CLASSROOM RENOVATION STANDARDS

This document will define classroom planning and design standards and processes for renovations of our existing classroom stock. These recommendations may also be used as a guideline for new classroom design.

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PLANNING & DESIGN PROCESSES

GUIDING PRINCIPLES

These Principles for the Design of Learning Spaces have been established by Dartmouth to ensure that all standards for learning space design are created with student-centered learning at their core. They were developed based on the National Survey for Student Engagement (NSSE), grounded in extensive educational research. The NSSE indicators and practices list five principles to be considered when designing or renovating learning spaces:

1. **Campus climate and culture**
    - Learning spaces should be consistent with the college's culture and priorities as reflected in the campus master plan, follow college design standards, and be designed with future flexibility in mind.
2. **High-Impact Practices (HIPs)**
    - Learning spaces exist within a larger campus context; there should be an ease of transition between spaces so as to better support high-impact practices inside and outside the classroom.
3. **Academic challenges**
    - Learning spaces should allow students to actively engage with content and include a range of technologies that support multiple modes of teaching and learning.
4. **Learning with peers**
    - Learning spaces should provide features that permit students to work both individually and in collaboration with one another.
5. **Interactions with Instructors**
    - Learning spaces should facilitate communication and interaction between students and faculty.

Standards grounded in these principles will indicate how to apply them in the design of different room types such as seminar rooms, auditoriums, and active learning classrooms.

These principles can be translated into specific design standards to ensure that Dartmouth's learning spaces become a physical manifestation of our teaching and learning vision.

Appendix 1: Reference Dartmouth Guiding Principles Matrix

RENOVATING AN EXISTING CLASSROOM OR PLANNING A NEW CLASSROOM

OVERVIEW

Preparing for a new classroom or a major renovation of an existing classroom is a collaborative process and enables the college to provide high-quality, state-of-the-art teaching and learning spaces for students, faculty,

and instructors. In planning for this type of space, there are many key details to consider that will affect the overall use of the space long after the space is constructed, including location, layout, furniture, technology and more.

This document is designed to:

- Provide over-arching principles and considerations to assist in classroom planning and design.
- Ensure that new classrooms meet the needs of the institution.
- Share best practices (and a few lessons learned) from recently constructed classrooms on the Dartmouth campus.

This document applies to general purpose classrooms (room type 110) only, such as traditional classrooms, lecture halls and auditoriums, and seminar rooms. It does not apply to computer labs or highly specialized class labs.

GUIDELINES FOR PLANNING & DESIGN

High-quality instructional space supports the college's core academic mission and ensures that, as an institution, Dartmouth is providing faculty and students with the proper resources to meet continually changing teaching and learning needs. When designing classrooms spaces for the future the following guiding principles should be considered.

All college classrooms should:

- Enrich the student's learning experience and faculty/instructor teaching experience.
- Have room layouts, furniture, and equipment that satisfy current and future pedagogical needs of the majority of the faculty and not inhibit use of the classroom for instruction by other departments.
- Provide a flexible configuration, when feasible, to enable students and instructors to change room layout to meet individual class needs.
- Be placed in building locations that are easy to locate and in close proximity to formal or informal gathering spaces to promote student and faculty interaction.
- Be located adjacent to one another when multiple classrooms are being planned, if possible. Co-location of classrooms creates a sense of vibrancy and community, allows for easier maintenance and access to the spaces, and provides more flexibility in the future when the space may need to be renovated or reconfigured.
- Be available for use by other campus departments when not scheduled for classes.
- Comply with all applicable accessibility, building and fire safety regulations, and master design specifications and guidelines.

Appendix 1: Reference Dartmouth Guiding Principles Matrix

COMMON CLASSROOM CONFIGURATIONS

There are a wide variety of classrooms sizes, layouts, and furniture types. The following section outlines the most common types of general purpose classrooms at Dartmouth and other institutions.

- Lecture Hall or Auditorium [large and extra-large]
- Discussion and Lecture Classroom [medium and large]
- Seminar Classroom [small and medium]
- Active Learning Classroom (flexible teaching and learning space)

Room size	Number	Type	Comments
XL [over 100 seats]	11	Auditorium [12.5 sqft/seat]	Typically tiered with fixed seating
L [<=100; >=59]	8	Lecture hall [20 sqft/seat]	Tiered or flat with static seating
M [<=59; >=24]	37	Classroom [19 sqft/seat]	Flat with static seating
S [<=24]	21	Seminar room [23 sqft/seat]	Flat with static seating
F [<=59; >=24]		Flexible space	Flat with mobile furniture; multiple presentation walls

TYPOLOGIES - BASED ON TEACHING STYLES AND SIZES

At Dartmouth we are categorizing our learning spaces sizes as XL, L, M, and S.

Our current inventory includes 81 Registrar-managed classrooms across campus in 20 buildings whose ages vary from 100 years to 1 year old.

These rooms should be designed to fit people's needs - those of the learners, the teachers, and in some cases should flex for other purposes as well.

