ACOUSTIC IMPACT ON INNOVATIVE LEARNING ENVIRONMENTS

JOHN CAMPBELL - GLOBAL CONCEPT DEVELOPER - EDUCATIONAL ENVIRONMENTS

SAINT-GOBAIN

ACOUSTIC IMPACT ON INNOVATIVE LEARNING ENVIRONMENTS

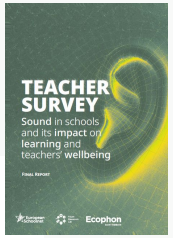
1. Importance of acoustics
2. Changes in Education and why
3. **Research in schools** - linking ILEs and deeper learning
4. **Acoustic case studies** – what good acoustics feels like and how it can influence behaviour
5. **Takeaways** – Organisation, culture, design & acoustic solutions

EDUNET – COLLABORATIVE INTERNATIONAL NETWORK

Education agencies, academia
Educators, architects & consultants

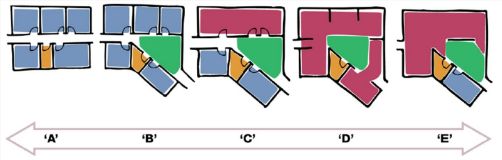
Industry Partnerships:
European SchoolNet - FCL
University of Melbourne - ILETC

Future Classroom Lab
by European Schoolnet



ILETC
INNOVATIVE LEARNING ENVIRONMENTS AND TEACHER CHANGE
A 2016-2019 ARC LINKAGE PROJECT

ILE+SE
INNOVATIVE LEARNING ENVIRONMENTS AND STUDENT EXPERIENCE: THE SCOPING STUDY



Pedagogics and networking

Acoustics

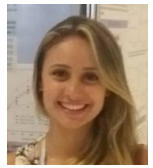
Architecture

Acoustics and surveying

Technical Service

Expertise in NET

Environmental Engineer



Design and acoustics

Multi-Sensory

Marketing and training

Architecture and acoustics

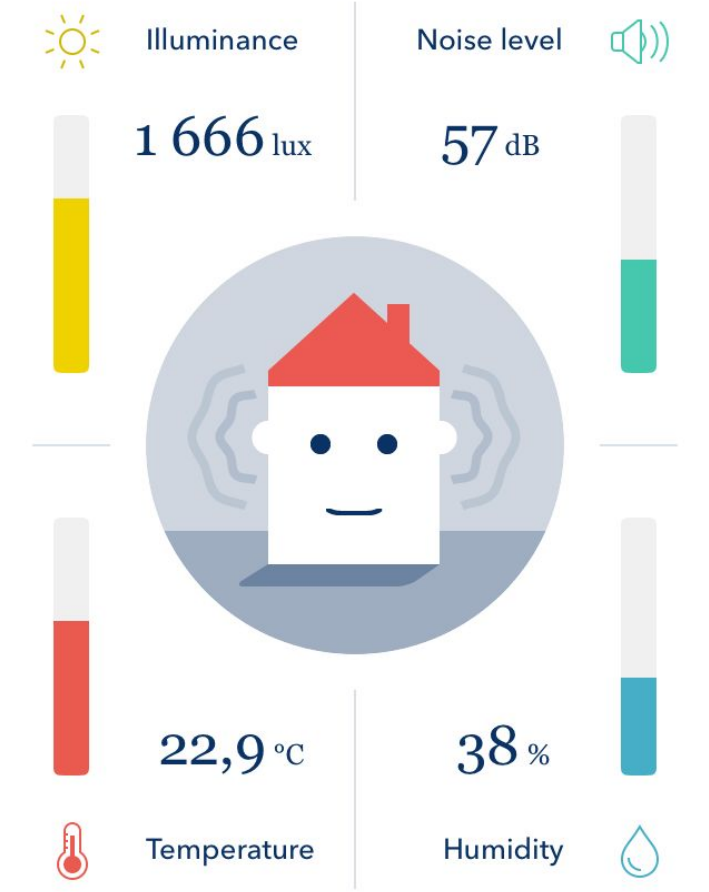
Human resources

Pedagogics and teaching

INDOOR ENVIRONMENTAL QUALITIES

ACOUSTICS AS PART OF #IEQ INDOOR ENVIRONMENTAL QUALITY

Building Managment Systems (BMS) can control lighting, heating and air quality…..

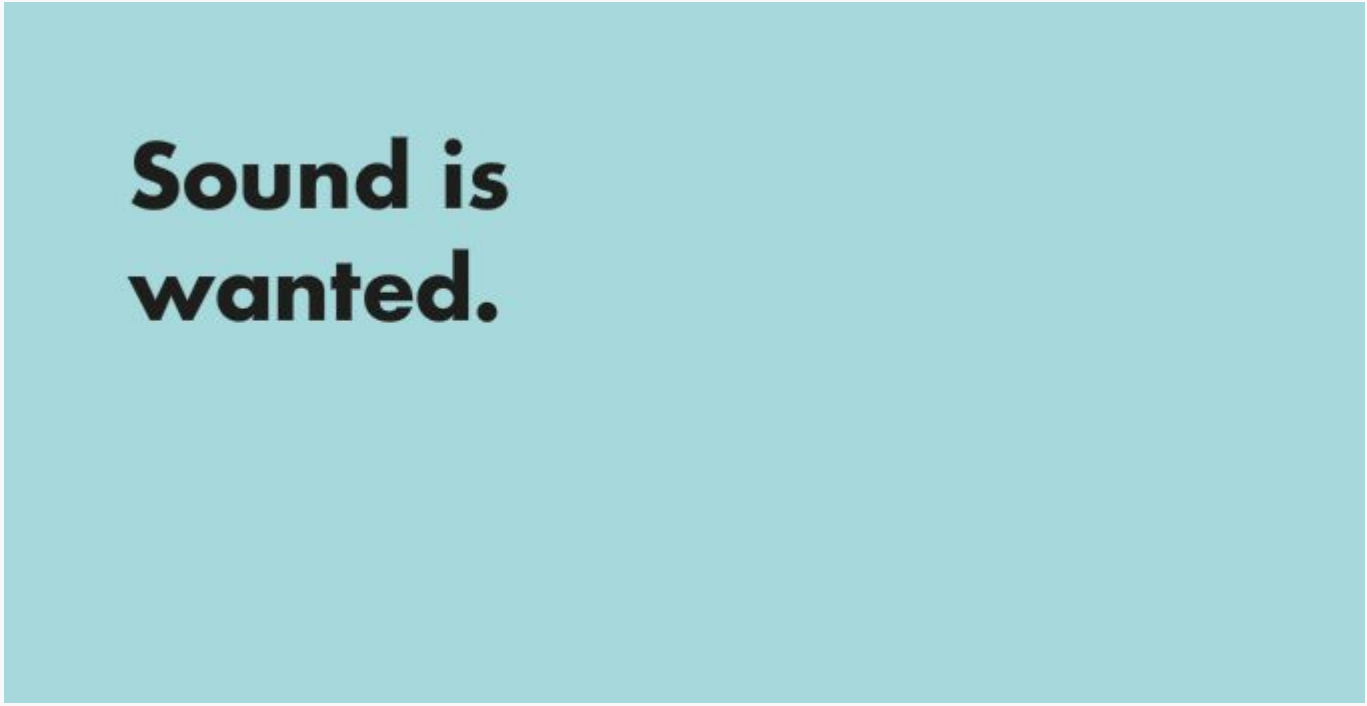


World Health Organization

Air pollution is most damaging to our health however...

Noise pollution is now 2nd most damaging to our health

SOUND INFLUENCES MANAGEMENT & BEHAVIOUR



BRINGING THE OUTDOORS, INDOORS

SPACES FOR LEARNING MINDSETS WHICH SUPPORT & ENHANCE WELL-BEING

Decreasing:

- Unwanted noise
- Late reflections
- stress

Increasing:

- Speech quality
- Listening quality
- Peace of mind

ACOUSTICS FOR COLLABORATIVE LEARNING SPACES

INNOVATIVE LEARNING ENVIRONMENT & TEACHER CHANGE RESEARCH

Moving from a monologue to supporting a dialogue

Agile spaces embracing learner-centric approaches

Spatial typologies approach

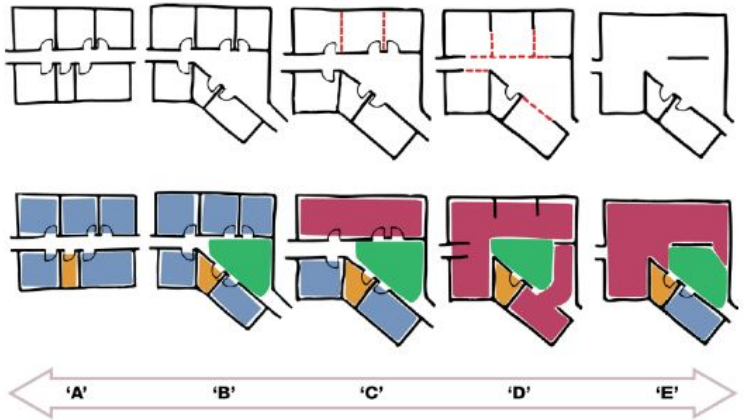


Figure 1. Dovey and Fisher's learning space typologies (2014), adapted by Soccio & Cleveland, 2015

INNOVATIVE LEARNING ENVIRONMENTS AND TEACHER CHANGE
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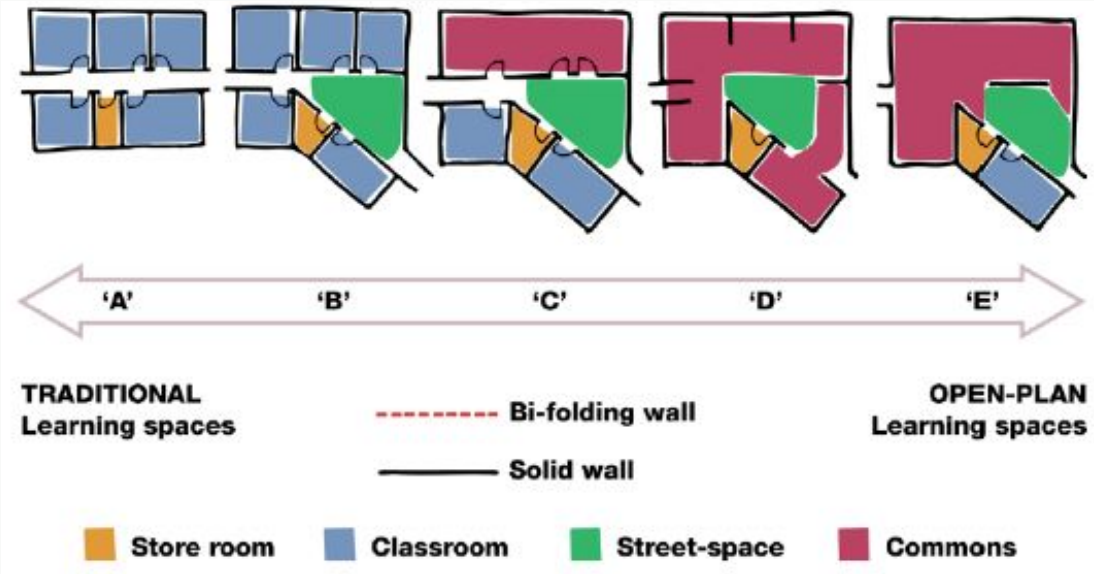
INNOVATIVE LEARNING ENVIRONMENTS TYPOLOGIES

