

Calculating School Capacity

for next generation learners

presented by:

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(finally!)

Association for Learning Environments

workshop agenda

1. Introductions

- who & why
- learning objectives

2. The Basics

- terminology
- variables
- example calculations

3. New Ideas for a New Generation

- adjusted variables
- new approaches
- examples

4. Story Time (Q/A)

- sharing ideas, questions, lessons learned

Introductions

- why we're here, why you're here



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Architects & Educators

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Collaborating with Clients around the world

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Award-winning schools



Why Calculate Capacity?

- to enroll the right number of students in a school facility

or conversely

- to plan a school facility that is the right size for its intended enrollment

- School construction funding
- Maximize educational resources
- Accommodate enrollments
- Overcrowding & underutilization
- Adjust Attendance Boundaries
- others?

1

Learning Objectives:

- to understand conventions and terminology used by local and state guidelines
- to see what it takes to plan a school facility that is the right size for its intended enrollment
- to see what characteristics of next generation learning are transforming how school capacities should be calculated

School Capacity Defined

- the number of learners that can be reasonably accommodated by a school, building, and site.
- **physical variables**
- **operational variables**
- **programmatic variables**



Capacity Variables

- **physical variables can include:**
 - building size/area
 - number/types of spaces for learning
 - support facilities (kitchen, lunchroom, restrooms, etc)
 - infrastructure (power, systems, security, etc.)
 - net vs gross areas
 - building & life-safety codes
 - site amenities (parking, drop-offs, bus area, play areas, etc.)



Capacity Variables

- **operational variables can include:**
 - utilization rates & efficiency
 - operational policies
 - staffing
 - funding structures
 - teacher/union regulations
 - space management
 - staff & operational budgets
 - specialty program offerings

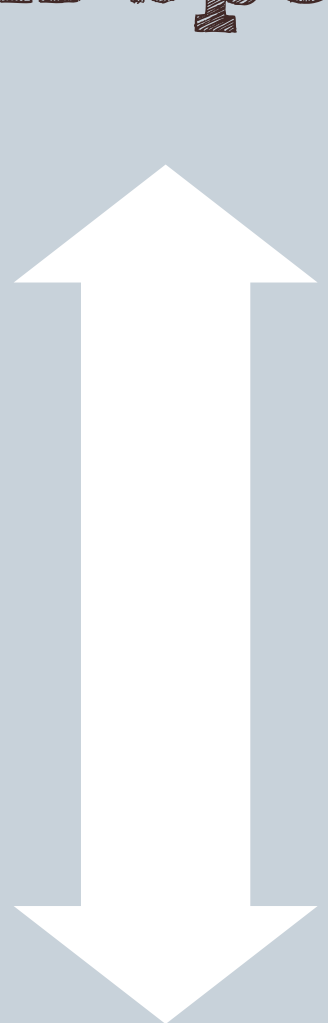


Capacity Variables

- **programmatic variables can include:**
 - class sizes & staff ratios
 - educational program offerings
 - operational models (teams, academies, etc.)
 - specialty programs
 - schedules
 - partnerships, off-site learning, etc.
 - extended use



A Spectrum of Definitions



- **Maximum Capacity**

The total number of student “seats” in the school facility.

- **Building Capacity**

Also considers the extent of support facilities.

- **Functional Capacity**

Also considers the desired level of schedule flexibility.

- **Program Capacity**

Also considers demographics, curriculum & program offerings.

- **Temporary Capacity**

Also considers temporary and make-shift facilities.

Example: Maximum Capacity

400

- considers
 - total student “seats”
 - largely hypothetical – difficult/impossible to operate in a traditional school setting

In this example:
25 students each
used **8 of 8** periods
= 100% utilization
= 400 students/day



25 students x 2 rooms = 50 students at a time
50 students x **8** periods = 400 students per day

Building Capacity

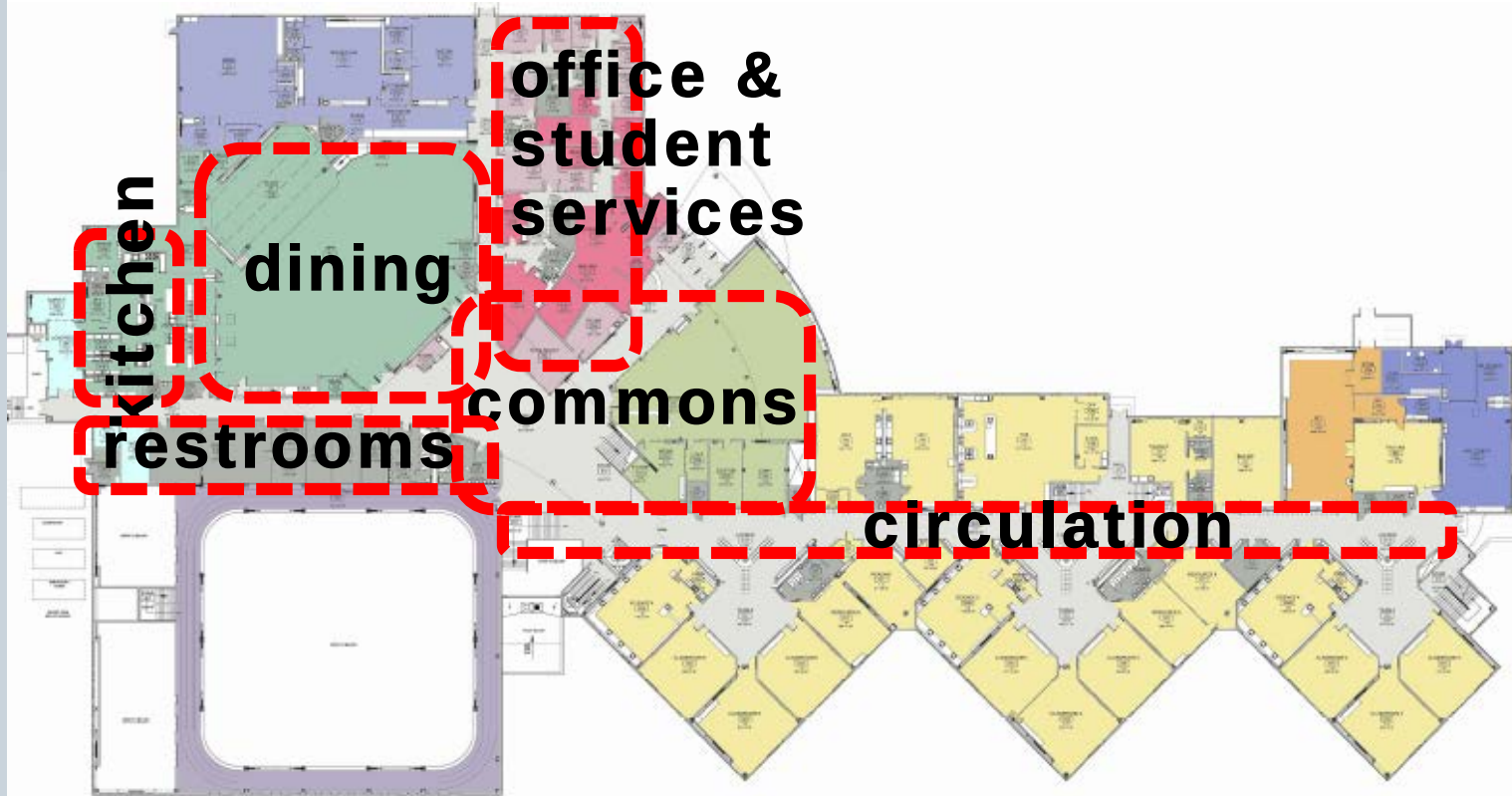
- considers
 - total student “seats”
 - support facilities

400

+/-350

such as:

systems
circulation
toilets
dining
commons
offices
etc...