Definitions:

- Extra Large
    - over 100 seats
    - auditorium
    - 12.5 sqft/seat
    - inventory: 11
    - activities:
        - lecture
        - presentation
        - events
- Large
    - between 59-100 seats
    - lecture style
    - 20 sq ft/seat
    - inventory: 8
    - activities:

    - lecture
    - events

- Medium
    - between 25-59 seats
    - lecture style or group learning
    - 19 sq ft/seat
    - inventory: 37
    - activities:
        - lecture
        - group work
- Small
    - up to 24 seats
    - typically seminar spaces
    - 23 sq ft/seat
    - inventory: 19
    - activities:
        - seminar
        - group work
- Active Learning or Flexible Teaching Space
    - Vary in size.
    - Ideal sizes allow for groups of 5 in classes of 50, 75, and 100 students
    - Inventory:
        - 50 seats: Fairchild 101, Steele 07
        - 75 seats: future Silsby 28 renovation
        - 100 seats: LSC 200 and future Silsby 28 renovation [possibly]

LECTURE HALL OR AUDITORIUM

Lecture halls are designed to accommodate classes of 85 or more in traditional auditorium-like setting. The instructor is positioned at front of the room with all seats facing in this general direction.

Seating Capacity	85+
Furniture Options	• Fixed strip tables and moveable chairs • Fixed strip tables and attached swing-arm chairs Fixed auditorium seats with retractable tablet arm • Fixed table with jury-based seating (swivel chair on fixed base)
Assignable Sq. Feet Per Person (recommended)	20 to 25 asf

Floor Type	Tiered
Considerations	• Large lecture halls generally only allow for one-way instruction (instructor lectures to students). Technological advancements, such as interactive polling devices, can help to connect the audience to the instructor. • Breaking into smaller groups is difficult because of fixed furniture. • If designing a lecture hall with tables, consider placing two rows of tables per tier to allow students to turn their chairs around and gather in groups fordiscussion. • A stage-like platform at front of room might be desired to provide more versatility to the space. If stage-like platforms are needed, consider design of platforms such that they can be removed and stored to increase flexibility of space. • Tablet arm chairs and jury-based chairs at strip tables may not be adequate to accommodate all sizes of people comfortably. Alternative accommodations should be provided. • Consider having two locations or moveable podiums for increased flexibility. • If installing fixed seating in a lecture hall, stagger seats from row-to-row to allow for better sightlines. • Because of high ceilings that are typical in lecture halls, special attention is needed when planning lighting (and lighting strength) and sound distribution. • Acoustical treatments are required to reduce sound reverberations and echoes.

DISCUSSION AND LECTURE CLASSROOM

Discussion or lecture classrooms are the most common type of room on campus, offering greatest amount of flexibility in furniture choices and layouts.

Seating Capacity	15 to 99
Furniture Options	• Moveable tablet armchairs • Moveable tables and moveable chairs • Fixed tables and moveable chairs
Assignable Sq. Feet Per Person (recommended)	• 20-25 asf for smaller tablet • 25-30 asf for larger tablet or tables & chairs (fixed or moveable)
Floor Type	• Flat preferred for maximum flexibility • Tiered when space is constrained and capacity is critical

Considerations	**Moveable Tablet Chairs**
	
	• Allows for highest number of seats compared to other furniture styles in the same room.
	• Allows for easy transition between lecture and smaller group discussion.
	• Newer tablet designs offer more mobility (on casters/wheels), as well as larger seats and writing surfaces, allowing for use of personal computers.
	• Rooms with flexible furniture are difficult to keep in a specific arrangement, which may require time to reset the rooms to a preferred configuration (applies to style below, too).
	• Fixed tables are better suited for larger capacity classrooms, since resetting moveable furniture in these rooms would be very difficult to do from class to class.
	• Breaking into small groups can be more difficult because of lack of ability to shift tables.
	• Tables bolted to the floor or powered/wired tend to only be changed in a significant renovation.
	• Tables can be configured into a number of room styles: rows, boardroom style, and seminar-style table.
	• Room dimensions should provide breathing room to allow for easy rearrangement of tables. Small rooms or rooms without enough space to make moving practical will generally stay in the same configuration, even if moveable tables are present.
	• New table designs offer a wide variety of shapes and sizes, such as individual student desks/tables that can be combined into circular or semi-circular tables.
	• Tables cannot be wired for power because of the desire to move tables. Power can be provided in floor outlets, if required.
	• Tables can be on casters/wheels to make moving more manageable:
	  ○ Flip-top tables can be nested, wheeled away, and stored, requiring less lifting.
	  ○ May require additional user training to understand locking mechanisms.
	  ○ Can be noisy and may move around too easily on hard floor surfaces. They are therefore better suited for carpeted floors.
	
	Fixed Tables and Moveable Chairs
	
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SEMINAR CLASSROOM

Seminar rooms are smaller rooms that are purposely designed to promote small group discussions around a common table. The instructor is typically seated at the table with students.

Seating Capacity	Up to 24
Furniture Options	Single conference style table and moveable chairs Moveable tables and moveable chairs
Assignable Sq. Feet Per Person (recommended)	25 to 40 asf
Floor Type	Flat
Considerations	• A common table promotes central focus and purpose in room, making active participation and discussion more natural. • A large unifying table constrains ability to break into smaller groups. • Chairs with casters and the ability to swivel are recommended to allow students to shift viewing orientation easily. • Room might require multiple projectors or screens, particularly in larger rooms, to provide easy viewing for all students.