SPATIAL, T&L ACTIVITIES, FURNITURE



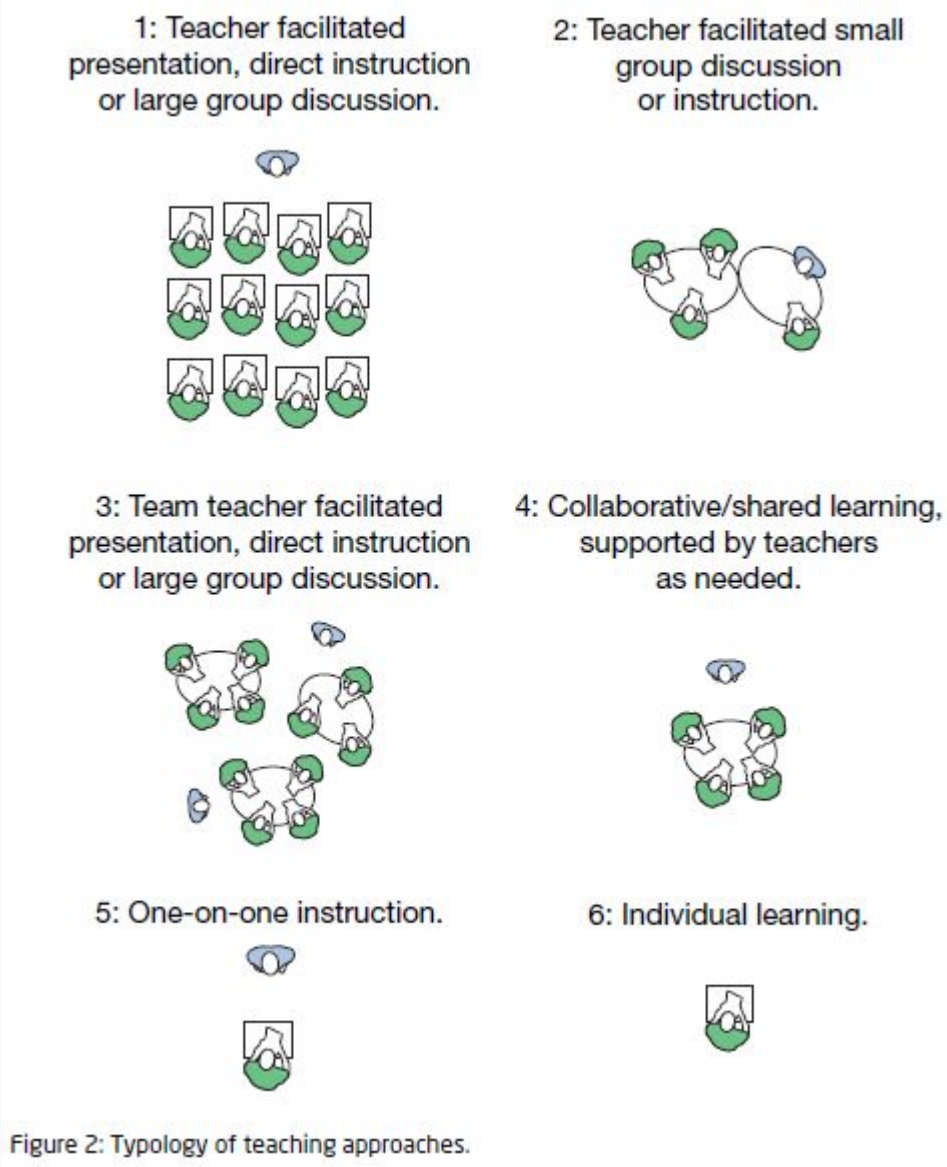


Figure 2: Typology of teaching approaches.