Functional Capacity

- considers:
 - total student “seats”
 - support facilities
 - schedule flexibility

400

300



In this example:

25 students each
used **6 of 8** periods
= 75% utilization
= 300 students/day

25 students x 2 rooms = 50 students at a time
50 students x **6** periods = 300 students per day

Program Capacity

■ considers

- total student “seats”
- support facilities
- schedule flexibility
- student needs / demographics
- curriculum & program offerings

400

In this Example:

25 students regular

15 students small

used 6 of 8 periods

= 75% utilization

= 240 students/day

240



25 students x 1 room = 25 students at a time

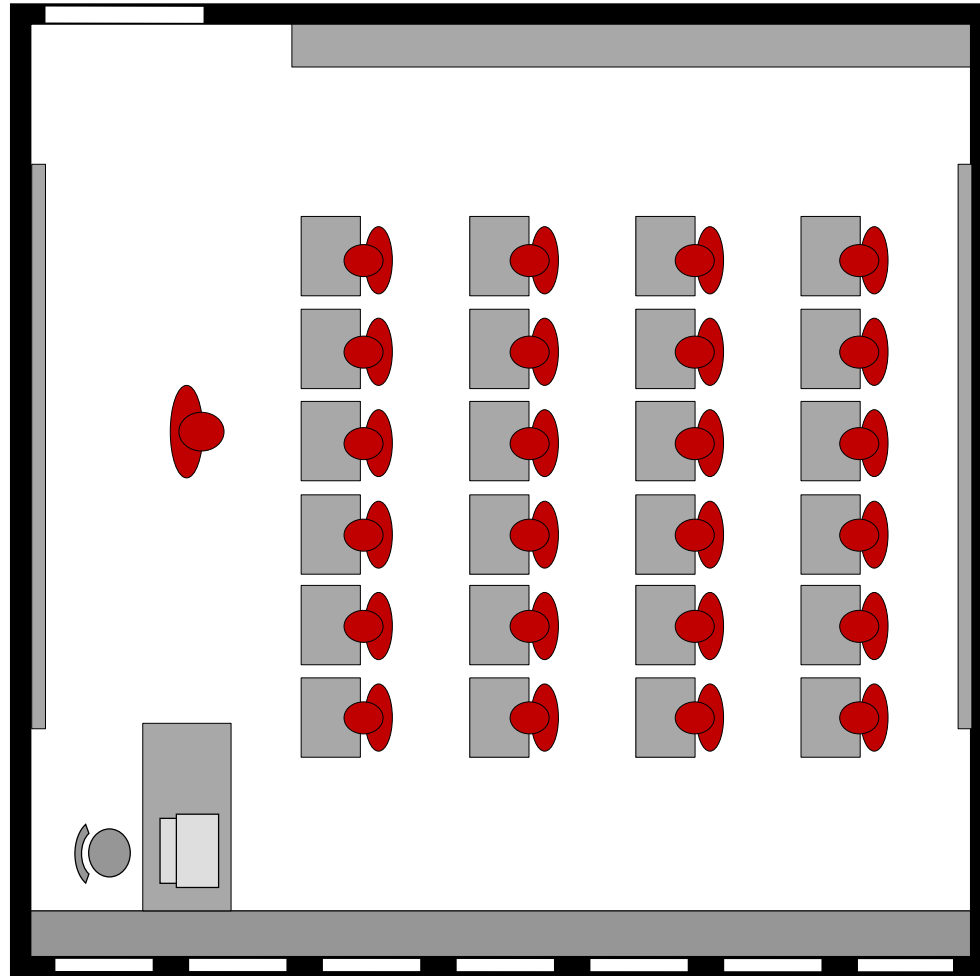
15 students x 1 room = 15 students at a time

40 students x **6** periods = 240 students per day

Room Capacity

Classroom Size VS Class Size

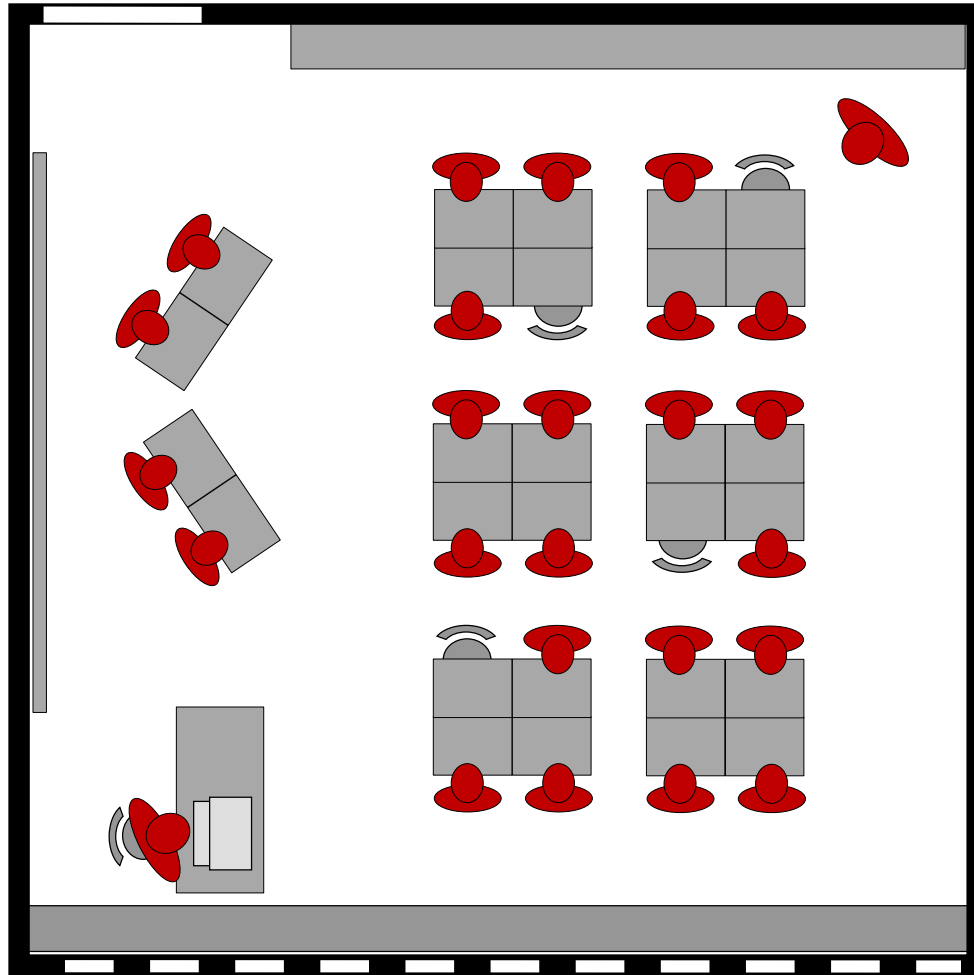
- number of students
- size of classroom
- furniture & equipment
- classroom activities
- desired flexibility



Room Capacity

Classroom Size VS Class Size

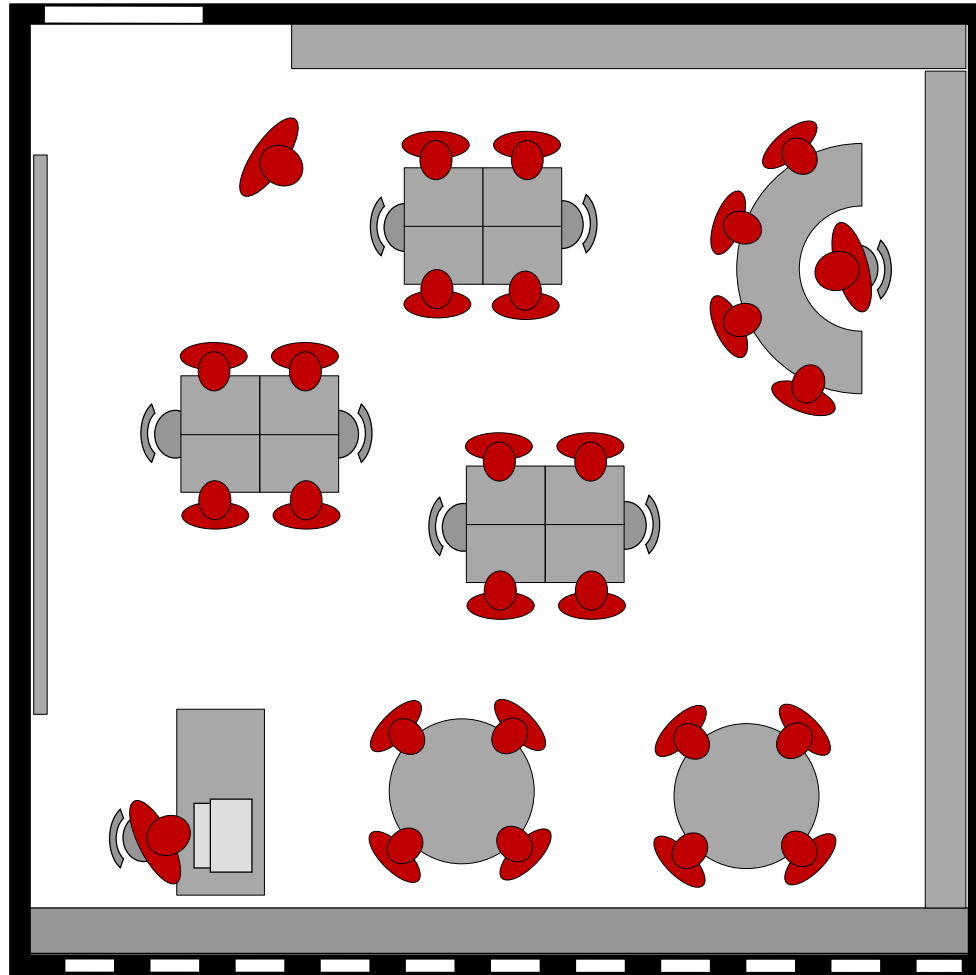
- number of students
- size of classroom
- furniture & equipment
- classroom activities
- desired flexibility