ACTIVE LEARNING CLASSROOM (FLEXIBLE TEACHING SPACE OR LEARNING LAB)

The active learning classroom is a variation of the discussion or lecture classroom but is designed to allow for mix between lecture and small group work/discussion at tables. The room often does not typically have a front and may contain multiple projectors or digital displays on various walls, being controlled by both the instructor and students. The room layout places emphasis on a multi-focal learning and teaching style, with a mix of small group discussion, reporting out, and lecture. Multiple writing surfaces enable group work to be shared and active postures to be used.

Seating Capacity	30 to 100

Furniture Options	Moveable tables and chairs Fixed tables and moveable chairs
Assignable Sq. Feet Per Person (recommended)	25 to 40 asf
Floor Type	Flat or Tiered
Considerations	• Since the layout varies from the more traditional classroom styles, the curriculum needs to be planned and matched to the room style. Instructors willing to experiment with teaching and learning styles should be sought out for such rooms. • If equipped with multiple projectors or digital displays, technology controls can often be more complex than in a traditional classroom of the same size. Additional training and support may be required for both students and instructors.

GETTING STARTED ON A CLASSROOM PROJECT

WHILE EACH CLASSROOM RENOVATION/CONSTRUCTION PROJECT IS UNIQUE, THERE ARE SOME CONSIDERATIONS THAT SHOULD BE DISCUSSED AND PLANNED EARLY ON IN THE PROCESS.

PROVOST'S OFFICE ROLE AND APPROVAL

Classrooms are a critical institutional resource needed to meet the academic mission, and therefore, must be planned for thoughtfully and strategically. Adding or removing a classroom in any area of campus impacts not only the department that manages the space, but also the Registrar's Office and nearby departments relying on these classrooms. As a result, all major changes to classrooms must be approved by the Provost's Office. Communication to the Provost can occur through the Classroom Committee which meets once a term, sponsored by the director of DCAL.

Through the Classroom Committee and the Registrar, the Provost's Office governs the inventory of classrooms campus-wide to ensure that the overall pool of classrooms continues to meet campus demands, paying particular attention to the number and sizes of classrooms available campus-wide and by geographic area.

For these reasons, approval from the Provost's Office must be received before pursuing a classroom project in the following situations:

- Constructing a new classroom.
- Removing and repurposing an existing classroom.
- Changing the seating capacity of an existing classroom significantly (e.g., +/- 20%).
- Designing a new classroom when central resources are used to fund the project.

IDENTIFYING FACULTY AND STUDENT CLASSROOM NEEDS

Feedback from faculty, staff, and students can be tremendously helpful in planning and designing a new classroom, particularly by assessing the effectiveness of existing classrooms. Whether obtained through formal surveys or focus groups, this feedback can help determine what types of room configurations, furniture, technology, and amenities work well for current and pedagogical needs. It also helps identify technologies or room configurations that are no longer needed or that prevent instruction from being successful.

Students offer a completely different perspective from faculty or staff when planning classrooms. They are able to identify things that only those who spend several hours a week in the space can identify, such as the lack of a clock, obstructions in the view to the instructor, or acoustical or lighting issues. Including students in the classroom working group is highly recommended.

Alternatively, or in addition, surveys play an important role in assessing faculty and student needs and

opinions.

See Appendix 2: Sample questionnaire for “Defining Classroom Needs”

VISIT OTHER CAMPUS CLASSROOMS

Touring, reviewing visual surveys, or even teaching classes in other registrar or departmental classrooms, particularly newer campus classrooms, promotes an understanding of the types of spaces that work for a variety of teaching methodologies. Hearing firsthand other departments’ lessons learned prior to beginning the design process also provides helpful information that can be applied to new and renovation spaces.

In the case of a unique instructional need or faculty who would like to experiment with new teaching methods that cannot be accommodated in general purpose rooms, consult with the Office of the Registrar, or the Office of the Provost to identify other campus spaces that may meet those needs.

CLASSROOM DESIGN WORKING GROUPS AND DEFINING NEEDS

Once approval is received to pursue a classroom construction project, form a dedicated working group to define classroom requirements to share with senior administrators and with designers or architects. It is important that both faculty and staff take part in the planning and design process. Refer to the *“Questionnaire”* for sample brainstorming questions to help define particular needs.

Whether or not the working group contains members from each of the following groups, it is vital to consult with each as they will provide a unique perspective in the planning process:

Faculty &	Faculty, both junior and senior, should be involved as early as possible in the classroom design process. Instructional needs change from class to class from faculty member to faculty member, and trends within

Instructors	disciplines may have significant implications on class size, room configurations, and furniture in the future. When new rooms are being planned, faculty should also have a parallel discussion about what they envision the curriculum to be in the coming years. Dartmouth Center for the Advancement of Learning (DCAL) is able to assist in identifying these needs (dcal.dartmouth.edu) and to help think about ways to plan for changing teaching and learning styles related to future curriculum.
Curriculum Staff	Curriculum staff, such as room schedulers, registrars, and departmental administrative staff, interact directly with faculty and students and hear first-hand the needs for specific room sizes, technologies, and layouts and the limitations of existing classrooms.
Facilities Staff	Facilities staff witness the successes and failures of specific building elements, including those within classrooms. Because of their detailed knowledge of physical attributes of the space, including infrastructure, facilities staff can offer insight as to what needs improvement and what is possible within a building.
Information Technology Staff	Information technology staff directly support the people and technologies in classrooms and are often aware of emerging technologies that can be used to enhance the teaching and learning experience. Since technology has implications on planning and design, particularly related to infrastructure, their expertise and support is needed.
Office of the Provost	The Office of the Provost (through the Classroom Committee) approves and oversees recent classroom projects on campus and can provide information on other other projects on campus. The Office of the Provost is also responsible for ensuring that classrooms will meet broader institutional needs, where appropriate. Engage with the Office of the Provost through the Classroom Committee early in the planning process to make sure the Provost's Office is aware of your plans. See *"Provost's Office Role and Approval"* above for additional information.