Teacher Responsibility

Taught/ disciplined

Learned/ creative

Didactic instruction

Shared Instruction

Guided Practice

Independent Practice

Watch/ Listen

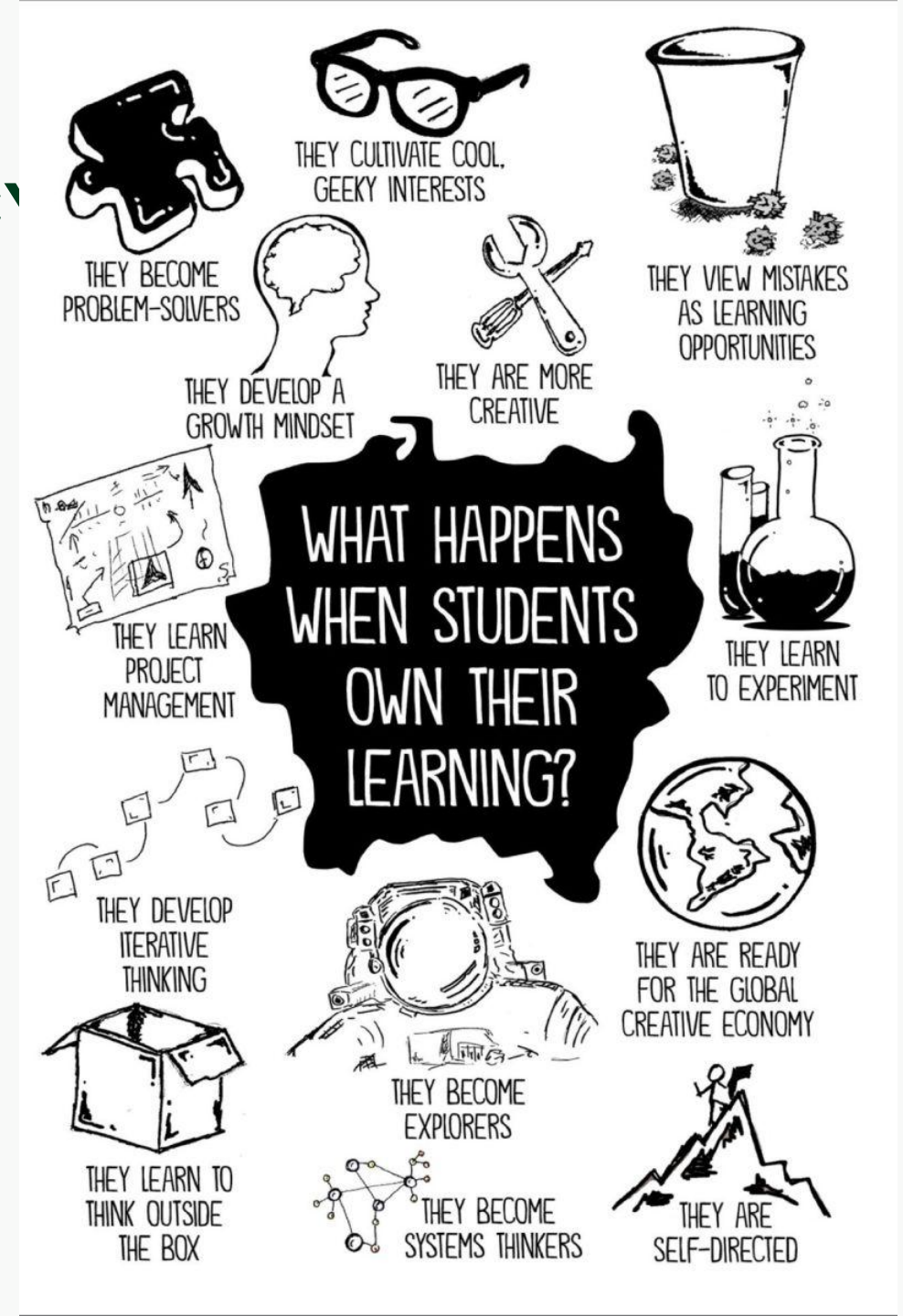
Collaborative

Independent/ Reflect

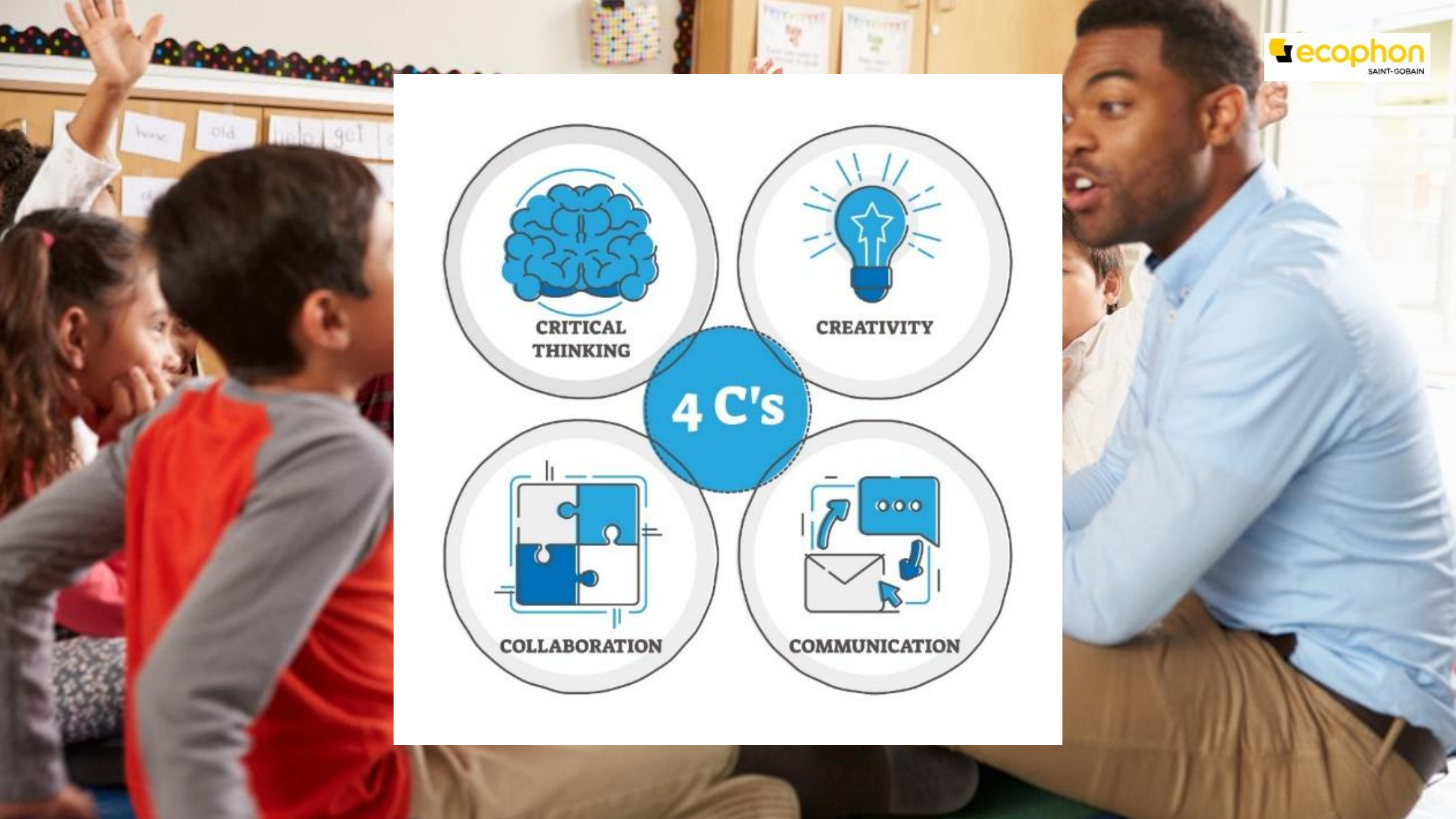
Student Responsibility

Ref: LOOP.bz

STUDENT AGENCY



https://www.futurefocusedtl.com/


CRITICAL THINKING
CREATIVITY
4 C's
COLLABORATION
COMMUNICATION

WE *HEAR* WITH OUR EARS BUT WE *LISTEN* WITH OUR BRAINS

WORLD ECONOMIC FORUM

FUTURE OF JOBS

Type of skill

- Problem-solving
- Self-management
- Working with people
- Technology use and development

WORLD ECONOMIC FORUM

Reskilling needs

Source: Future of Jobs Report 2020, World Economic Forum.

- Analytical thinking and innovation
- Active learning and learning strategies
- Complex problem-solving
- Critical thinking and analysis
- Creativity, originality and initiative
- Leadership and social influence
- Technology use, monitoring and control
- Technology design and programming
- Resilience, stress tolerance and flexibility
- Reasoning, problem-solving and ideation

Source: Future of Jobs Report 2020, World Economic Forum.

ecophon SAINT-GOBAIN

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ACTIVITY BASED ACOUSTIC DESIGN

- **What will people be doing?**
  Lectures? Homework? Deep learning? Noisy/quiet activities?

- **Who is performing the activity?**
  Many or few? Age? Special needs?
  Hearing impairments, ASD, ADHD etc.

- **What kind of space is it?**
  Big or small? Where in the building? Materials used?
  Quiet or noisy (fans, alarms)?

ACTIVITY BASED APPROACH AND SPEECH COMMUNICATION

Learning Typologies

Name	Symbol	Meaning
Campfire (Focused, scaffolded input)		A place for learners to come together, listen to experts and learn from each other. A **sharing space** for problem-creating, goal setting and curriculum-making.
Cave (Independent, reflective learning)		A **safe, reflective space** to be alone and to reflect or to work independently, without interruption or distraction from others.
Watering Hole (Collaborative learning)		A more informal space to gather for learning from peers, exchanging ideas in small groups. A good place to get help and advice when we get 'stuck' or need inspiration. A **problem-solving space**.
Fields (Experiential learning)		Practice, specialist, and creative spaces. Places where we actively try out ideas, test things out, applying our knowledge and skills in the wider world, life spaces. A **'doing' and moving space**.
Journey to the Mountain Top (Celebratory, shared learning)		A place to celebrate and share learning with others. A place to feel proud. A wellbeing and **'feeling good'** space.

To support a mix of communication:

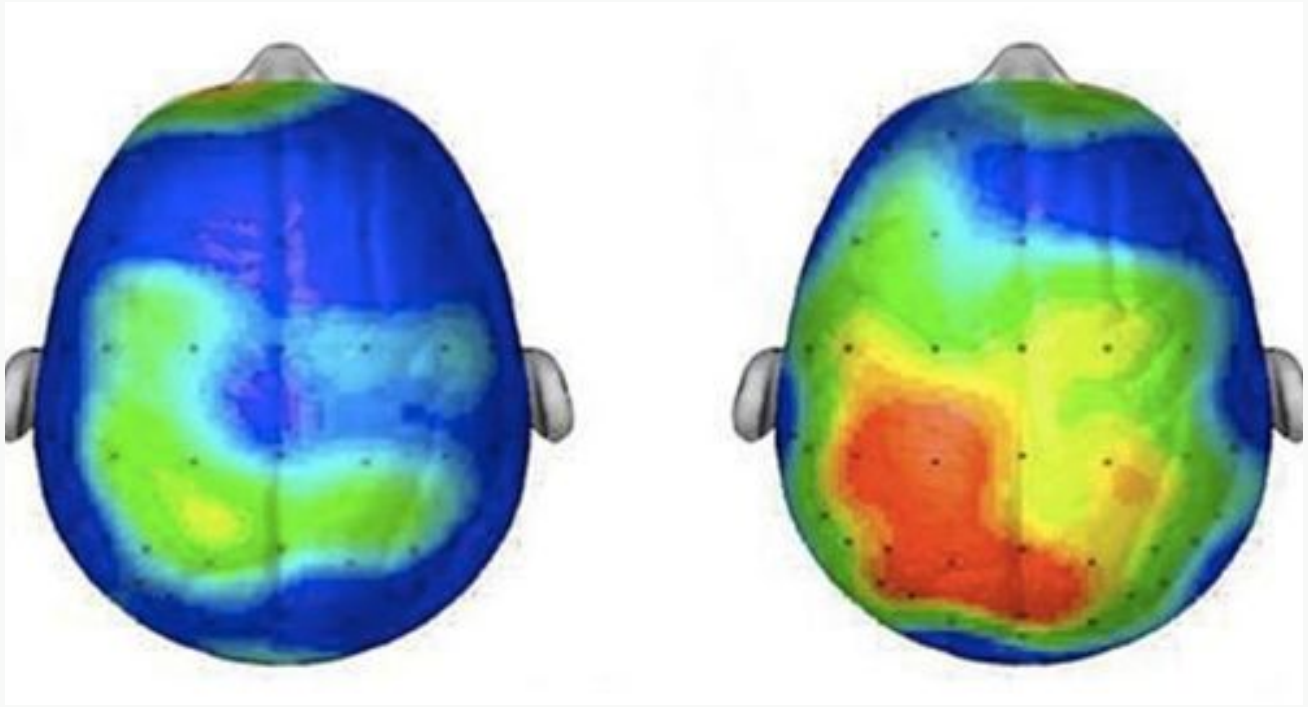
Gather & focus

Collaborate & explore

Talk & reflect

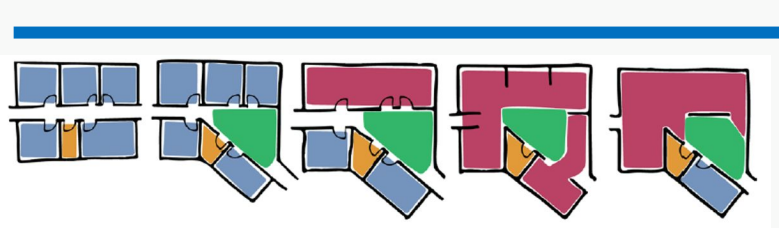
ENCOURAGING PARTICIPATION, ENGAGEMENT AND MOVEMENT