Room Capacity

Classroom Size VS Class Size

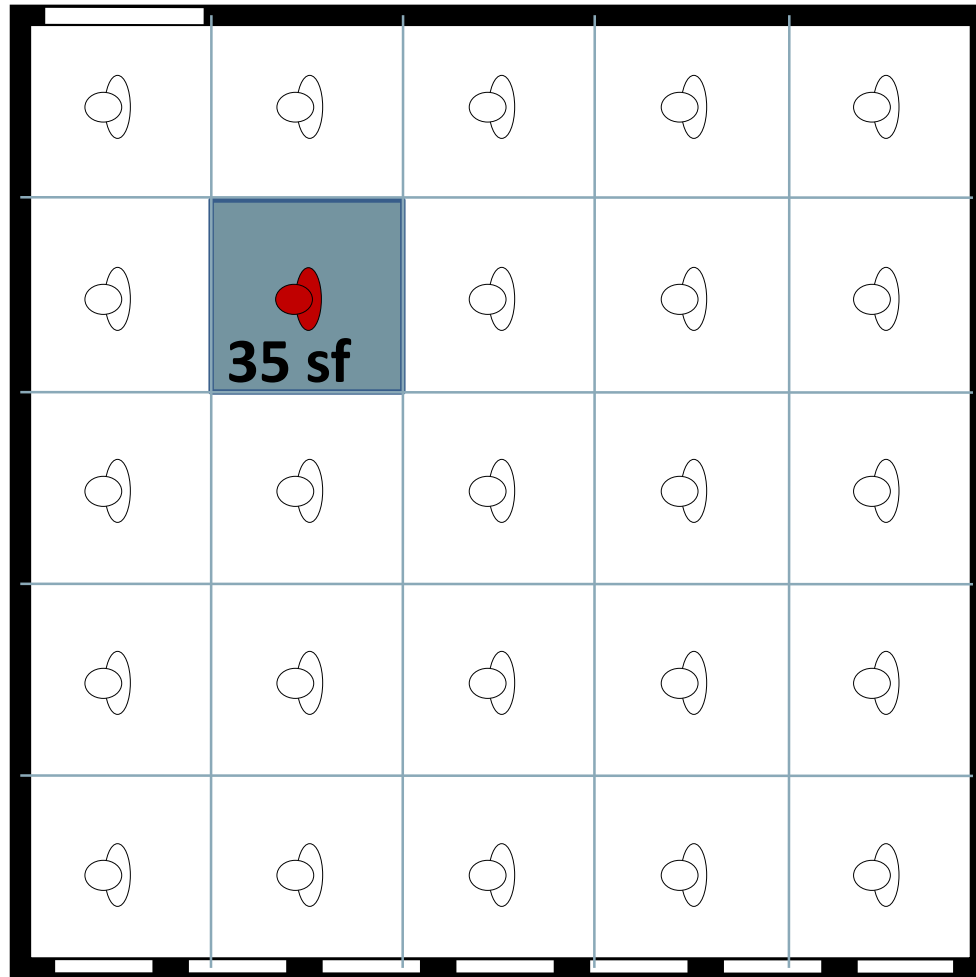
- number of students
- size of classroom
- furniture & equipment
- classroom activities
- desired flexibility



Room Capacity

Classroom VS Class Size

- number of students
- size of classroom
- furniture & equipment
- classroom activities
- desired flexibility



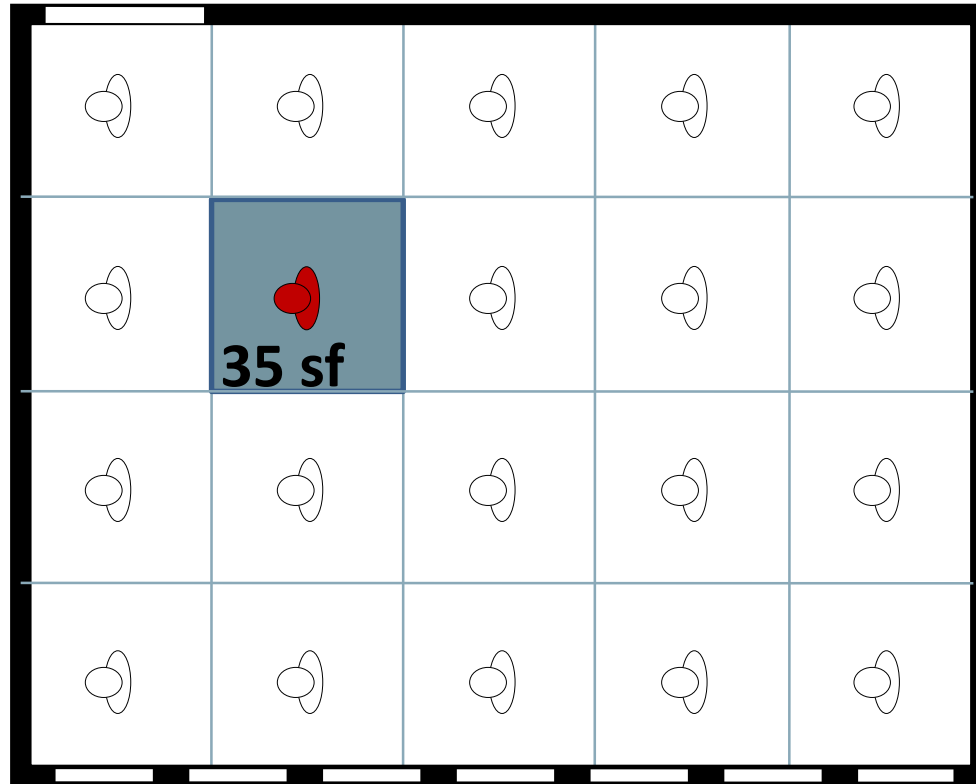
$$875 \text{ sf classroom} \div 35 \text{ sf} = 25 \text{ students}$$

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Room Capacity

Classroom VS Class Size

- number of students
- size of classroom
- furniture & equipment
- classroom activities
- desired flexibility