BEST PRACTICES

While each classroom project is different, there are a number of lessons learned from recent campus classroom construction projects. Please take the following into consideration when planning classroom projects:

Initial Research & Information Gathering	• In the case of a pressing classroom need, contact the Registrar's Office or the Provost's Office for assistance. The Provost's Office can assist in finding short-term solutions until a long-term project is possible. • Benchmark with Dartmouth's peers at other institutions or with other departments on campus to learn of various classroom styles and emerging technologies used in programs similar to those offered within the department.

	• Become familiar with current research and articles related to classroom design and technology trends. • Refer to the *"Resources"* later in this document for additional information.
Technology & Infrastructure	• Allow infrastructure of classrooms to be flexible enough to accommodate changes in technology in the future, when feasible. While we can never predict the future of instructional technologies, a room's technology infrastructure should be considered scalable and agile. For example, a classroom built with a raised floor to provide power outlets should be constructed in a way to allow for other technology infrastructure to be added in the future. • Use technology control panels to simplify use of IT and AV equipment in classrooms and to reduce requests for assistance. Contact Classroom Technology Services to ask about common devices used on campus today. • Ensure that the classroom includes a digital projector/display that enables instructors to display content from their personal computers or devices as well as the dedicated classroom computer. Because it is difficult to configure every classroom computer to meet various instructor needs (and a financial commitment to replace computers every few years), a growing trend on campus is for instructors to bring their own technology to the classroom and connect to the room's display system rather than have a dedicated desktop computer available. • Place power outlets in strategic locations to enable students to charge laptops and other personal electronic devices. For flat-floor classrooms, use flush-floor power outlets to enable furniture to be moved into various configurations. • Explore ways to power portions of the classroom, rather than providing one power outlet per student seat. While currently the need to provide power outlets is relatively high, it is also very expensive to construct, and battery technology for personal electronics continue to improve. Large lecture halls should provide power to one-third to one-half of the seats. • If designing a room with restricted access (e.g., locks or key cards) provide a clear process for all College-community members to gain access to the space. • Ensure wireless networking is available within classrooms as well as surrounding areas and provides enough bandwidth to accommodate simultaneous use by a majority of the students in the room. • If a wired data connection for students is needed, consider only providing ports in a few locations throughout the room. Most students rely primarily on wireless networking. • For additional information see section on Presentation Technologies
Sound & Acoustics	• Be aware of the acoustics within the room, especially in larger spaces. Slight changes or enhancements to furniture and finishes can reduce echoes and reverberations. • Rooms, particularly those seating 40 or more, should have a sound system that amplifies the program sound (A/V and computer) as well as the instructor voice. The program sound amplification/speakers should be distributed throughout the room, while the instructor voice should come from the front of the room. • Ensure there is enough soundproofing between classrooms and their adjacent spaces to provide a comfortable learning and teaching experience with minimum sound distractions. • For additional information see section on Acoustical Environment
Lighting	• Rooms with windows should have solar shades, blackout shades, or blinds to reduce or cut out daylight to make digital displays more visible. ○ When there are more than two windows or they are over 5ft tall, provide automatic controls for shades.

	• Interior lighting should allow for variety of lighting scenes from full illumination to subdued lighting for projection. • Banks of lighting near the digital display should be able to be switched separately from the remainder of the lights. • For typical zone/scene descriptions see section on Lighting
Furniture	• Furniture styles and sizes today are often larger than what was used years ago, and provisions for accessibility require wheelchair accommodations through a room. As a result of these two space needs, the seating capacity in a renovated classroom may decrease. In recent classroom renovations on campus, seating capacity has been reduced by about 20% or more. ○ Refer to the *"Resources"* section later in this document for accessibility resources. • Moveable chairs should be light-weight and/or on wheels or casters to allow for rearrangement and grouping. • When feasible, allow for variety of seating or writing surface styles within a room to accommodate different student preferences. • For additional information see section on FF&E/Furniture *NOTE: See section "Common Room Configurations" for more information about furniture in specific room types*
Finishes	• Student satisfaction in classrooms can be improved by simple and relatively inexpensive cosmetic upgrades, such as using accent colors on walls or carpeting previously tiled floors. Increased satisfaction with rooms provides a more comfortable learning experience. • For additional information see section on FF&E/Finishes
Flooring	• Carpeted flooring can provide better acoustics in classrooms but a replacement cycle and budget should be planned. • In larger classrooms, consider carpeting only the circulation areas/aisles and tiles at the student stations, for easier cleaning and replacement. • Wood or other non-tile flooring options have different maintenance and upkeep requirements. There may be cost implications to choosing non-traditional flooring options. • For additional information see section on FF&E/Finishes
Tiered vs. Flat Floors	• Flat floor rooms offer the most flexibility in day-to-day use and are more cost-effective to renovate or reconfigure. • Tiered floors should typically be constructed in larger capacity rooms. • It is generally cost-prohibitive to change a currently tiered/sloped classroom into a flat floor classroom and vice versa. • It is possible to create a tiered effect in a flat floor classroom by providing high tables and chairs at the rear and sides of a room. • Addressing accessibility requirements is more challenging in tiered rooms and typically requires additional space (e.g., for compliant ramps).
Accessibility & Code Compliance	• Compliance with all local, state, or federal accessibility, fire safety, and building code regulations is required. Things to be aware of include the number of doors/exits required for various capacity classrooms, wheelchair accommodations, requirements for assisted listening devices, etc. It is also important to consider occupant loads, as new classrooms with increased occupant loads may also trigger code compliance issues elsewhere on the same floor, may

