


BUILDING THINKING CLASSROOMS



...back in 2003...



20% of students spent 20% of class time thinking

80% of students spent 0% of class time thinking

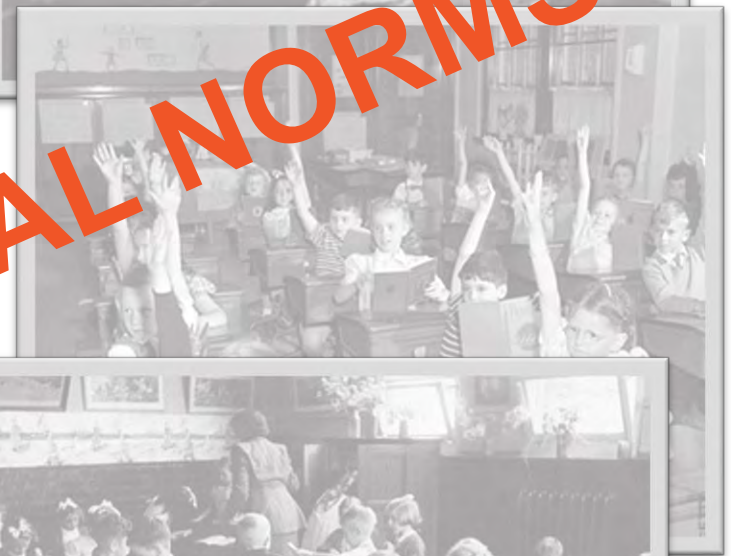




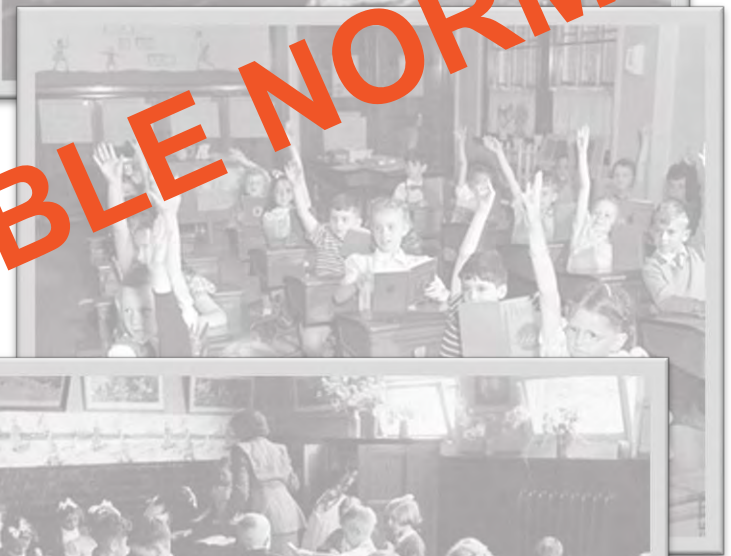








INSTITUTIONAL NORMS



NON-NEGOTIABLE NORMS



**INSTITUTIONAL
NORMS**



**STUDENTS
NOT THINKING**





400+ TEACHERS | 15 YEARS | 2 WEEK CYCLES



**RENEGOTIATING THE
NON-NEGOTIATED NORMS**

400+ TEACHERS | 15 YEARS | 2 WEEK CYCLES

CLASSROOM PRACTICES

1 What are the types of tasks we use?

2 How we form collaborative groups?

3 Where students work?

4 How we arrange the furniture in our classroom?

5 How we answer questions?

6 When, where, and how tasks are given?

7 What homework looks like?

8 How we foster student autonomy?

9 How we use hints and extensions?

10 How we consolidate a lesson?

11 How we give notes?

12 What we choose to evaluate?

13 How we use formative assessment?

14 How we grade?

CLASSROOM PRACTICES

OPTIMAL PRACTICES FOR THINKING

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CLASSROOM PRACTICES

OPTIMAL PRACTICES FOR THINKING

1	What are the types of tasks we use?	Use thinking tasks
2	How we form collaborative groups?	Form frequent visibly random groupings
3	Where students work?	Use vertical non-permanent surfaces
4	How we arrange the furniture in our classroom?	<i>Defront</i> the classroom
5	How we answer questions?	Only answer keep thinking questions
6	When, where, and how tasks are given?	Give tasks early, standing, and verbally
7	What homework looks like?	Give check your understanding questions
8	How we foster student autonomy?	Be intentionally less helpful
9	How we use hints and extensions?	Create and manage <i>flow</i>
10	How we consolidate a lesson?	Consolidate from the bottom
11	How we give notes?	Use meaningful notes
12	What we choose to evaluate?	Evaluate what you value
13	How we use formative assessment?	Communicate to students where they are and where they are going
14	How we grade?	Report out based on data (not points)