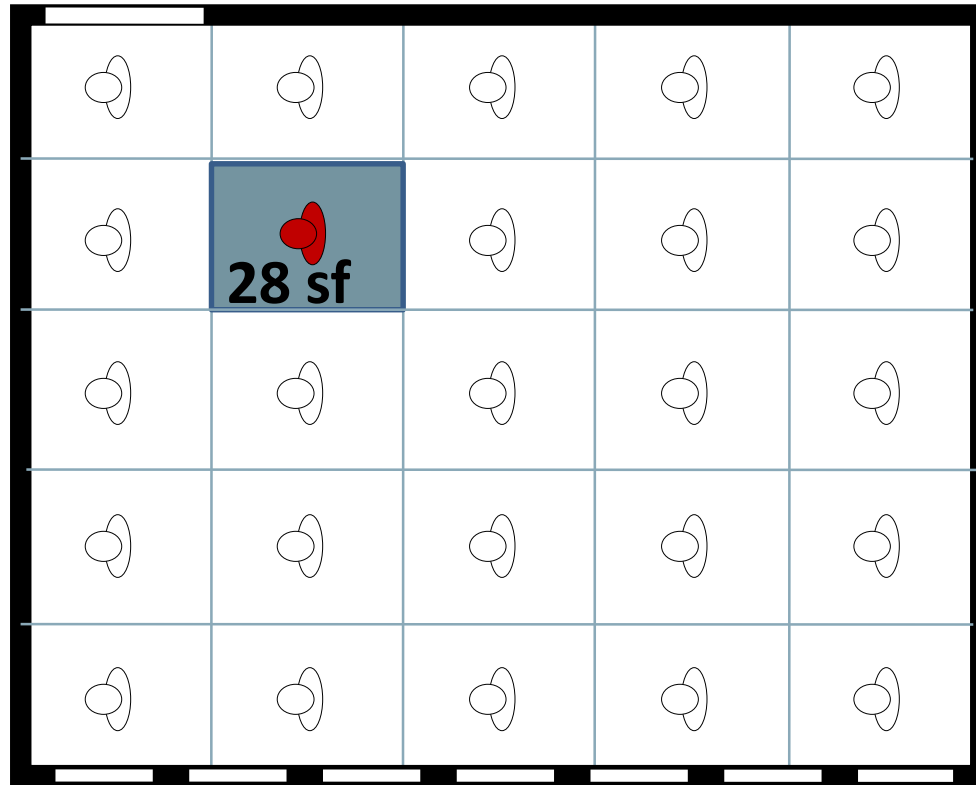


$$700 \text{ sf classroom} \div 35 \text{ sf} = 20 \text{ students}$$

Room Capacity

Classroom VS Class Size

- number of students
- size of classroom
- furniture & equipment
- classroom activities
- desired flexibility



$$700 \text{ sf classroom} \div 25 \text{ students} = 28 \text{ sf}$$

Utilization

1
student
1
seat
1
time

A) The educationally appropriate percentage of the school day that teaching stations can be used for instruction.

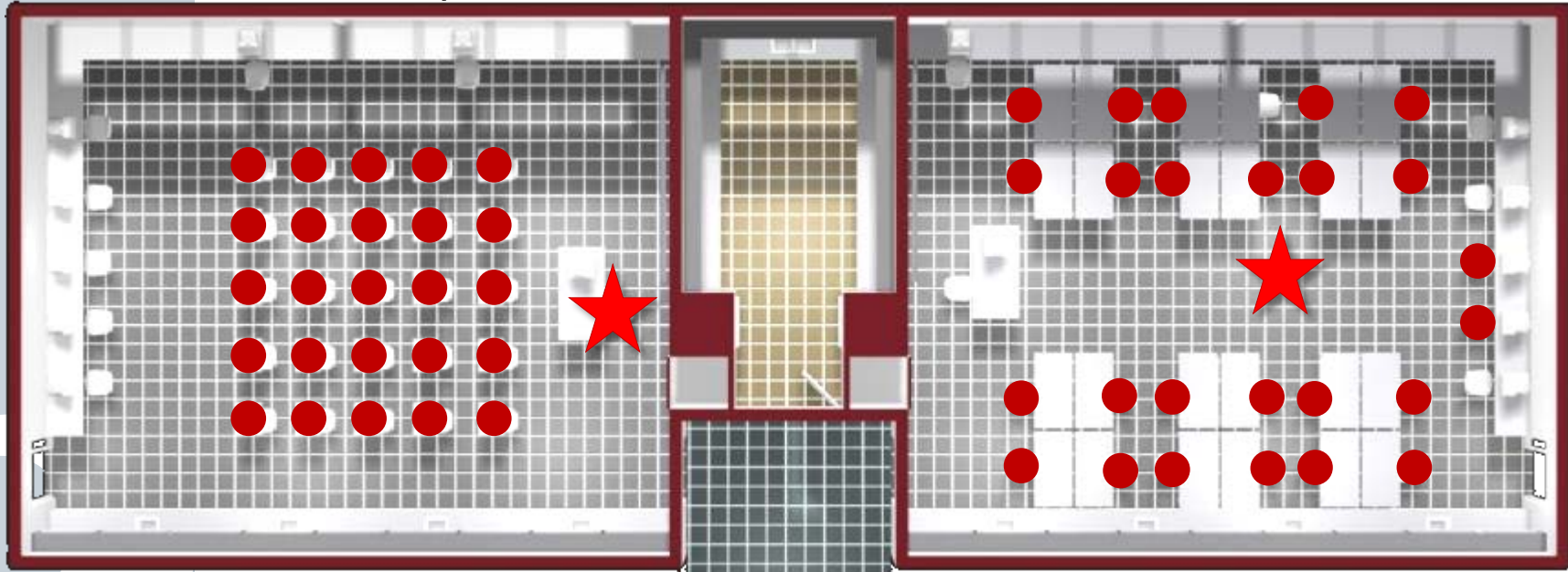
B) The ratio of unoccupied to occupied “seats” per teaching station per period.



Utilization: Seats

- class size & “seat” utilization

for example:



25:25 = 100%

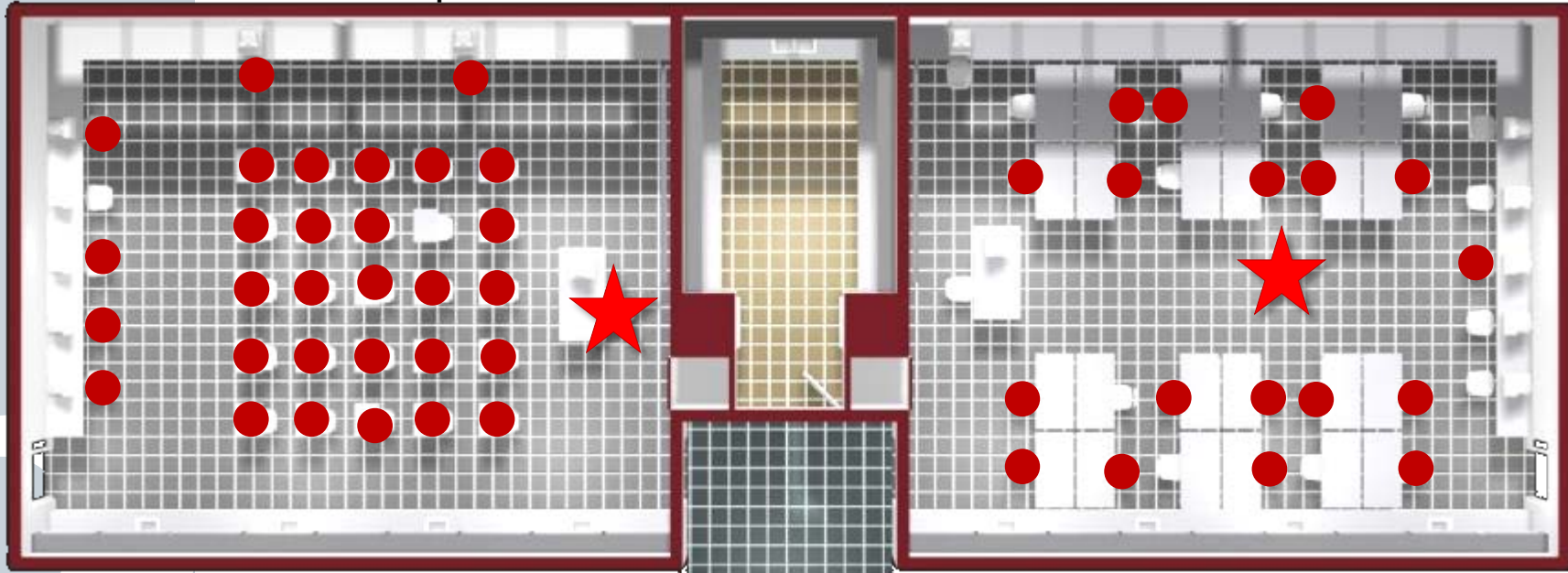
25:25 = 100%

note: the number of “seats” and the actual class size don’t often match

Utilization: Seats

- class size & “seat” utilization

for example:



$$30:25 = 120\%$$

$$18:25 = 75\%$$

note: the number of “seats” and the average class size don’t often match

calculations are rounded for clarity

Utilization: Time

■ Rules of Thumb

higher
utilization

usually
equals

tighter
scheduling

<u>School Type</u>	<u>avg. utilization</u>
Elementary	90-100%
Middle/Jr. High	65-85%
High	75-95%

Teaching Stations

- what counts in utilization calcs?