	impact egress stairwells, etc.
College Design and Construction Guidelines	• All classroom modifications must comply with Dartmouth's Design and Construction Guidelines and Specifications, including sustainability requirements and technical specifications for ventilation systems, sound insulation, lighting, security access, etc. *https://www.dartmouth.edu/opdc/design-and-contruction/project_resources/project_guidelines/index.php*

RESOURCES FOR ADDITIONAL INFORMATION

Name	***Description***
Office of the Provost	The Office of the Provost is the steward of all academic space on campus, is involved recent classrooms projects, and monitors current room inventory and technology trends in campus classrooms.
Campus Planning + Project Management Services	Dartmouth's Planning Office, together with Project Management Services provides all accessibility, life safety, and building code compliance requirements based on current codes.
Dartmouth Center for the Advancement of Learning (DCAL)	DCAL provides a wide number of educational services and resources to faculty, graduate instructors, and departmental staff.
Office of the Registrar	The Office of the Registrar can assist in locating rooms on campus that may meet specific instructional needs.
Classroom Technology Service (CTS)	CTS supports and maintains AV equipment in registrar managed classrooms. The CTS team has a tremendous amount of knowledge to share on presentation technologies and is also willing to consult with other departments on campus by request.

STANDARDS AND GUIDELINES FOR FF&E

ACOUSTICAL ENVIRONMENT

Speech is the most critical aspect of communication in the classroom experience. Therefore, all classroom design elements should prioritize the acoustical environment of the space.

When noise is made within a building, it will either be absorbed, reflected or transmitted by a wall, ceiling and flooring. The goal of sound treatment is twofold: (1) prevent transmission of sound from room to room and floor to floor, and (2) reduce background noise to enhance the quality of speech or music within rooms. Installing acoustic flooring is an effective and efficient way of accomplishing the former goal.

- engage with acoustician to define high level best practices in addressing renovation specs for finish materials.
- engage with acoustician on case/case basis to
    - evaluate existing conditions before renovation
    - receive design recommendations
    - evaluation post-renovation conditions

DARTMOUTH HIGH PERFORMANCE BUILDING ENERGY POLICY

Provides general guidance on acoustical performance criteria for different space types on campus.

https://www.dartmouth.edu/fom/docs/high_perf_bldg_energy_policy.pdf

ACOUSTICAL STANDARDS WILL INFORM RECOMMENDATIONS FOR WALL/FLOOR/CEILING FINISHES.

STC - Sound transmission class: minimum 50

A good level of isolation for walls and ceilings is STC 50 plus. A high level of isolation for walls is STC 60 plus with ceilings at STC 50 plus.

OITC - Outside inside transmission class: minimum tbd (consult with Project Manager)

The OITC rating represents transmission loss results from 80 to 4,000 Hz using a different mathematical equation than the STC rating. The results express in decibels as opposed to the point system used to determine STC ratings and with weighting more towards low frequency performance. A higher number shows better performance.

IIC - Impact Insulation class: minimum 50

We are using this ANSI standard as the baseline for new construction. In renovation projects allow an additional 10dB if existing building conditions such as HVAC or traffic noise makes the ANSI requirement out of reach.

LIGHTING

This guide represents the requirements for lighting, control, and integration for an AV environment. The specifications should provide guidance on achieving the optimal viewing and audience comfort in the following scenarios.

Sufficient natural and artificial light in classrooms spaces enhances learning processes. Whenever possible locate classrooms in above ground spaces with direct natural light available.

Use cases:

- General class discussion - Faculty and students participate in a full room discussion and need to view each participant
- Group work – Students work in groups on faculty provided activity. Students and faculty need to be visible as well as writing surfaces.
- Presentation with projection - Single presenter provides dialogue to a projected image. Audience needs to be seen for participation
- Presentation with board work - Single presenter provides dialogue along with formal board work. Board, presenter, and audience need to be visible
- Focused media presentation (no audience participation) – Media is being shown as the primary focus. Distractions should be minimized to provide best attention to material being presented.

User experience:

Users should be able to identify scenes through accurate labeling on the touch panel or printed labels on the wall. The order of presets should be intuitive so that the brightest settings are on the top and the dimmest settings are on the bottom. The order should reflect the most popular use case after brightness. Users should have the option to dim the lights manually and have control over the minimum of two zones (front of room and audience).

Example:

- All on
  - Front of room on (100), audience (60), board lights (60)
- Presentation mode
  - Front of room off (0), audience dimmed (60), board lights (0)
- Group work mode
  - Front of room on (100), board lights on (100), audience (75%)
- Spare
  - example: Front of room off (0), audience dimmed (20)]
- All off

Control Locations:

- All controls should conform to ADA requirements
- Physical controls should be available by the entrance of the room and by the presentation station. Physical controls by the door should provide at minimum, all on and all off. The physical controls by the presenter should provide all scene controls and manual dimming capabilities.

