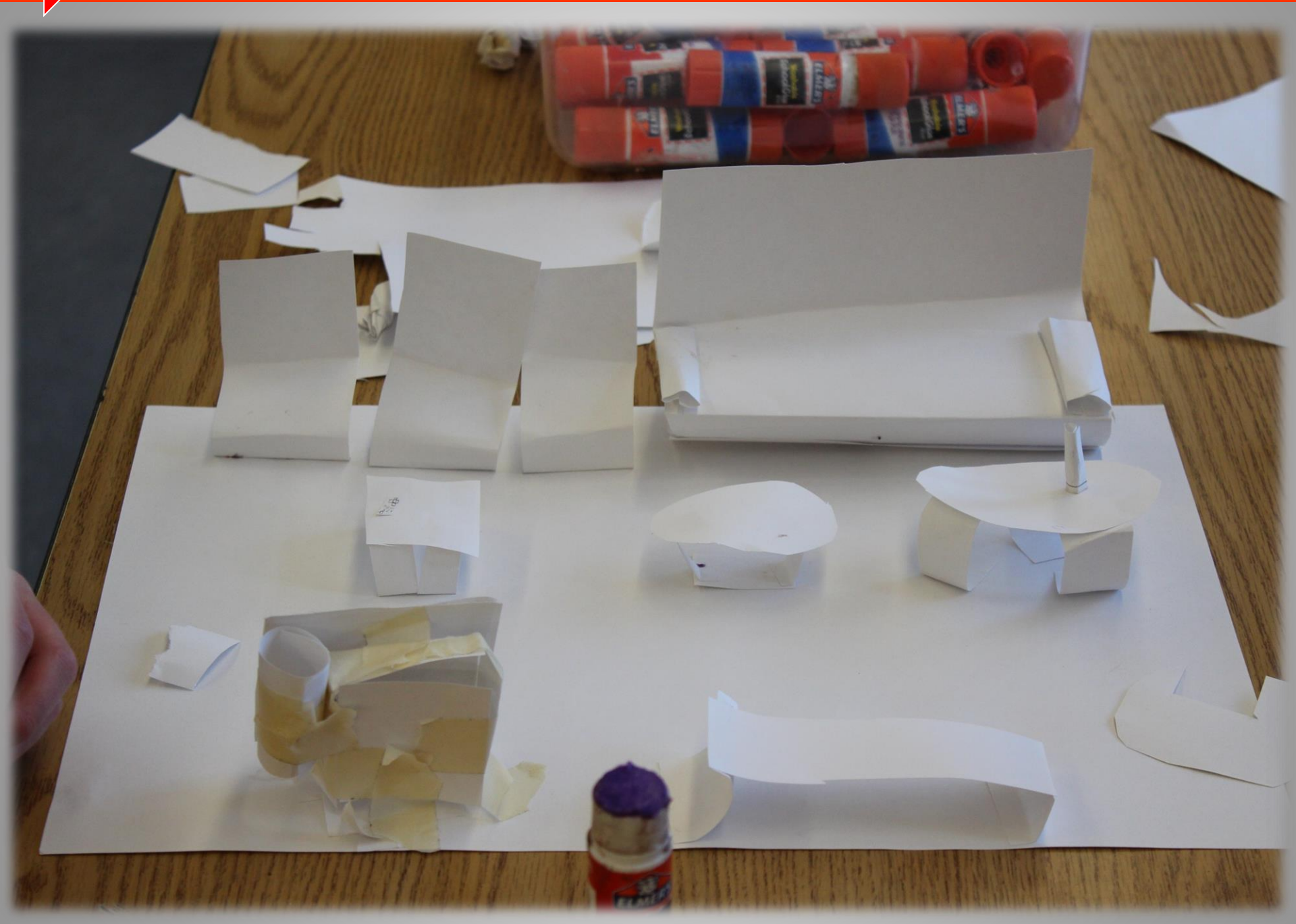


4.6. children's drawings

Groton Elementary School
art class / drawing workshop

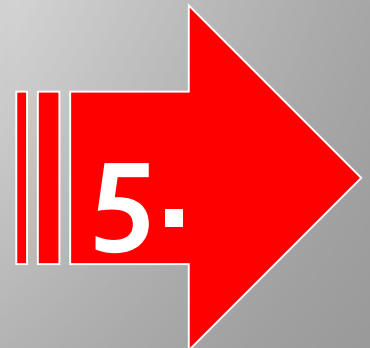








CONCLUSION ????



Several questions were highlighted during the TTR and WS observations:

- **Are children prepared for such new classroom design? (habits, learned behaviour, learning outcomes, savour, satisfactions, body positions, health, etc.)**

Do children know "how" to behave in such environment / or they think that something "is not allowed"?

- How long will it take students to get used to having a relaxing behaviour in classrooms like this, but with one goal: to do schoolwork, homework, or at least to have better learning outcomes?
- How much students pay attention on furniture design and furniture layouts?
- Is it important for learning outcomes and the sense of well-being that furniture in such classrooms is made from sustainable materials or not?
- How could we measure children satisfaction in such rooms?

What would happen to student's (and teacher's) behaviour if this type of furniture arrangement were used in a "classic" classroom?

- Can this, more liberal approach to behavioural learning trigger the bureaucratic system and manufacturers to introduce standardized equipment beyond the traditional "school desk and four-legged" system?

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- **Can this, more „liberal“ approach to behavioural learning, trigger the bureaucratic system and manufacturers to introduce such standardized equipment beyond the traditional "four-legged school desk and chair" system?**



THANK YOU!

questions
&
discussion
😊