<u>School Type</u>	<u>what counts?</u>	
Elementary	classrooms	
Middle	classrooms science rooms gymnasium (x1)	art & music special education computer labs
High	classrooms science rooms art & music gyms (x2) vocational programs etc...	special education media center auditorium/stage computer labs pe fields (depending on climate)



Utilization: Time

Example: Middle vs Junior High Schools

Variables in this example:

- Class size
- Schedule
- Utilization

	Middle School	Junior High
Teaching Stations	40	40
Class Size	25	25
Periods/day	7	7
Teacher prep	1	1
Team Planning	1	0
Periods of Instruction	5	6
Utilization Rate	71%	86%
Student Capacity	712	860

difference = 148 students

Utilization: Time

■ Example: Middle vs Junior High Schools

Variables in this example:

- Class size
- Schedule
- Utilization

	Middle School	Junior High
Teaching Stations		
Class Size	25	25
Periods/day	7	7
Teacher prep	1	1
Team Planning	1	0
Periods of Instruction	5	6
Utilization Rate	71%	86%
Student Capacity		

Utilization

■ Example: Middle vs Junior High Schools

Variables in this example:

- Class size
- Schedule
- Utilization

	Middle School	Junior High
Student Capacity	800	800
Class Size	25	25
Periods/day	7	7
Teacher prep	1	1
Team Planning	1	0
Periods of Instruction	5	6
Utilization Rate	71%	86%
Teaching Stations	45	37

difference = 8 teaching stations

Teaching Stations

- average class size (number of learners)

School Type

class sizes:

Elementary

10-25

little variety

Middle

15-35

some variety

High

5-50

much variety



Teaching Stations

- average classroom size (traditional)

School Type

class sizes:

Elementary	800-1,200	little variety
Middle	400-900	some variety
High	200-2,000	much variety

space size basic considerations:

- 1) # learners, # adults**
- 2) intended activities**
- 3) equipment & furniture**

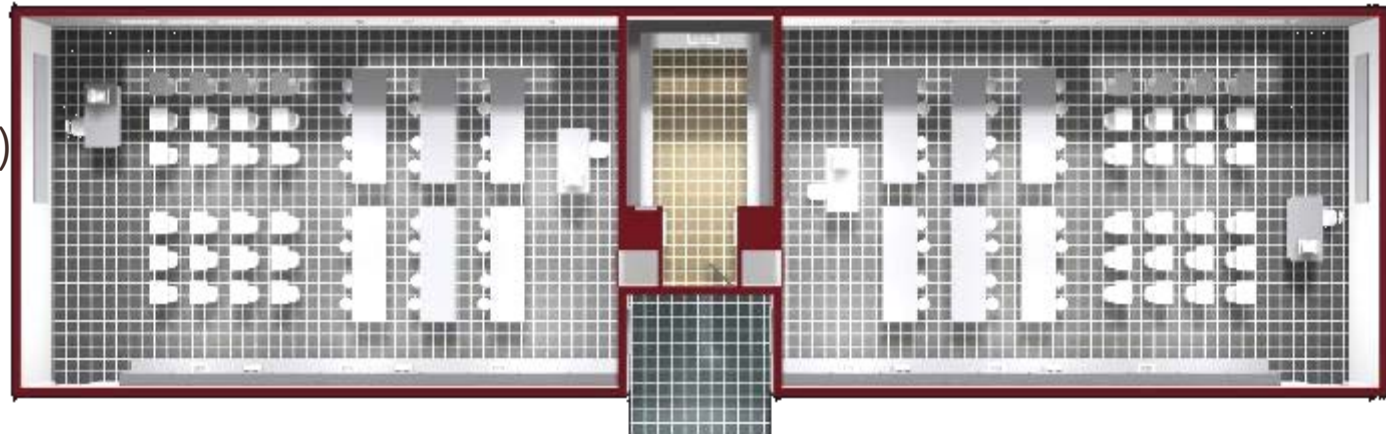


Example Calculations

- comparison of facilities for science

Case “A”

3,200sf (2 rooms + prep)
for 50 students
= 56 sf/student



size difference = 800sf or 16 sf/student

Case “B”

2,600sf (2 rooms + prep)
for 50 students
= 52 sf/student

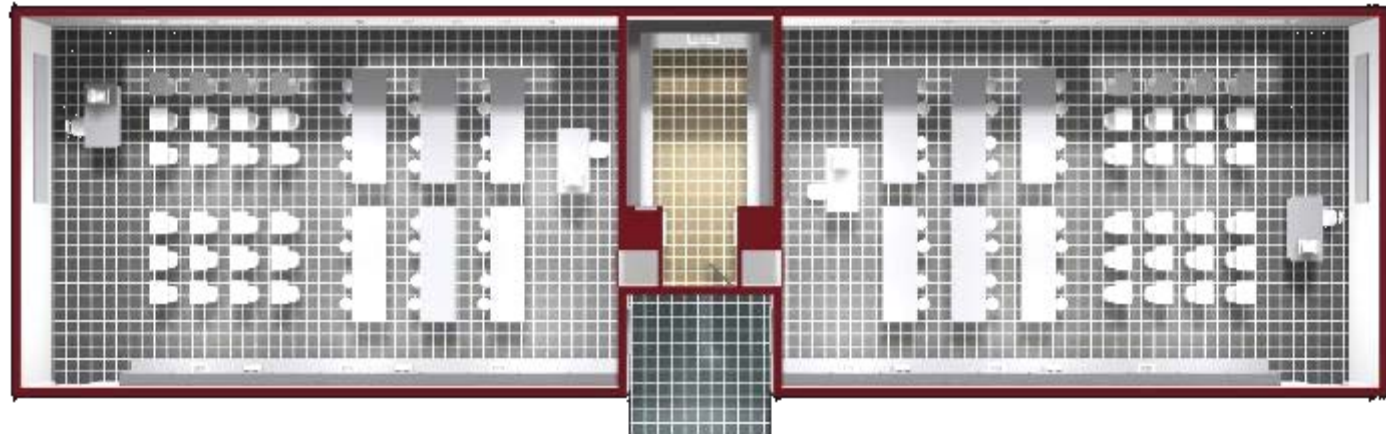


Example Calculations

- comparison of facilities for science

Case “A”

say 25 students each
used 6 of 8 periods
= 75% utilization
= 300 students/day



main difference = area (SqFt)

Case “B”