- Individual zone controls shall also be provided for specific needs real time adjustments

- Touch panel controls should mimic physical controls in the room with the same labeling and order. If lighting control integration is not available on the touch panel, directions should be included to use the closest physical controls.

Learning spaces lighting design guidelines consist of:

- Lighting requirements
    - illuminance levels in context of surfaces
    - color temperature in context of surfaces
    - energy efficiency
    - natural lighting [where possible] and provisions for shades
- Luminaire selection [fixtures/lamps]
- Zone requirements per room type
    - ceiling lights
    - board lights
    - presentation wall lights
    - lectern lighting
    - emergency lights
- Controls and integration
    - control system (Refer to Dartmouth Design and Construction Guidelines)
    - location of controls
        - ADA compliance, relationship with other room controls
    - other integrated services
        - AV and shade control
- Replacement cycle

Consider rebate programs where appropriate.

Consider additional needs for people with visual impairments or lighting specific needs for screens since many are now looking at their laptops/devices as part of class work.

FINISHES

Finishes are the materials we select to and apply to the vertical and horizontal spaces in a room. They can be used to enhance a space or remain a neutral component depending on the desired outcome for a room. Careful selection of finishes can assist in improving acoustical environments, reducing glare, and provide an overall perceived harmony in learning spaces.

Finishes include:

- wall treatments

- flooring
- ceiling materials

WALLS

- Paint
- Writing Surfaces
- Acoustical treatments
    - Example: https://commercial-acoustics.com/product/acoustic-absorption-panel/
- STC rating: 50+ wherever possible

FLOORS

As a default, all classrooms should receive carpet* which balance the following requirements:

- ADA compliance
- Sustainable practices
- Enhance acoustical environment by absorbing background noise
- Durability
- Stain resistance

Whenever possible select higher quality modular tiles and plan to store 10% attic stock for replacement.

- Carpet underlayment should be considered for improving acoustical environment if/when transition into the room from adjacent corridors/rooms will allow for the increased heights [https://www.spectracf.com/acoustic-underlayment-explained/].
- Carpet layout and pattern can aid in zoning a room and providing guidance for default furniture layouts when mobile furniture is provided.
- Color palette should be harmonious with building/room aesthetics.

* In classrooms with demonstration labs, sinks, high potential liquid spills as part of the curriculum [note science classrooms], vinyl tile flooring should be specified at the areas around the demonstration bench/sinks. Exceptions can also be made for classrooms on the first floor where direct access to outdoors pose higher impacts on the flooring.

Maintenance:

- Carpets should be cleaned twice a year minimally or when incidental staining occurs

Replacement cycle:

- Carpets should be replaced on a 10 year cycle. When modular carpet tiles are used evaluate for individual tile replacement on a yearly basis when cleaning efforts are insufficient to remove stains.

Sound absorption: when finishing floors above classrooms where sound transmission is an issue

- ICC rating: min 50

CEILINGS

- Acoustical environment
- Ease of access to wiring and AV services
- STC rating: 50+
- Drop ceiling acoustical tiles specifications
    - NRC rating: min 80
    - CAC rating: min 35
    - Good products include Armstrong Calla and CertainTeed Ecophon Focus

FURNITURE

LAYOUT

All rooms should have a default configuration determined by the agreed upon programmatic needs of the space.

All other layouts are secondary and those who wish to rearrange the furniture must return it to the default layout at the end of their session.

For classroom designers:

- Provide a diagram of the room with the default layout
    - [non auditorium] lecture style layouts should have a minimum of 20sqft per student
    - active learning layouts should have a minimum of 25sqft per student with adequate aisles for faculty circulation
- Provide a diagram of proposed secondary layout[s] if appropriate
- Provide a storage plan for excess furniture needed for accommodations or possible term based reconfiguration of the room layout
    - this can be shown as nesting furniture located within the room or located in nearby storage

FURNITURE

Finishes palettes for furniture should be determined by building/room aesthetics. Finishes standards should be developed by the consulting design team with input from Planning + Project Management.

Classroom chairs should be caster based and can take two forms depending on the typical teaching style in the room.

- Presentation, lecture - tablet arm
- Group learning, seminar - tables & chairs

When in doubt, select the tablet arm option to optimize flexibility

TABLET ARM CHAIRS

- caster-based for carpet
- cushioned backs and seats [*upholstered seats/backs should be easily replaceable]

- example chairs: KI Grazie, Steelcase Shortcut
- storage tray beneath if there is sufficient room [KI version has a larger footprint chairs; Steelcase is a circular smaller footprint]
- large tablet size
- 10% should be left-handed tablets
- *If small table is needed for wheelchair, height adjustable classroom tables are now available, see note under 'ADDITIONAL FURNITURE for ACCOMMODATION PURPOSES,' below.*

TABLES AND CHAIRS

- caster-based for carpet
- chairs: cushioned backs and seats [upholstered seats/backs should be easily replaceable]
    - example chairs: KI Grazie, Steelcase Shortcut
    - Chairs should be of sufficient size to accommodate varying body sizes.
- tables: appropriate sizes are determined by room layout
    - minimum width for two students is 54"
    - depth between 18-24" [layout and seat count will determine depth]
    - height 29"; one adjustable height table available per classroom floor
    - example table: KI Pirouette [mobile and nesting]