Benefits of activity and moving into different spaces



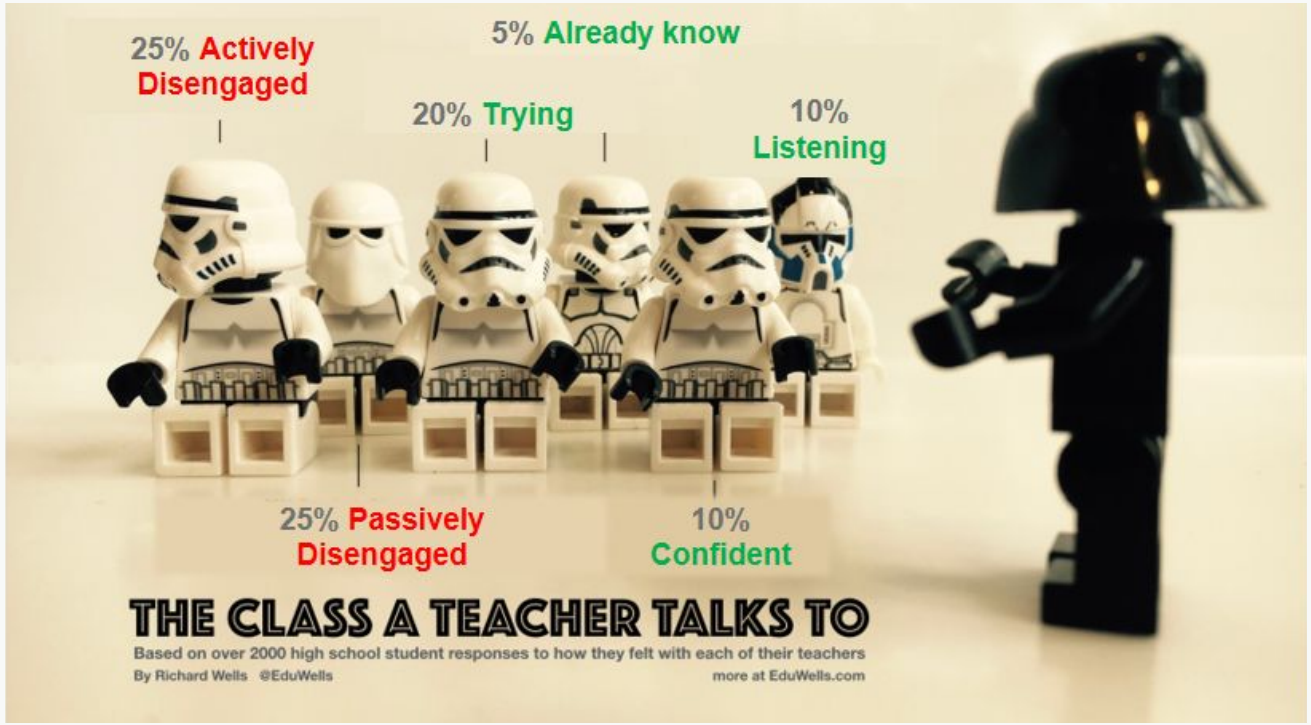
Passive student

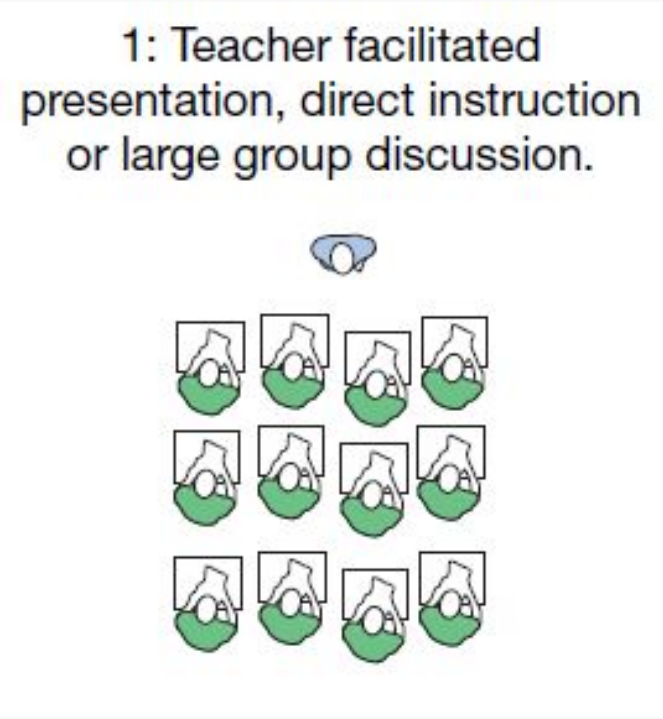
Active student

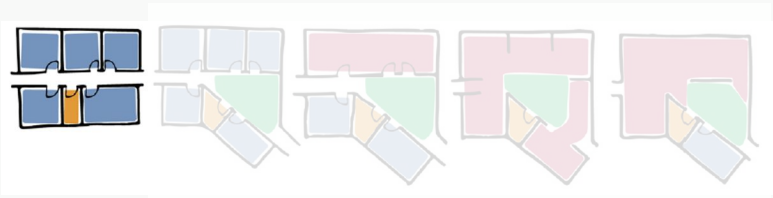


FROM TEACHER TO STUDENT-CENTRIC

SPACES FOR DIALOGUE NOT JUST A TEACHER MONOLOGUE

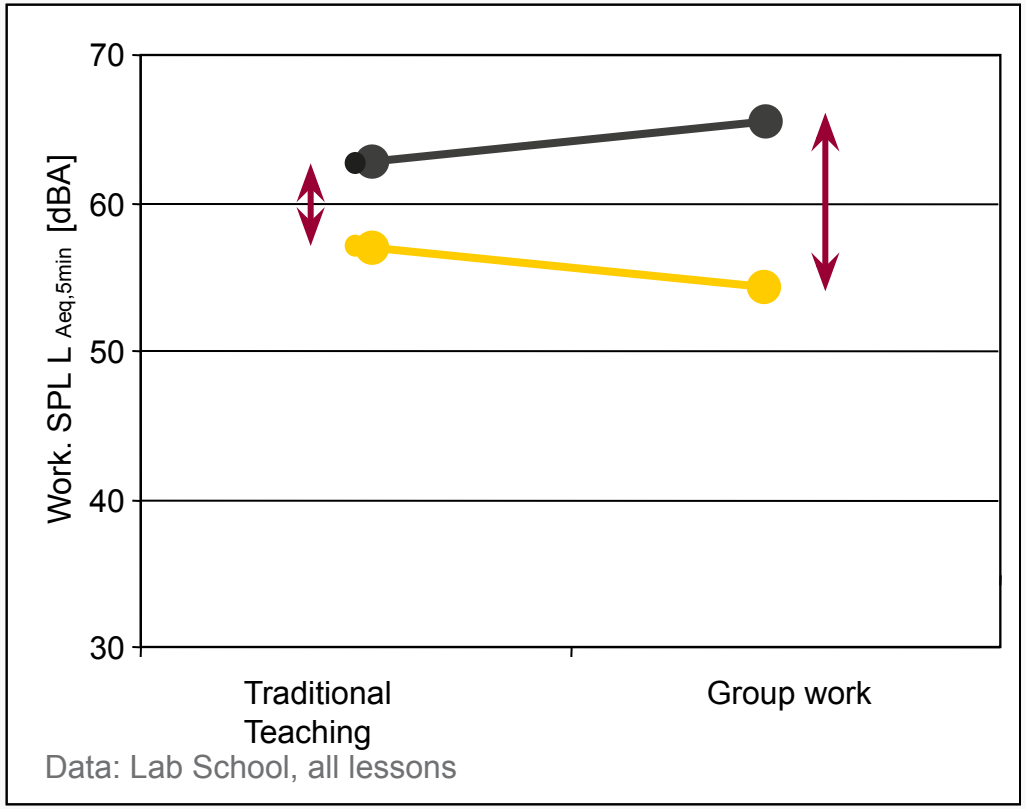






TEACHING STYLES AND SOUND LEVEL DIFFERENCES

Working Sound Pressure levels ($L_{Aeq,5min}$) before and after refurbishment

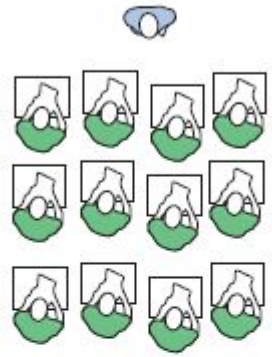


Data: Lab School, all lessons

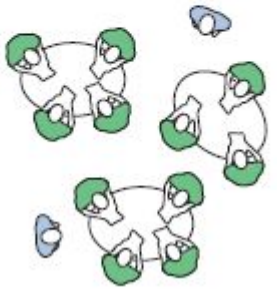
Universität Bremen

13 dB: 3dB predicted
10dB behavioural
"Buy 3dB – get 10dB for free!" G.Tiesler

1: Teacher facilitated presentation, direct instruction or large group discussion.



3: Team teacher facilitated presentation, direct instruction or large group discussion.



L_{Aeq} before ref. (RT >0.5s)
L_{Aeq} after ref. (RT <0.5s)

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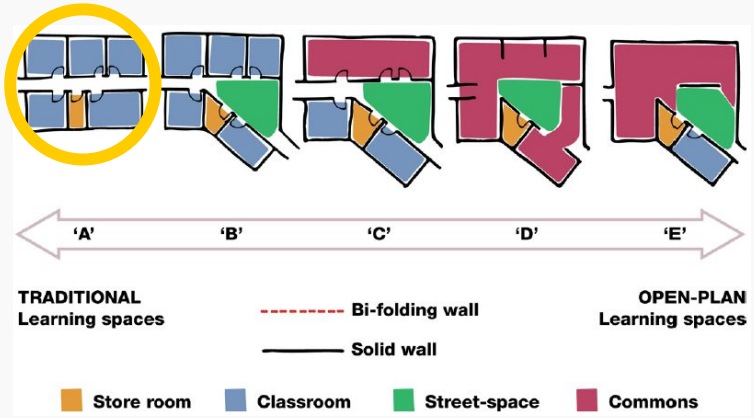
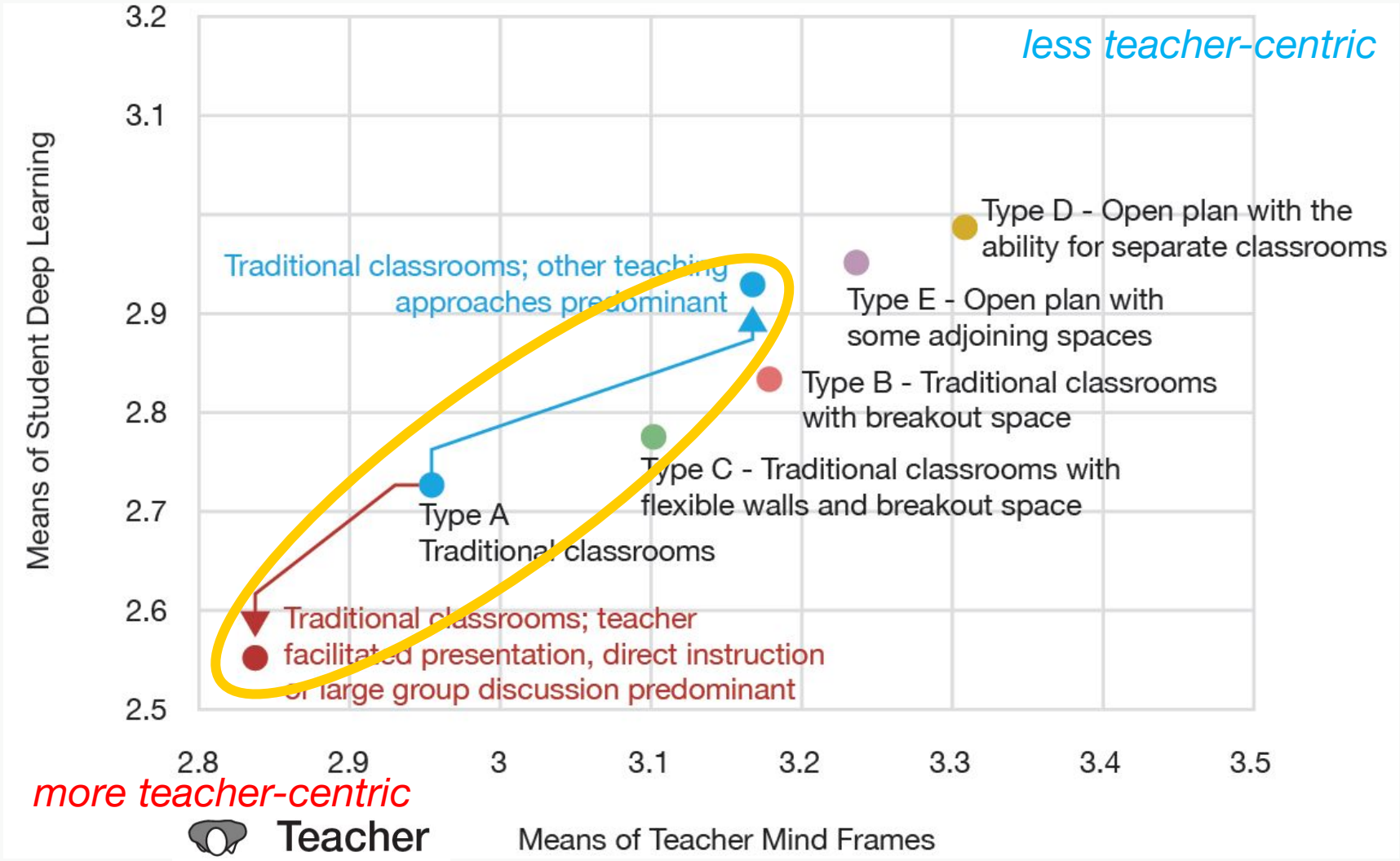
ILETC RESEARCH ABOUT DEEPER LEARNING