say 25 students each
used 6 of 8 periods
= 75% utilization
= 300 students/day



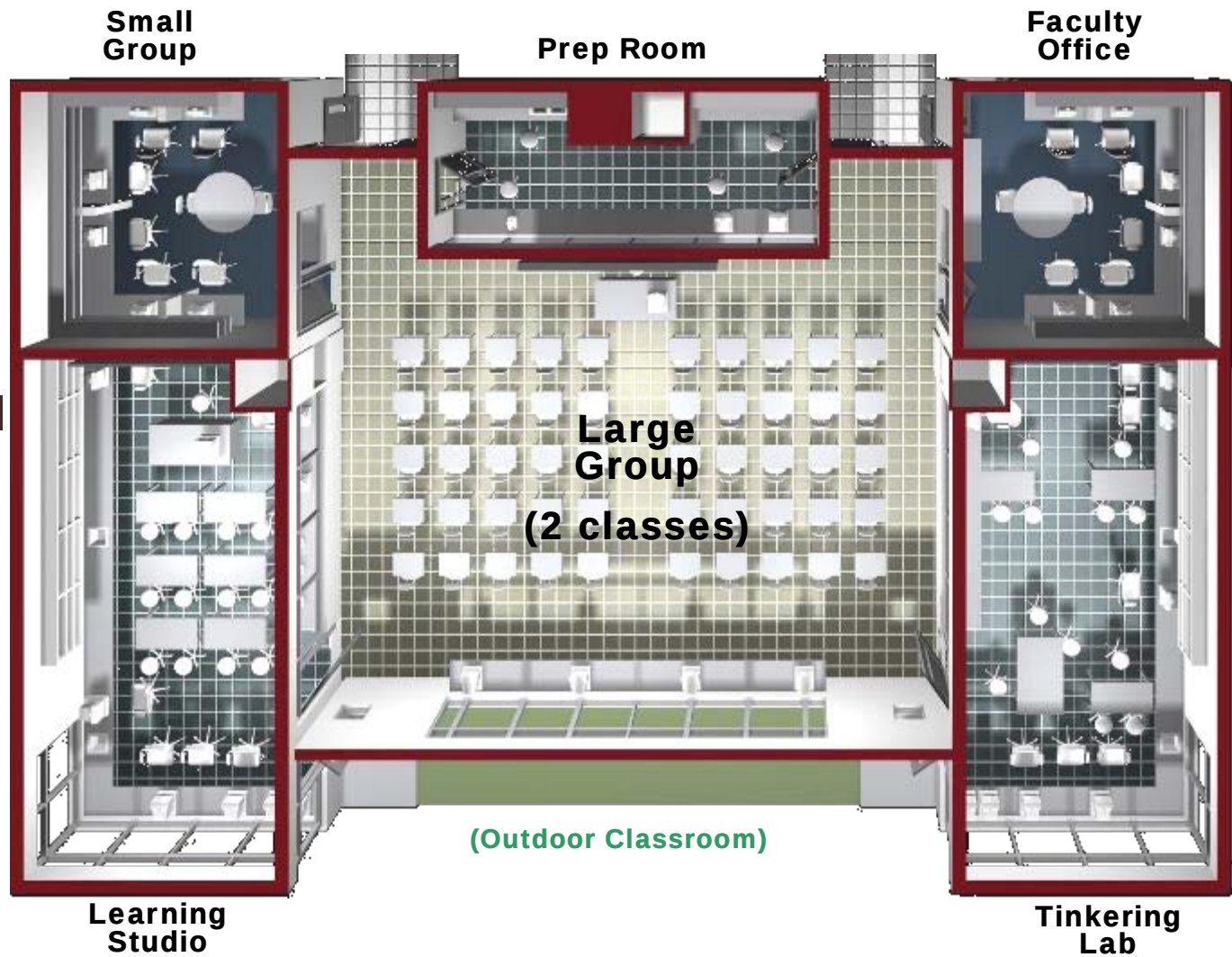
Example Calculations

- comparison of facilities for science

Case “C”

say 75 students total
used 8 of 8 periods
=100% utilization
= 600 students/day

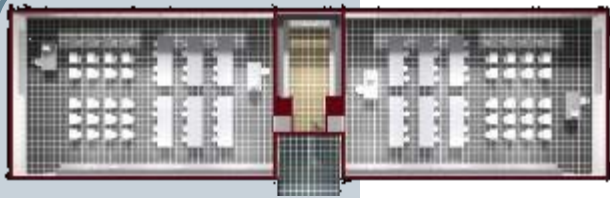
4,000 sf



Example Calculations

■ comparison of facilities for science

Traditional Facilities for Science & Commonly Used Capacity Calcs.



Case A:

200 Students

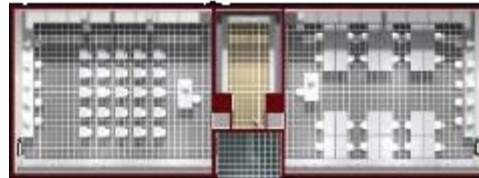
25 per Classroom

80% Utilization

Need 10 Classrooms

16,000 sf total

*(excluding teacher offices &
small group / resource rooms)*



Case B:

200 Students

25 per Classroom

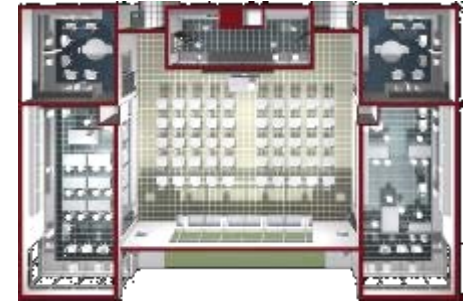
80% Utilization

Need 10 Classrooms

13,000 sf total

*(excluding teacher offices &
small group / resource rooms)*

Environments for a New Generation of Learners:



Case C:

200 Students

75 per Suite

100% Utilization

Need 3 Suites

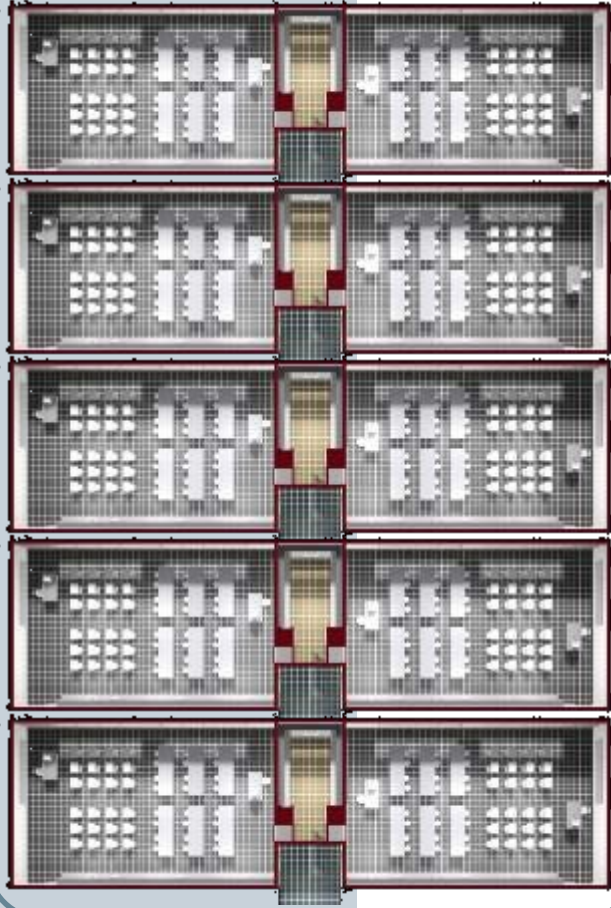
12,000 sf total

(all inclusive)

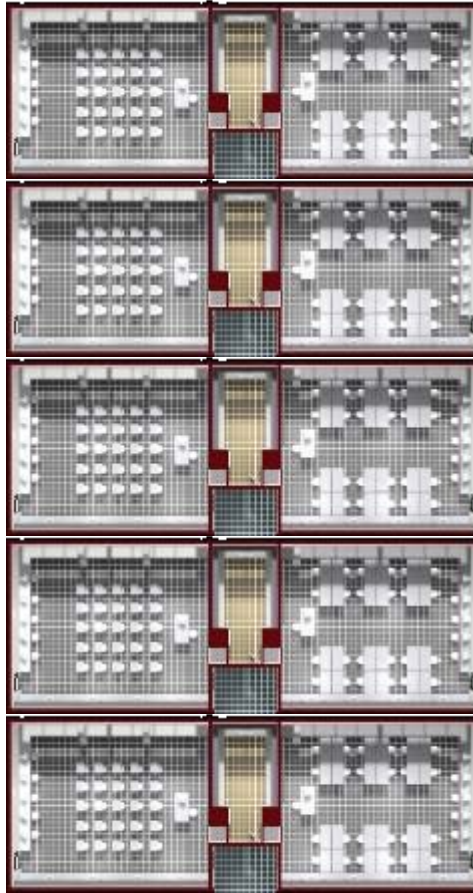
Example Calculations

■ comparison of square-footages

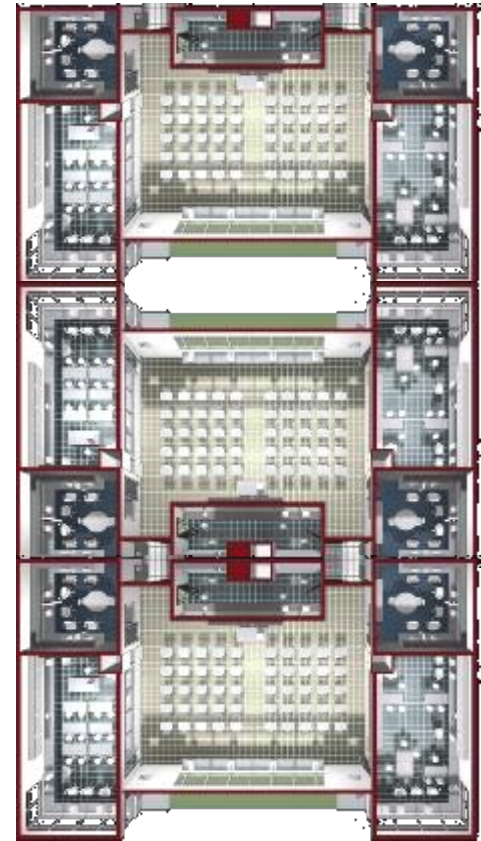
**Need 10 Classrooms
about 16,000 sf total**