CLASSROOM PRACTICES

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CLASSROOM PRACTICES

OPTIMAL PRACTICES FOR THINKING

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2 How we for

3 Where stud

4 Gold Chain Ex

5 You are backpa

6 home, but you

7 and you have f

8 payment of rod

9 and he is willi

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15 How we give not

16 What we choose

17 How we use form

18 How we grade?

groupings

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FURTHER PRACTICE
5. Factorize each of the following.
(a) $2x^2 - 12x + 18$
(b) $45m^2 + 60mn + 20n^2$
(c) $5 - 125n^2$
(d) $x^2y - 22xy + 121y$
(e) $72m^2 - 98n^2$
(f) $9a^3 - 12a^2b + 4ab^2$
(g) $3x^3 - 48x$
(h) $18y^2z^2 - 2y^4$
6. Factorize each of the following.
(a) $(x + y)^2 - 14(x + y) + 49$
(b) $(a + 3b)^2 - (2c + d)^2$
(c) $25 - (u - v)^2$
(d) $1 - 12xy + 36x^2y^2$
MATH@WORK
7. Harry has $(9x^2 + 24xy + 16y^2)$ marbles, where x and y are positive integers. He arranges the marbles as a square array.
(a) Express, in terms of x and y , the number of marbles on each side of the array.
(b) When $x = 2$ and $y = 5$, find the number of marbles on a side of the array.

BRAIN WORKS
8. Factorize each of the following.
(a) $y^4 - 81$
(b) $z^4 - 625$
9. (a) Expand $(a + b + c)^2$.
(b) Factorize $a^2 + 4b^2 + c^2 - 4ab - 4bc + 2ac$.
(c) Let $E = a^2 + 4b^2 + c^2 - 4ab - 4bc + 2ac$.
(i) What is the minimum value of E ?
(ii) Find two possible sets of values of a , b , and c such that the value of E is the minimum.
10. Alex was asked to factorize $x^2y^2 + 36 - 4x^2 - 9y^2$. He tried some ways of grouping terms as shown below.
 $x^2y^2 + 36 - 4x^2 - 9y^2 = (x^2y^2 + 36) - (4x^2 + 9y^2)$
 $x^2y^2 + 36 - 4x^2 - 9y^2 = (x^2y^2 + 36 - 4x^2) - 9y^2$
 $x^2y^2 + 36 - 4x^2 - 9y^2 = x^2y^2 + (36 - 4x^2 - 9y^2)$
As he could not carry out factorization with the above groupings, he concluded that the expression could not be factorized. Do you agree with him? Why or why not?

where
Report out based on data (points)

CLASSROOM PRACTICES

OPTIMAL PRACTICES FOR THINKING

1 What are the types of tasks we use?

2 How do we...

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10 H

11 H

12 W

13 How do we assess?

14 How we grade?

How do we...

Communicate to students where they are and where they are going

Report out based on data (not points)



CLASSROOM PRACTICES

OPTIMAL PRACTICES FOR THINKING

1

Use thinking tasks

2

3

4

5

	vertical non-perm	horizontal non-perm	vertical permanent	horizontal permanent	notebook
N (groups)	10	10	9	9	8
time to task	12.8 sec	13.2 sec	12.1 sec	14.1 sec	13.0 sec
first notation	20.3 sec	23.5 sec	2.4 min	2.1 min	18.2 sec
discussion	2.8	2.2	1.5	1.1	0.6
eagerness	3.0	2.3	1.2	1.0	0.9
participation	2.8	2.3	1.8	1.6	0.9
persistence	2.6	2.6	1.8	1.9	1.9
mobility	2.5	1.2	2.0	1.3	1.2
non-linearity	2.7	2.9	1.0	1.1	0.8

12 What

13 How

communicate to students where they are and where they are going

14 How we grade?

Report out based on data (not points)