STATIONARY LECTERN WITH AV RACK

- two section lectern
    - stationary section: minimum 1 rack for AV equipment tethered to wall Jbox inputs or floor box connections
    - height adjustable section: allows for seated, standing, or wheelchair instructor [must be ADA compliant]
    - example:
        - Spectrum Freedom eLift ADA compliant lectern

LECTERN STOOL

- provide one tall stool for the instructor at the lectern [*on carpeted floors only* height adjustable stool with adjustment range between 24-30" with foot ring can be specified]
    - finishes to match room furniture
    - example: KI Grazie 4 leg armless stool

MOBILE LECTERN

- small caster-based move-able lectern
    - example: Steelcase Pocket adjustable height
    - example: KI Ruckus [https://www.ki.com/products/name/ruckus-mobile-lectern/]
- adjustable height and adjustable angled surface preferred

*ADDITIONAL FURNITURE FOR ACCOMMODATION PURPOSES:

- when tablet arm chairs are selected, ensure 10% are suitable for left handed users, or specify ambidextrous type.
- when furniture is mobile provide 2 static chairs of the same type in the room

- provide 1 adjustable height table in near storage for every three classrooms in the building
    - example: KI Workup table, rolling base option

CLASSROOM STORAGE

- Storage space for classroom items should be located on the same floor in the building when possible, particularly in buildings without elevators.
- Storage space priorities: Heigh-Adjustable Tables, Mobile Podium, Table-top Podium, High Stool.

PRESENTATION TECHNOLOGIES

Consult with Classroom Technology Services when designing presentation technologies for classrooms.

AN IDEALIZED APPROACH TO CLASSROOM AND AV DESIGN

A presentation classroom that is 3 units wide to 2 units deep is optimal in plan. This reduces the distance between the faculty member and students at the back of the room and also affords more space on the front teaching wall for writing and visuals. These rooms feel more intimate than deep rooms.

Screens are sized by most distant viewer (MDV) divided by six. This yields the minimum screen size by height. Thus max room depth can be determined by subtracting 48" from the proposed finished room height and multiplying by six.

This method works well for most classrooms.

Shape can differ in group learning spaces if that's the only methodology. More rectangular spaces may be modestly better for group learning, given more perimeter space (and access to boards and displays) v. interior space.

WRITING SURFACES

Writing surfaces are the most important presentation technology for many teaching styles. The selection of white boards vs. blackboards is often a disciplinary preference. By default, whiteboards should be part of the initial classroom board specification but there are circumstances where either a hybrid board specification will be needed or all blackboards will be the classroom stakeholders preference. Bring up this discussion early in the planning and design process.

In some cases, writing surfaces also serve as projection surfaces. In these cases, all immediately adjacent boards shall also be of projection quality. This is primarily and aesthetic choice to ensure the surface color of the boards are continuous across the primary projection wall.

Vertical or horizontal sliding boards may be utilized in large and extra large spaces if ceiling heights allow. These boards may or may not be motorized depending on the quality of the board or the UL related challenges of motorization. In the case of non-motorized vertical sliding boards, consider useability and ADA compliance when specifying and designing the implementation.

Maximize the classroom vertical surface area with writing surfaces in medium and small classrooms. In large classrooms, consider the impact of the quantity of hard surfaces on the acoustical environment.

HVAC CONSIDERATIONS

The impact of mechanical equipment noise in classroom spaces can be difficult to remediate in existing classroom renovations. Whenever possible strive to improve the acoustical environment through modifications of the HVAC system by relocating air handling units, fans, or replacing heating/cooling units with low decibel fan coil units.

Proper location of HVAC equipment in new building and classroom design is essential and classroom locations should be optimized early in the design process.

- Refer to Dartmouth College Design and Construction Guidelines, Section 23 05 00 – Basic Mechanical Requirements.

- Refer to Dartmouth College Design and Construction Guidelines for HVAC Equipment Selection, Design Criteria and Adequate Locations.

APPENDICES

1. GUIDING PRINCIPLES FOR THE DESIGN OF LEARNING SPACES

2. DEFINING CLASSROOM NEEDS QUESTIONAIRE

DARTMOUTH

Guiding Principles for the Design of Learning Spaces

APPENDIX 1

These Principles for the Design of Learning Spaces have been established by Dartmouth to ensure that all standards for learning space design are created with student-centered learning at their core. They were developed based on the National Survey for Student Engagement (NSSE), grounded in extensive educational research. The NSSE indicators and practices list five principles to be considered when designing or renovating learning spaces:

1. ***Campus climate and culture:***
   Learning spaces should be consistent with the college's culture and priorities as reflected in the campus master plan, follow college design standards, and be designed with future flexibility in mind.

2. ***High-Impact Practices (HIPs):***
   Learning spaces exist within a larger campus context; there should be an ease of transition between spaces so as to better support high-impact practices inside and outside the classroom.

3. ***Academic challenges:***
   Learning spaces should allow students to actively engage with content and include a range of technologies that support multiple modes of teaching and learning.

4. ***Learning with peers:***
   Learning spaces should provide features that permit students to work both individually and in collaboration with one another.

5. ***Interactions with Instructors:***
   Learning spaces should facilitate communication and interaction between students and faculty.

Standards grounded in these principles will indicate how to apply them in the design of different room types such as seminar rooms, auditoriums, and active learning classrooms.