**Need 10 Classrooms
about 13,000 sf total**



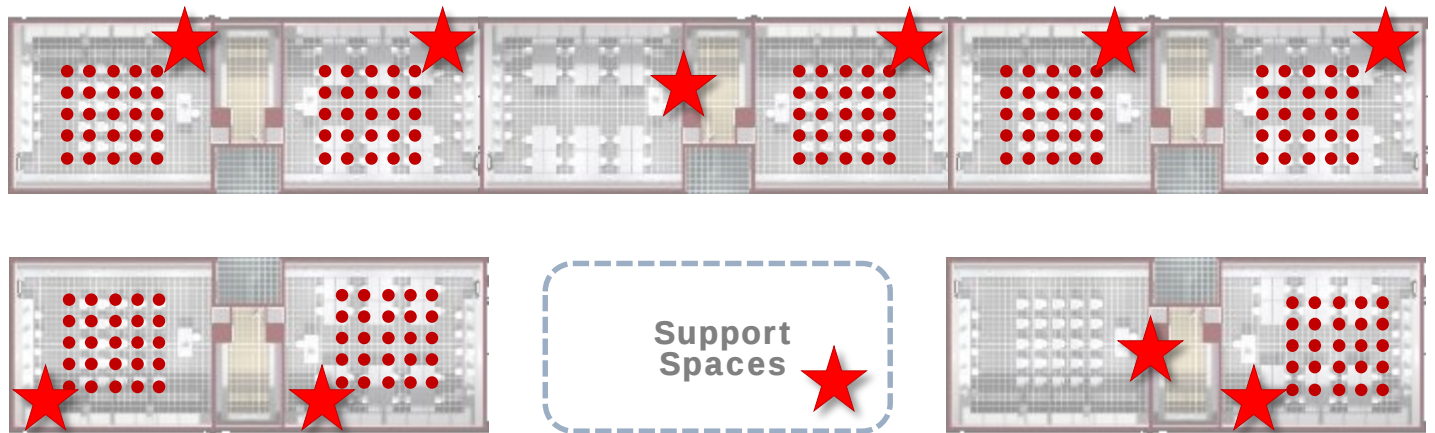
**Need 3 Suites
about 12,000 sf total**



Calculations: Traditional

200

Capacity, Teachers, & Utilization



$$200 \div 80\% = 250 \text{ "seats" needed}$$

$$250 \div 25 = 10 \text{ "classrooms" needed}$$

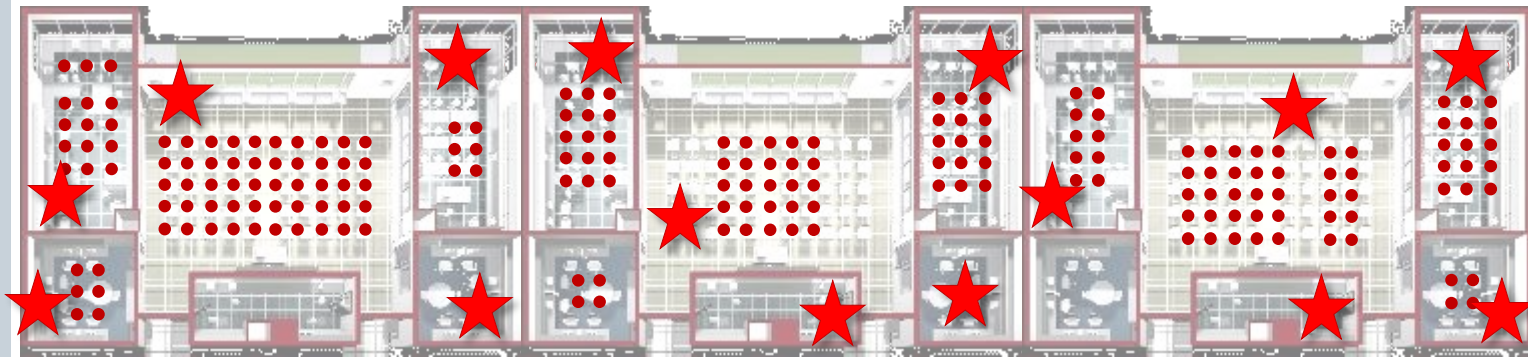
$$200 \div 25 = 8 \text{ classrooms in use per period}$$

$$8 \div .75 = 11 \text{ "teachers"}$$

Calculations: New

200

Capacity, Teachers, & Utilization



$200 @ 100\% = 200$ “seats” needed

$200 \div 5 \text{ to } 50 = \text{Variety}$ of spaces needed

Variety of Uses = Variety spaces used

Space for = 10-15 “teachers” ★

Analysis of Existing Use

- Understanding current practices so you can “defrag” use of existing facilities

RM#	Use	Traditional 8-Period Day								
		P1	P2	P3	P4	P5	P6	P7	P8	
111	English	25	23	common planning time	26	30	prep	19	25	0.97
177	English	30	24		24	28	18	prep	26	1.06
201	English/Drama	28	prep		21	28	30	28	28	0.83
211	English	prep	30		28	24	30	22	28	0.81
230	English	24	22		20	prep	23	24	30	0.77
241	English	prep	28		24	22	24	20	28	0.73
244	English	30	30		23	30	OPEN	25	prep	0.81
246	English/Resource	20	15		12	18	12	18	15	1.05
248	English/AP	23	21		prep	22	28	23	28	0.74
249	English	22	30		26	30	prep	27	30	0.81

National Trends

for the median school district in the US

square
feet
per
student

School Type	1970	1987	2006	2014	2015	2016
Elementary	70	90	120	149	188	135
Middle	70	111	146	173	173	180
High	120	153	163	174	180	182

Calculations

■ Gross Building Area – What Counts?



- lockers ?
- dining/kitchen facilities ?
- overhangs & canopies ?
- vertical circulation ?
- toilet facilities (specific to program)?
- exterior walls - to inside or outside face of wall ?



How Principals Add Capacity

■ Public High School Principals Report

More than half of the principals reported that their school had fewer students than the school's design capacity, yet they were overcrowded.

Those schools that principals described as overcrowded used a variety of approaches to deal with the overcrowding:

- using portable classrooms (78%)
- converting non-classroom space into classrooms (53%)
- increasing class sizes (44%)
- building new buildings or additions (35%)
- using off-site instructional facilities (5%)
- or other approaches (12%).

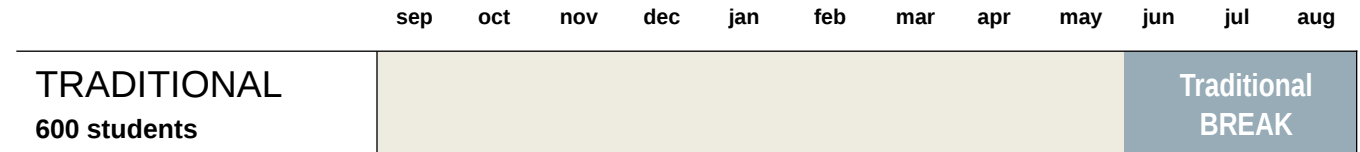
Strategies for Increasing Capacity

- Scheduling (daily & annual)
 - Space Utilization
 - Multiple-Use Facilities
 - Off-Site & Joint-Use Facilities
 - Reassignment of spaces
- Blended, On-line & Virtual Learning
others?



Strategies for Increasing Capacity

Calendar & Schedule



Does Not Add Capacity



Adds Capacity

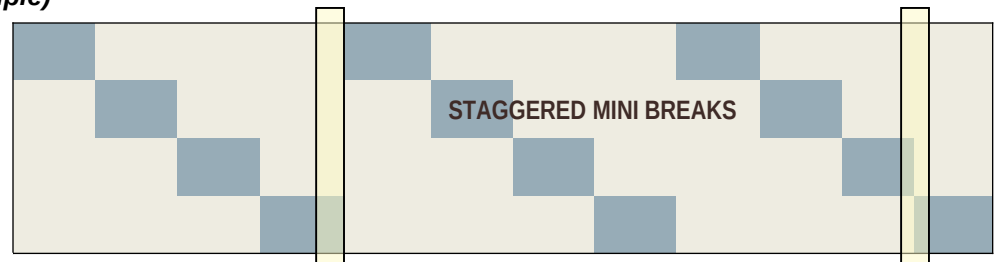
MULTI-TRACK (example)

Track A – 200 students

Track B – 200 students

Track C – 200 students

Track D – 200 students



Assumptions for this example:

1) school buildings can accommodate 600 students at one time, 2) school facilities can support full-capacity increases, 3) a 60/20 calendar is used, 4) multi-track schedules include common winter and summer mini-breaks.