CLASSROOM P

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BUILD

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in MAT

GRADE

14 TEAC
PRAC

FOR ENH
LEARNIN

PETER

FOREWORD BY
ILLUSTRATION

MODIFYING YOUR THINKING CLASSROOM FOR DIFFERENT SETTINGS

A Supplement to
BUILDING THINKING CLASSROOMS
IN MATHEMATICS



PETER LILJEDAHL

Illustrations by Laura Wheeler

CORWIN Mathematics

CORWIN Mathematics

PRACTICES FOR THINKING

asks

: visibly random groupings

on-permanent surfaces

assroom

keep thinking questions

y, standing, and verbally

ur understanding questions

ly less helpful

image *flow*

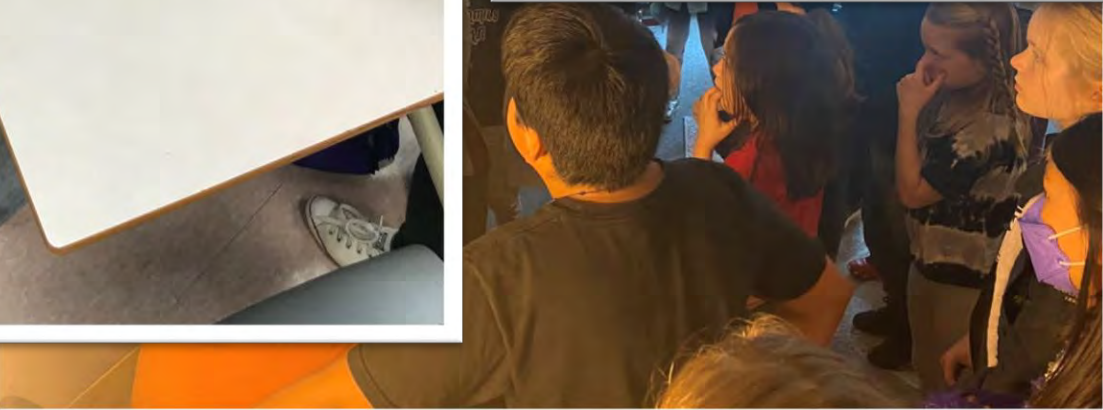
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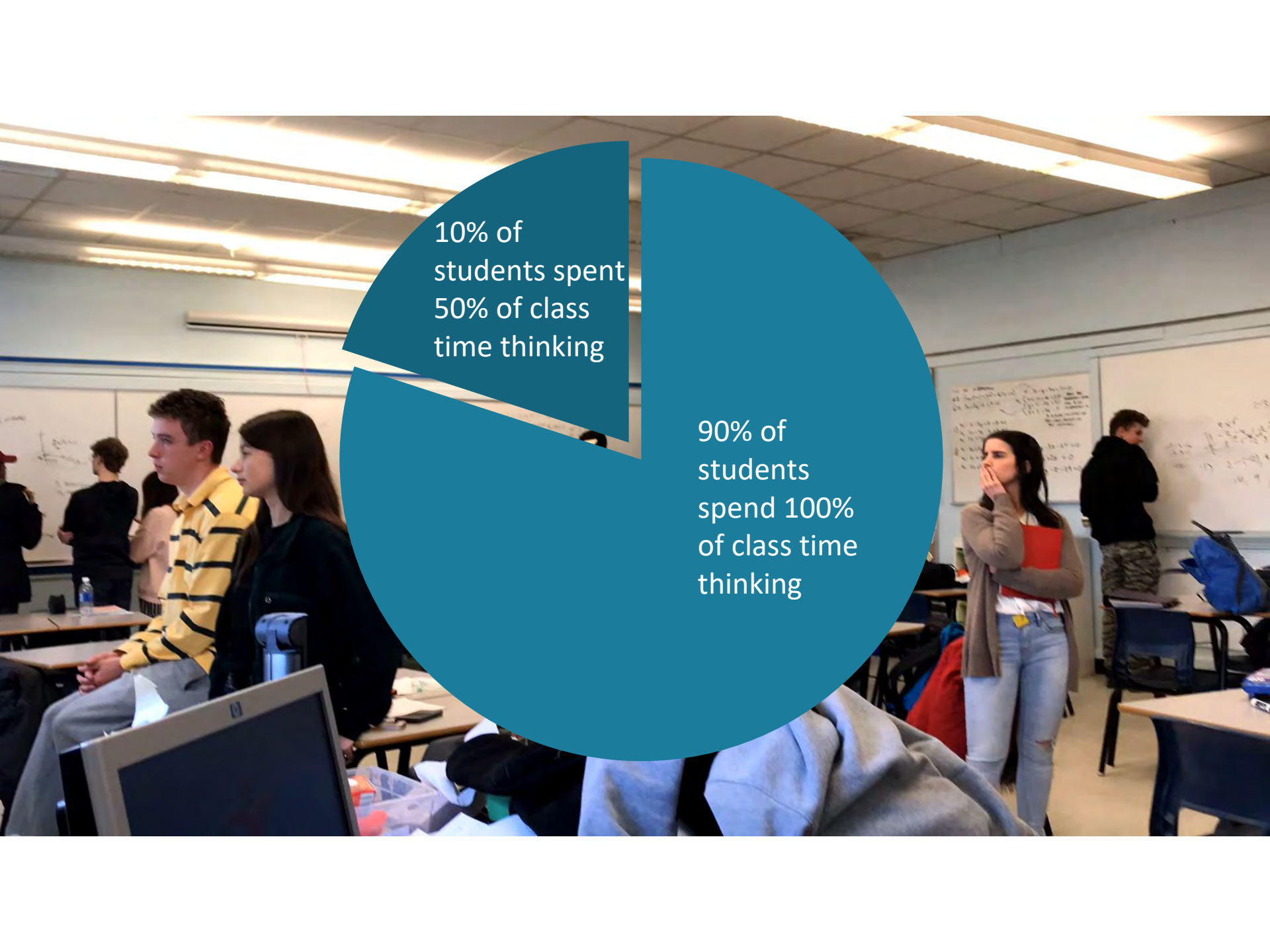
ul notes

you value

to students where they are and
e going

Report out based on data (not points)





10% of students spent 50% of class time thinking

90% of students spend 100% of class time thinking



THANK YOU!



@pgliljedahl | #thinkingclassroom



Building Thinking Classrooms



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<https://bit.ly/3qYGtDU>