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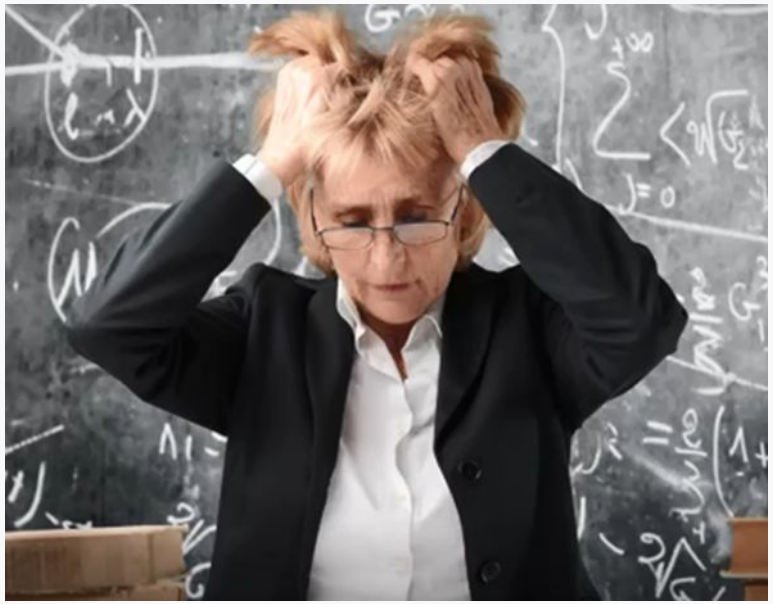
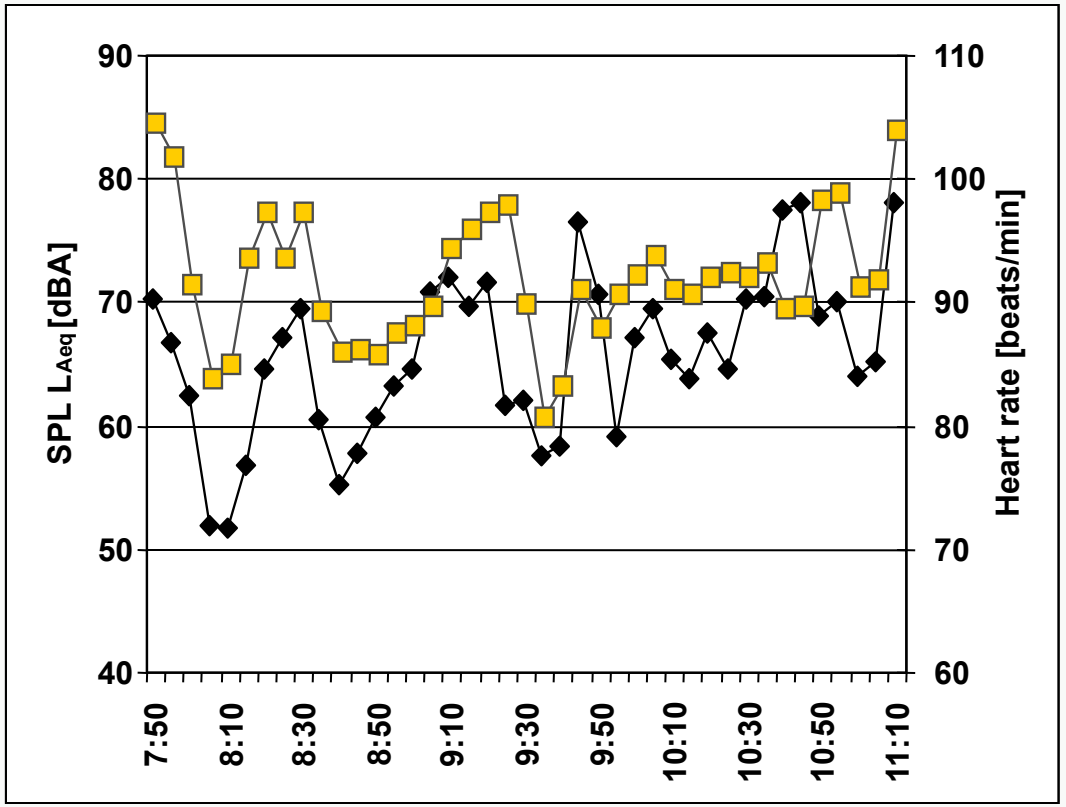
BREMEN STUDY

WORKING SPL AND AVERAGE HEART RATE$_{5MIN}$ OF THE TEACHER

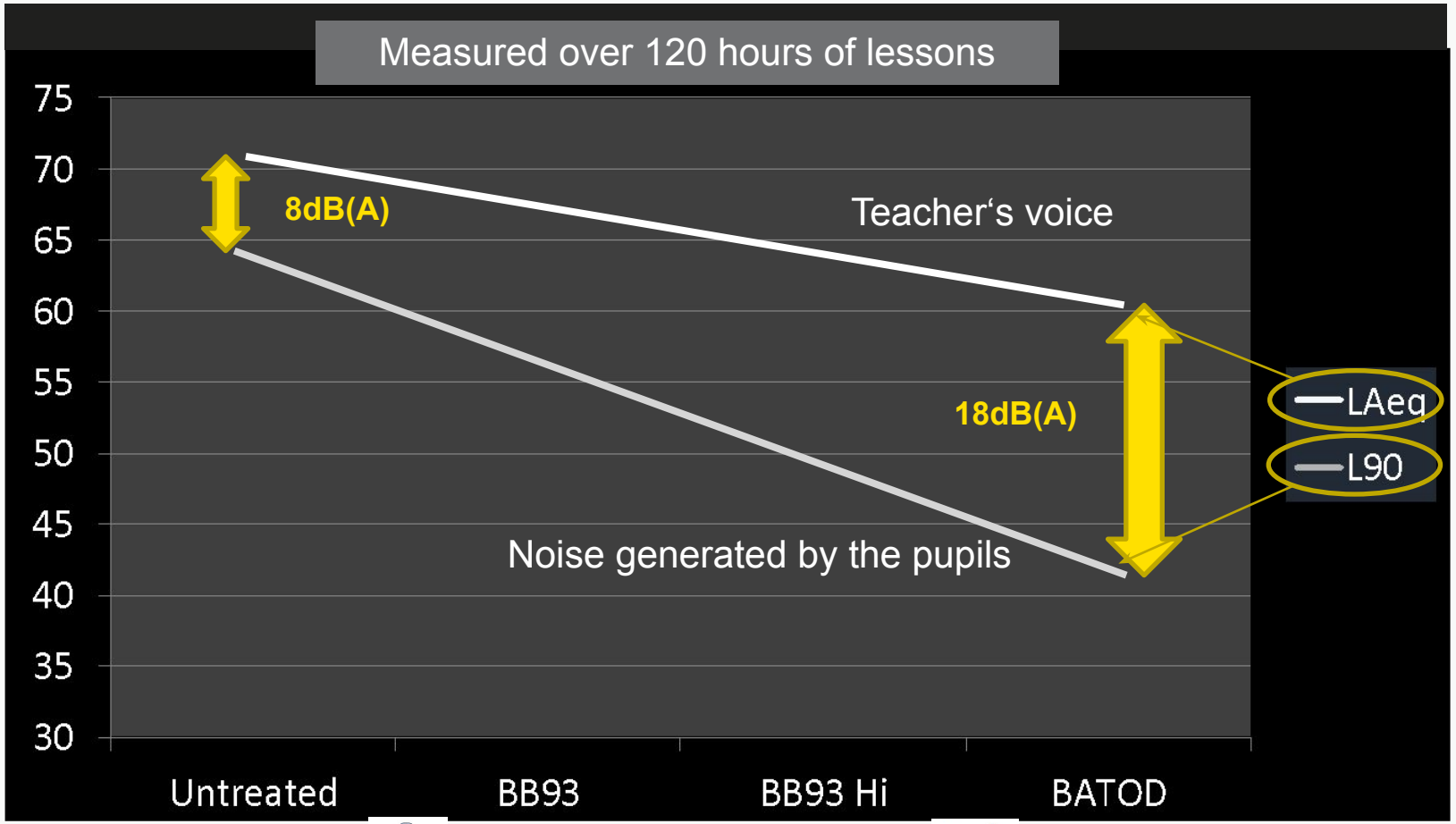




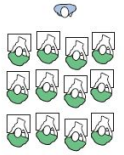
ESSEX STUDY

SOUND LEVELS (SNR) – ”REVERSE LOMBARD”

Essex County Council



(RT - 1.01s) (RT - 0.82s) (RT – 0.46s) 0.37s)



1. Untreated ”control” (RT - 1.01s)

2. BB93 Minimum (RT – 0.82s)

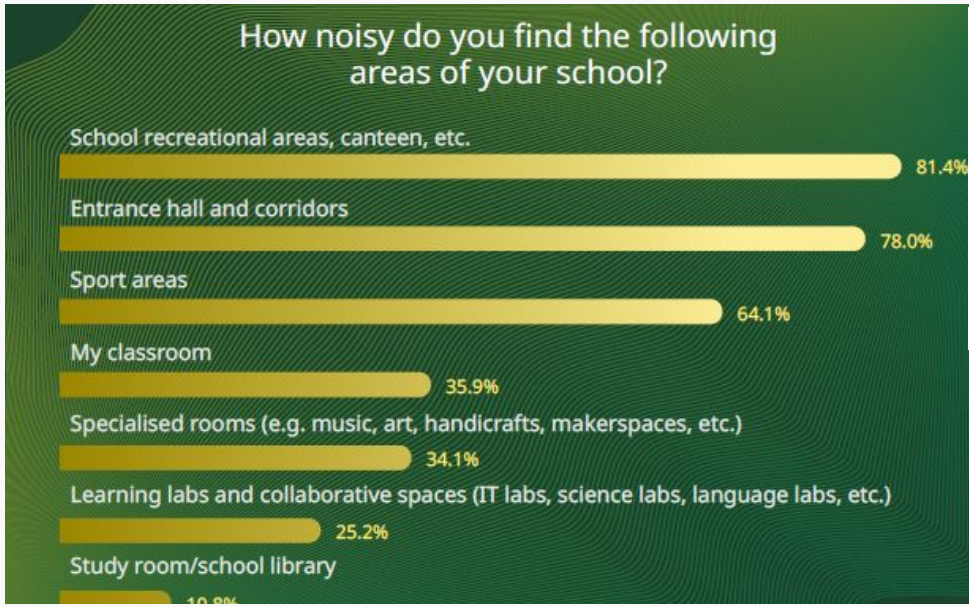
3. BB93 High (RT – 0.46s)