Strategies for Increasing Capacity

■ Multiple-Use Facilities

Example:
a cafeteria
space that
can be
transforme
d into a
theater



© Ken GrahamPhotography.com

Strategies for Increasing Capacity

■ Multiple-Use Facilities

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a cafeteria
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South Anchorage High School: Perkins+Will and ECI Hyer

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Strategies for Increasing Capacity

■ Multiple-Use Facilities

Example:
a dining
space that
serves as
classroom
break-out
spaces
during the
rest of the
day



Strategies for Increasing Capacity

- Joint Use or Off-Site Facilities



Example:
using
community
facilities as
learning
environ-
ments



SAMI, iDEA and SOTA, Tacoma Public Schools

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Strategies for Increasing Capacity

- Joint Use or Off-Site Facilities



SAMI, iDEA and SOTA, Tacoma Public Schools

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Strategies for Increasing Capacity

■ Off-Site & Blended Learning

Example:
a school
that has
enough
“seats” for
roughly
half of the
students
enrolled –
the other
half of its
students
learn off
campus



Strategies for Increasing Capacity

■ Multi-Use Spaces

Example:
a school
lobby area
that can be
used as a
mini-
theater or
large group
instruction



Strategies for Increasing Capacity

■ Reassignment of Spaces



Example:

existing spaces used for a variety of activities and groupings – lead to design of new facilities that recognize needs for space other than “classrooms” (see next slide)

Existing Alternative School, Central Kitsap SD

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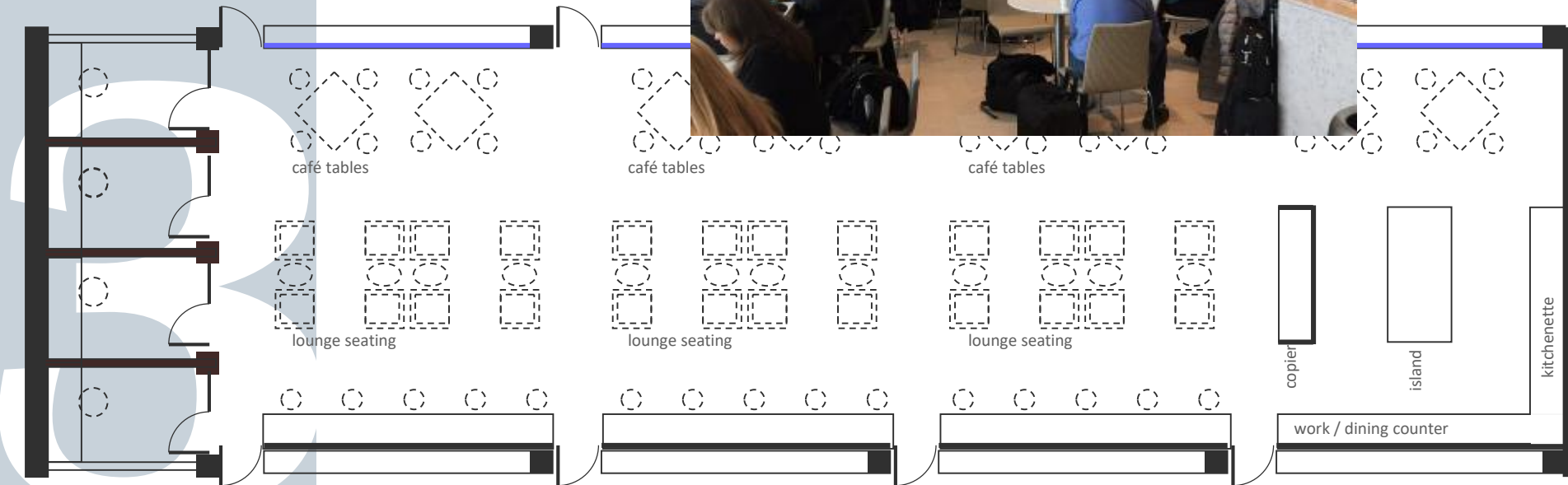
Reassignment of Spaces



Strategies for Increasing Capacity

■ Faculty/Staff Support

Example:
a “think-tank” for teachers
to use while planning and
prep – might be modeled
after a frequent flier
lounge (without the bar!)



Strategies for Increasing Capacity

■ Faculty



Strategies for Increasing Capacity

■ Alternative Settings

Example:
a large
stairway that
also serves
as a
presentation
/ lecture hall
and
gathering
space



Strategies for Increasing Capacity

■ Alternative Settings: Roof Plaza



Example:
a library that
extends its
reading room out
onto the adjacent
(green) roof



Strategies for Increasing Capacity

Alternative Settings: Roof Plaza

Example:
a library
that extends
its reading
room out
onto the
adjacent
(green) roof



Lincoln Middle School ---- STR Partners + BrainSpaces

Strategies for Increasing Capacity

■ Alternative Settings

Example:
an outdoor
space that
can be used
for school
and
community
events,
movies, and
presentations



Strategies for Increasing Capacity

- Technology / Virtual Reality Settings



Example:
students
experiencing
virtual
environments

Recommendations

general

For national, state & local guidelines

Country: ■ Use Net Building Area

State: ■ Consider State-wide specifics

District: ■ Include District-wide practices

School: ■ Account for Specific Programs

specific

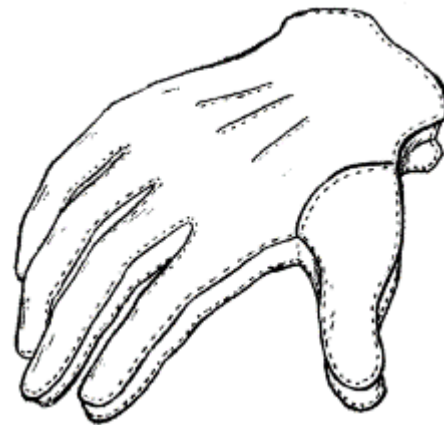
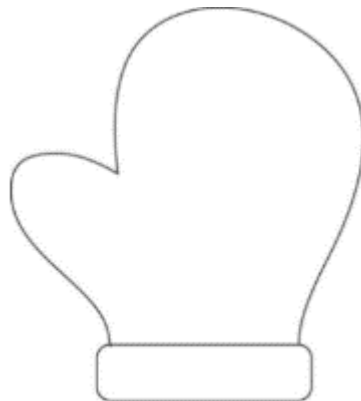
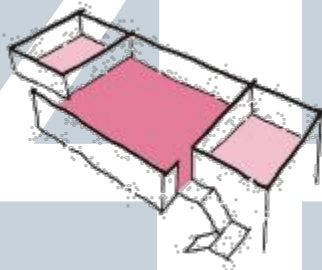
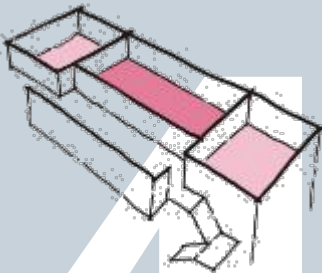
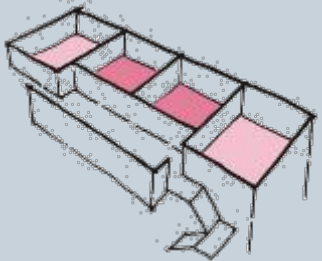
Recommendations

For national, state & local guidelines

and
always:

■ Plan for the Future

- “Flex” spaces that can support programs not yet defined
- Divide spaces in ways that may be easily changed
- Nurture community relationships where learning can extend beyond the school walls and bell schedule.
- Be prepared to use technology to not only enhance teaching and learning, but to also redefine “where” they take place.



Calculating School Capacity

for next generation learners

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**how will you redefine
learner capacity in
your schools?**

Association for Learning Environments