4. BATOD Maximised (RT – 0.37s)

SAINT-GOBAIN


Class Rules
Listen
Have all the necessary equipment
No toilet break during lessons
Take pride in your work
Respect
sound education
www.soundeducation.tv
TRIANGLE NUMBERS
PRIME NUMBERS
times tables
Untreated

TEACHER SURVEY – MOST NOISY AREAS IN SCHOOLS



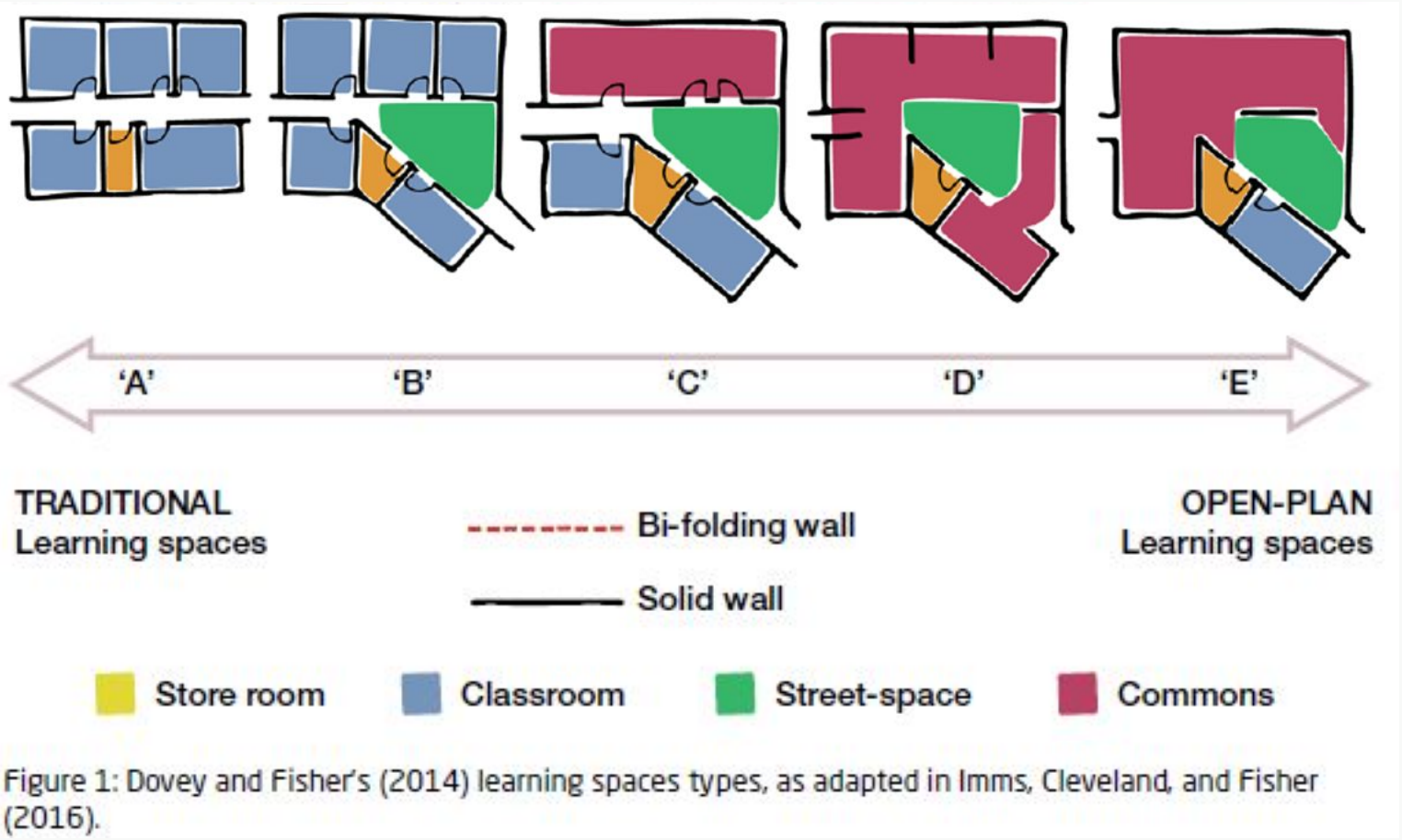
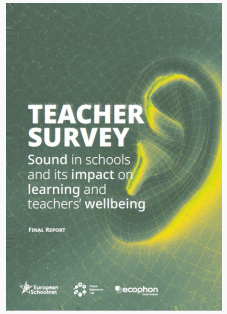
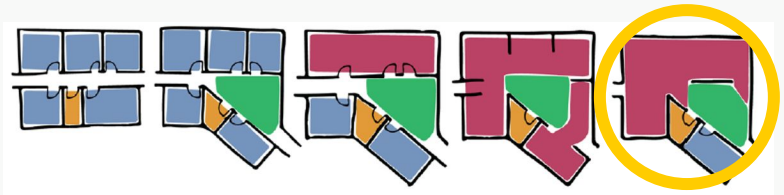


Figure 1: Dovey and Fisher's (2014) learning spaces types, as adapted in Imms, Cleveland, and Fisher (2016).



HAVING MORE OPEN SPACES LEARNING SPACES...

COULD GIVE THE ULTIMATE IN FLEXIBILITY



REMODELLING EXISTING SPACES AND STREET SPACES

INFORMAL LEARNING SPACES POTENTIAL

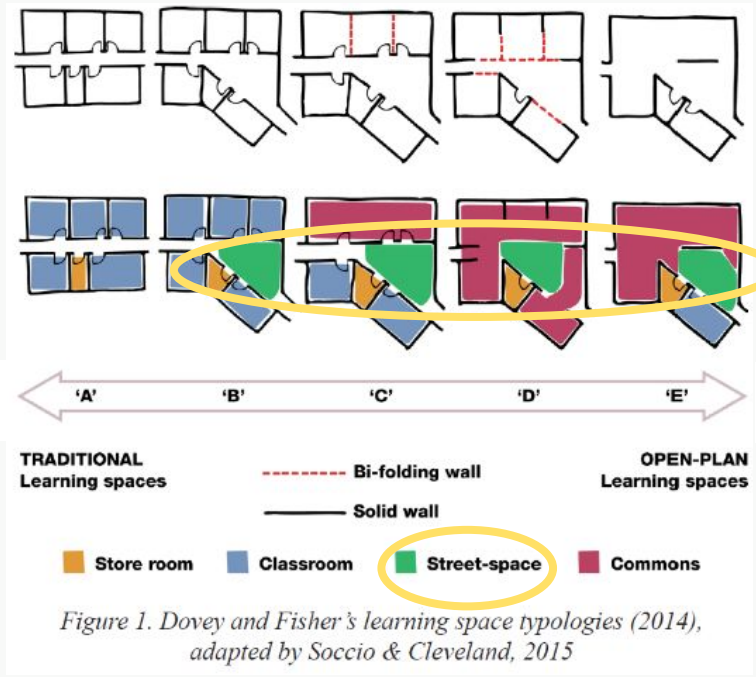
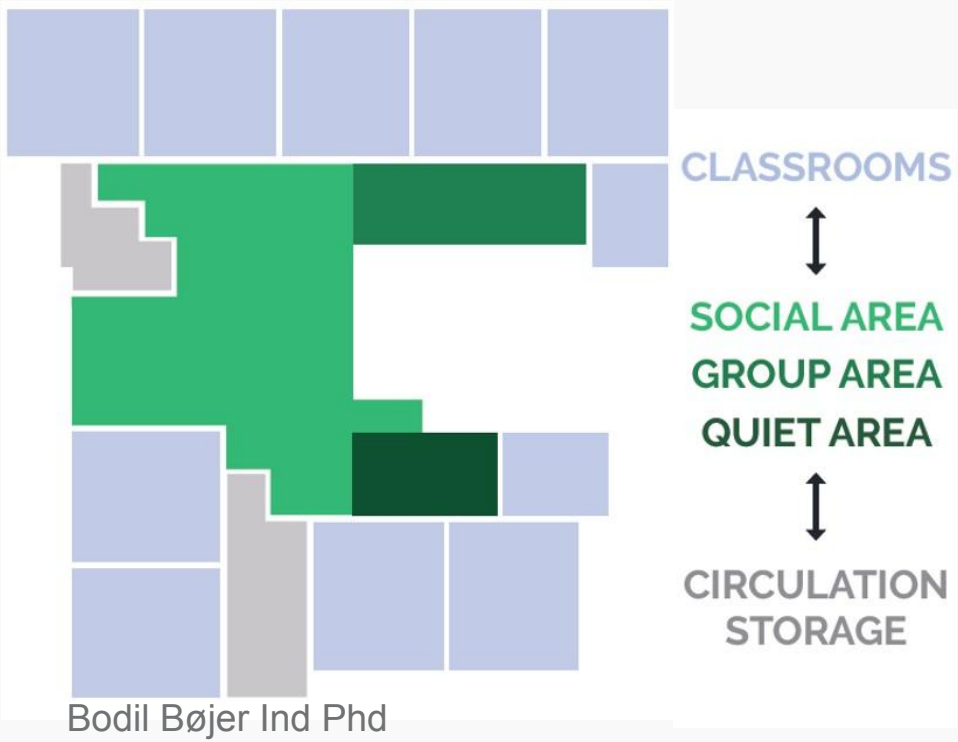


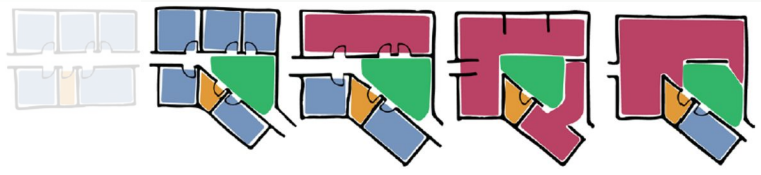
Figure 1. Dovey and Fisher's learning space typologies (2014), adapted by Soccio & Cleveland, 2015

Teacher

Student



Bodil Bøjer Ind Phd
KADK & Rune Fjord Studio



INNOVATIVE LEARNING ENVIRONMENTS AND TEACHER CHANGE
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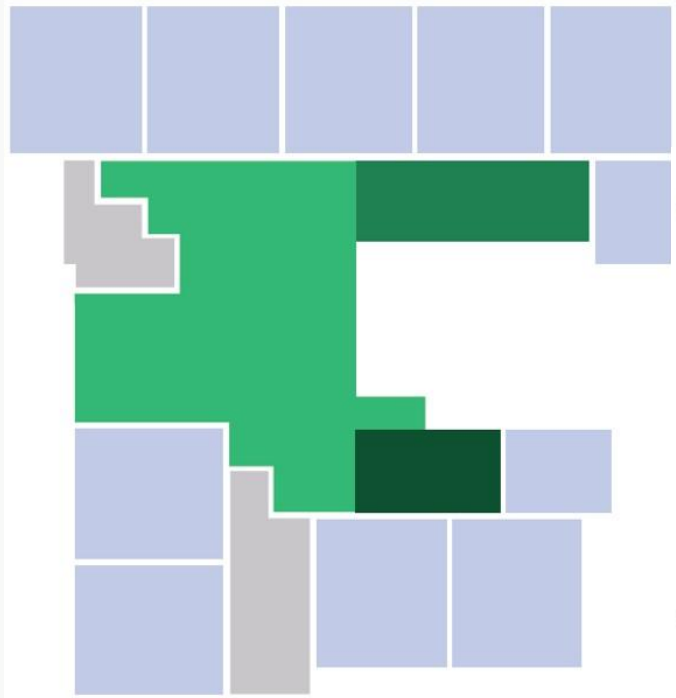
REMODELLING EXISTING CIRCULATION SPACES

NEW POTENTIAL TO UNLOCK LEARNING SPACES



CLASSROOMS

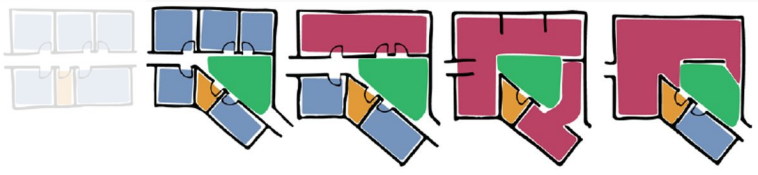
SOCIAL AREA

GROUP AREA

QUIET AREA

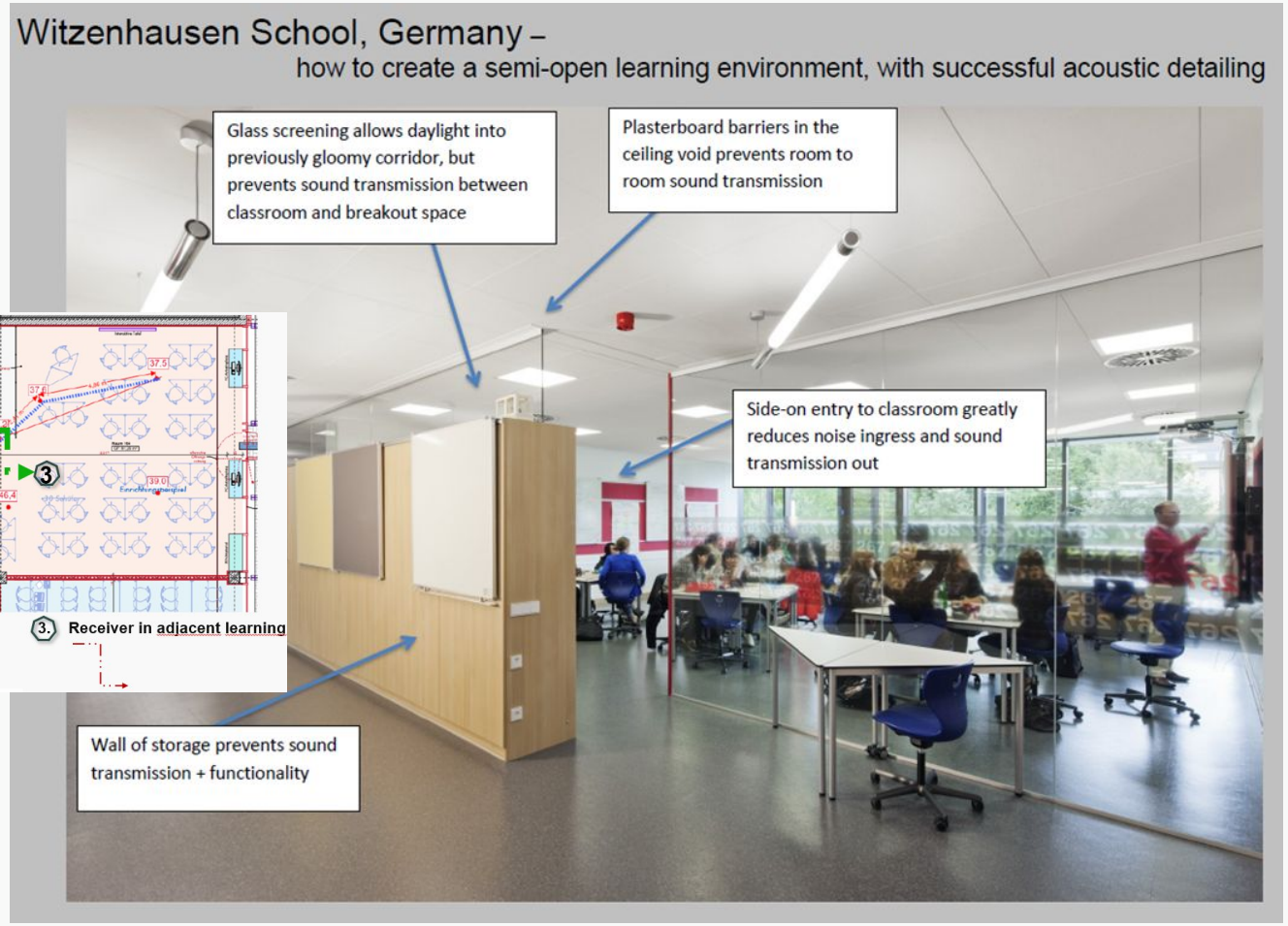
CIRCULATION STORAGE

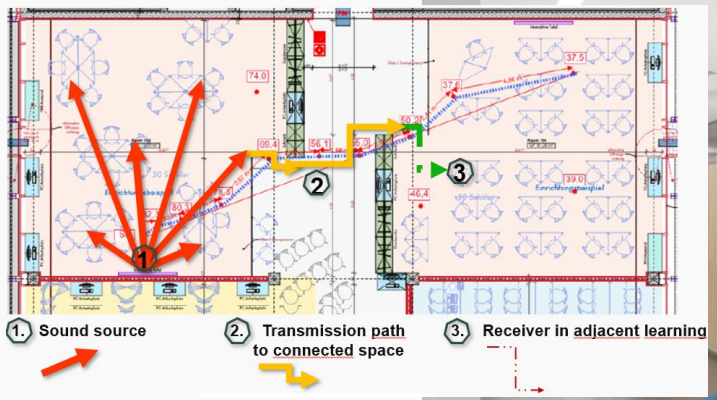
Bodil Bøjer Ind Phd
KADK & Rune Fjord Studio

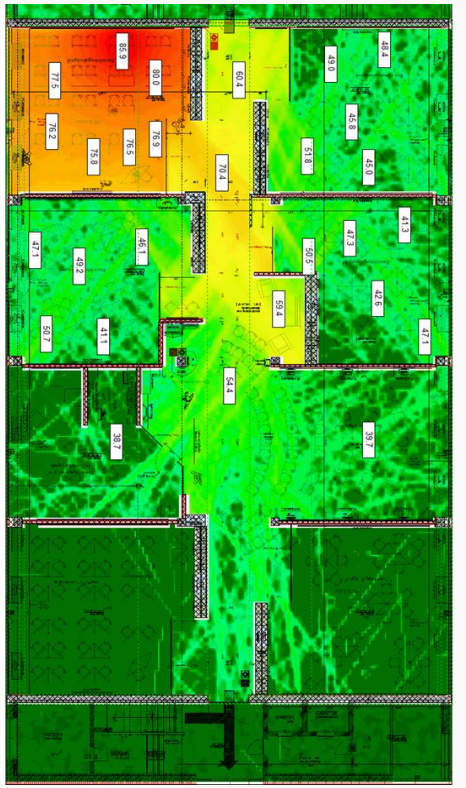


WITZENHAUSEN SEMI-OPEN SCHOOL CASE STUDY

Witzenhausen School, Germany –
how to create a semi-open learning environment, with successful acoustic detailing







Educationally open and transparent but acoustically closed

WITZENHAUSEN SEMI-OPEN SCHOOL CASE STUDY

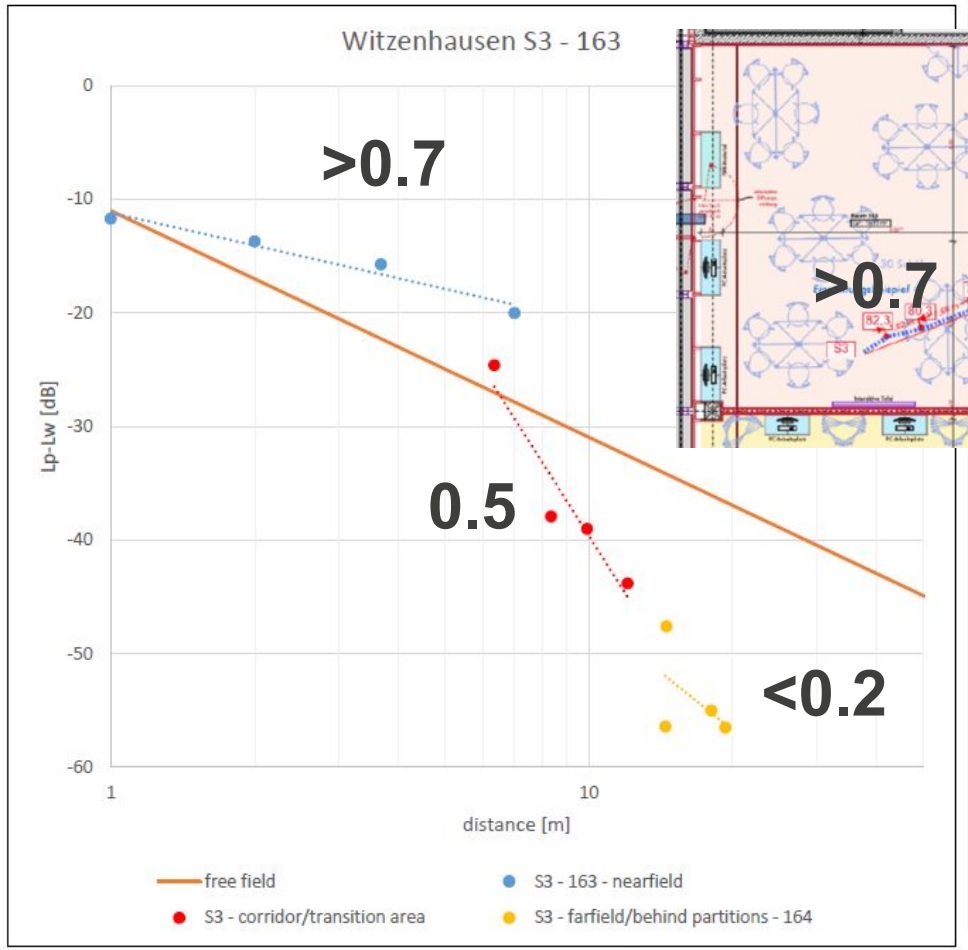
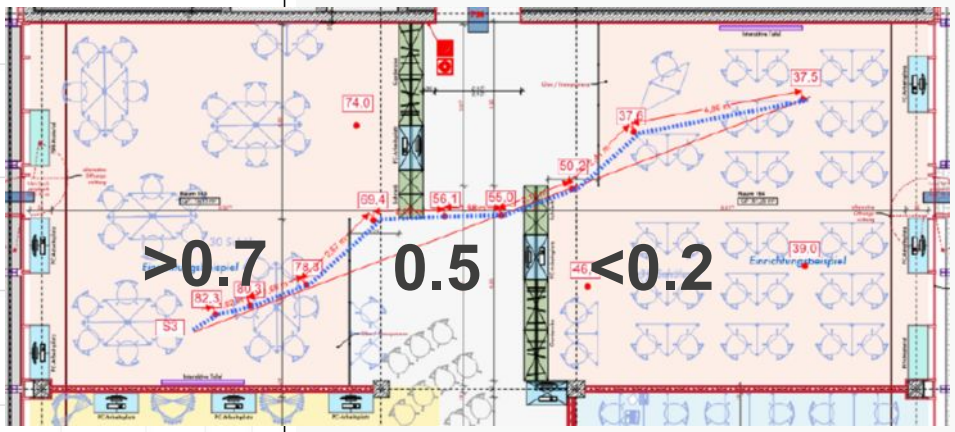
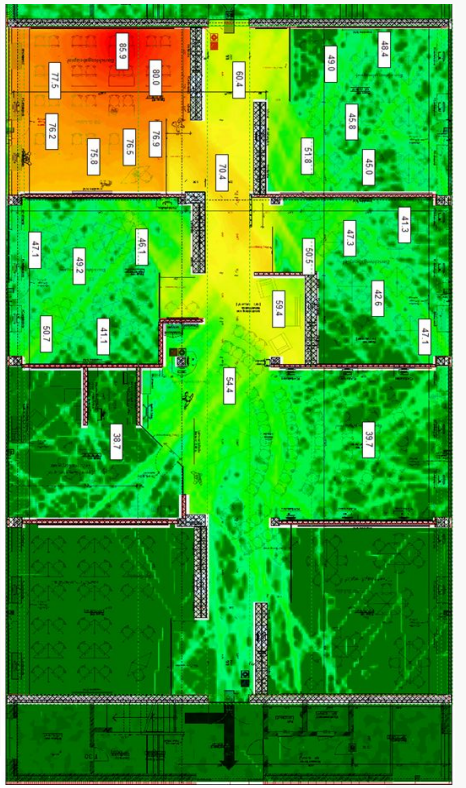


Figure 4.8
Sound propagation along measurement path S3.

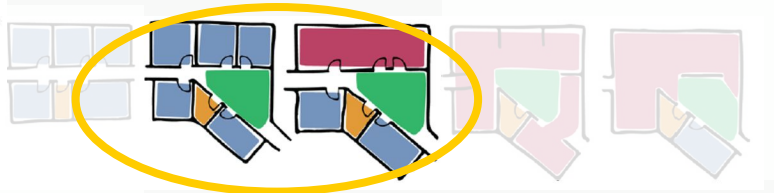


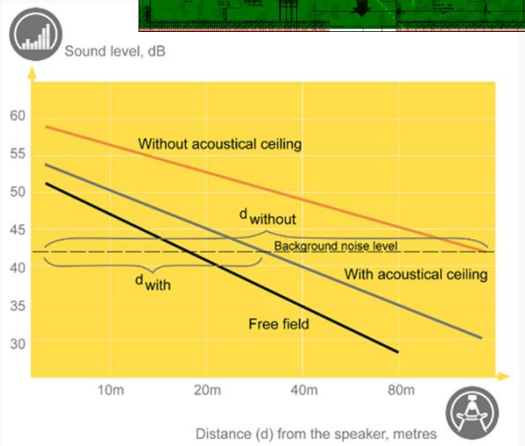


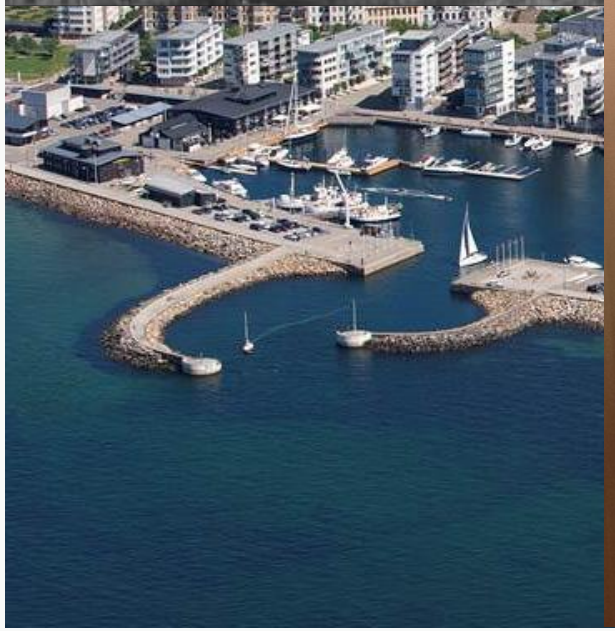
RT: 0.48s (Reverberence)
C50: 8dB (Speech clarity)
STI values >0.7 (Good – Excellent)
(Speech Transmission Index)

Corridor:
STI values around 0.5 (Poor – Fair)

Adjacent / neighbouring classrooms:
STI values <0.2 (Bad)







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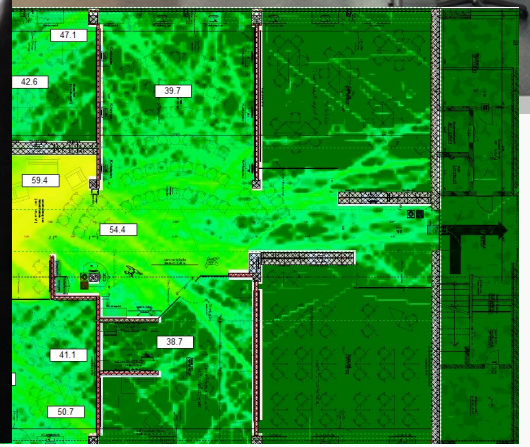
how to create a semi-open learning environment, with successful acoustic detailing

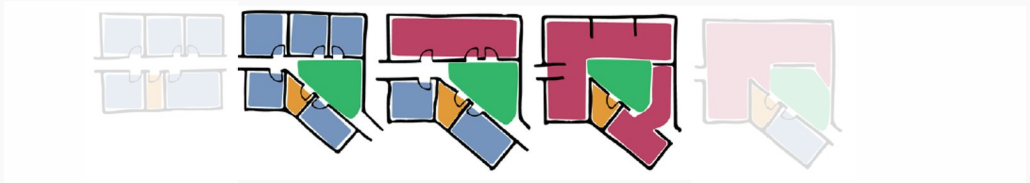


REDUCING SOUND ENERGY IS MUCH THE SAME AS WATER

OPTIMISING ACOUSTIC DESIGN

TO SUPPORT ALL LEARNING SPACES

- Starting with the educational vision and leadership.
- Health and wellbeing focus.
- Culture dependent – management & behaviour.
- Activity Based Acoustic Design approach
- Optimising acoustics and the indoor environment will support both positive teaching / learning activities and outcomes.
- Support inclusion of ASD & ADHD

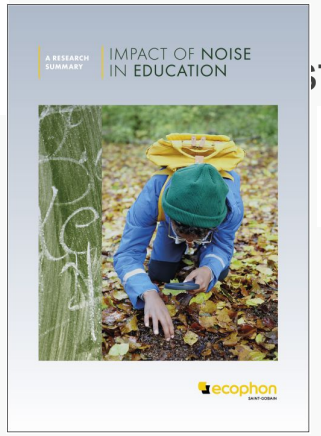


A sound effect on people

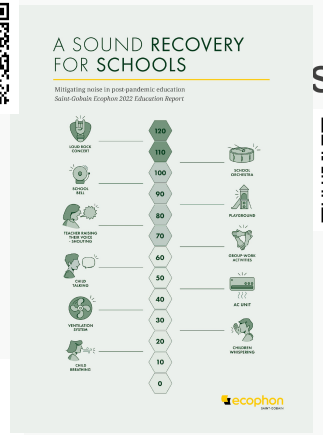
Thank you for listening!

RESEARCH DOCUMENTS, STUDIES AND A STUDY APP

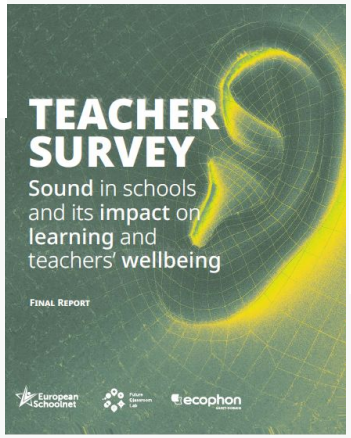
Research summary (2022)



st-pandemic student survey (2022)



survey report (2023)



Study App

AcousticBulletin™
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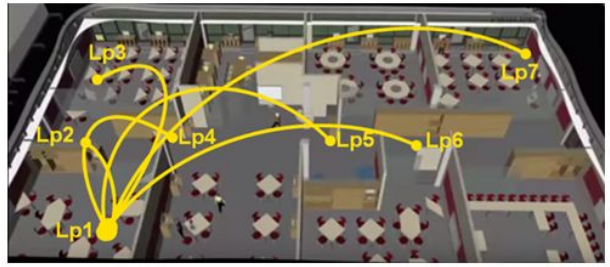
How open should a learning space be – acoustically? School Case Study 1

2017-09-20 by Colin Campbell



Sliding doors combined with good acoustics enable more student-centric learning – School Case Study 2

2018-06-27 by Colin Campbell

Do you know many open plan schools which really work acoustically? – School Case Study 3

2018-10-03 by Colin Campbell