These principles can be translated into specific design standards to ensure that Dartmouth's learning spaces become a physical manifestation of our teaching and learning vision.

Principles for the Design of Learning Spaces

Campus climate and culture: Promoting excellent learning spaces across campus .	Dartmouth provides opportunities for supporting students' learning through consistently high-quality learning spaces through the application of standards and design principles. For example: ☐ College standards applied, e.g., classroom guidelines (acoustics, lighting, infrastructure, etc), classroom AV standards; accessibility guidelines; sustainability practices, materials and furniture; building environmental (e.g., temperature and ventilation). ☐ Design classrooms for flexible future use where possible. ☐ Design classrooms consistent with the principles of Universal Design to meet the needs of and be used by all populations using these spaces (e.g., natural light, sufficient storage, and control panels to simplify instructors' use of equipment in classrooms across campus). ☐ Design surrounding spaces (informal spaces, etc.) to integrate with classrooms and student classroom experience (e.g. beyond the threshold of the door). ☐ All classrooms are strategically considered within the campus master plan.					
High-Impact Practices (HIPs)	☐ Multiple types of campus physical environments are needed to support a variety of HIPs. Ensure availability of, and support for, a diverse range of affordances (both physical and virtual) to maximize HIPs for student learning.					
	Layout	**Furniture**	**Learning and Presentation Technologies**	**Acoustics**	**Lighting/room color**	**HVAC**

Principles for the Design of Learning Spaces

Academic challenge: Promote individual, active engagement with content	☐ Ample work surface for multiple devices/resources (e.g. laptop and notebook) ☐ Adequate circulation space for students to move about without affecting others ☐ Unobstructed sightlines to writing and projection surfaces	☐ Comfortable furniture (for different body types) ☐ Conveniently available furniture to accommodate different positions, (sit, stand, wheelchair, etc.) ☐ Storage for bags, coats, and belongings	☐ Access to infrastructure (e.g.,, power for student laptops and devices, wireless network) ☐ Robust access to network/internet ☐ Multiple options for simultaneous display of different learning materials (e.g. screen & board)	☐ Acoustic design to avoid distraction from outside and inside sources ☐ Reduce background noise to enhance quality of speech within the room	☐ Appropriate lighting for individual work ☐ Consistent lighting temperature (hue) ☐ Access to and control of natural light ☐ Intentional use of room color to promote focus	☐ Heating, cooling, and ventilation adequate to provide environmental comfort in all seasons and parts of the day ☐ HVAC agile and responsive to various demand

DARTMOUTH

Principles for the Design of Learning Spaces

	Layout	Furniture	Learning and Presentation Technologies	Acoustics	Lighting/room color	HVAC
Learning with peers: Promote active engagement with one another	☐ Promote face-to-face communication (chair movement, adequate space to move) ☐ Unobstructed sightlines from person to person and group to group ☐ Adequate circulation space for students to move about easily to engage one another	☐ Flexible seating to support different types of tasks and preferences (e.g., fixed chairs that rotate, movable tables and chairs, tablet chairs on wheels)	☐ Shared workspaces (e.g., writable walls, projection capability)	☐ Appropriate amplification available ☐ Acoustic design supports multiple simultaneous conversations (e.g. reduce interior noise)	☐ Different lighting zones and light levels to support different activities (e.g. lighting pattern suggests grouping) ☐ Using color in surfaces to define groups' use of space ☐ Access to and control of natural light	*same as above*
Instructor interactions with students: Promote interaction and communication	☐ Adequate circulation space for faculty to move about easily to engage any student (e.g., multiple aisles, unobstructed sightlines)	☐ Podium doesn't interfere with sightlines, movement and interaction, while being large enough for instructional materials. ☐ Flexible furniture to support different teaching strategies (e.g., movable, variable heights)	☐ Allows students to share content to projection (facilitated by instructor) ☐ Ability to present content anywhere in the room (e.g. wireless projection)	☐ Appropriate amplification available (for students)	☐ Different lighting to support multiple types of teaching tasks ☐ Access to and control of natural light	*same as above*
Practical supports	☐ default layouts with flexible rooms ☐ layout transition plans (class to class) ☐ visual cues for various layouts	☐ adequate storage in or near room		☐ Outreach on microphone use and benefit ☐ Mowing, facilities, and delivery schedules		☐ AC (as opposed to open a window) ☐ HVAC introduces noise into a room. Must be designed to reduce additional noise.

APPENDIX 2

DEFINING CLASSROOM NEEDS QUESTIONAIRE

See "Classroom Design Working Groups and Defining Needs" above for information on forming a working group.

Assemble a classroom design working group(s) and articulate instructional needs to architects, designers, and department or College administration is the next step. Use the following questions as a starting point for defining and documenting your needs:

QUESTIONS ABOUT CURRENT CLASSROOMS AND CURRICULAR DEMANDS

1. How many classrooms do are currently in use?
    - What is the instructional seating capacity of each room?
    - What types of furniture do you currently have in rooms you use most commonly (e.g., conference table, strip table, individual tablet chair, fixed or moveable)?
2. What are the classrooms you are most happy with? Least happy with?
    - Why (e.g., aesthetics, technology, furniture, size)?
3. What is the number of classes/sections currently offered and the sizes for these classes/sections?
    - Do your current rooms meet these capacity needs?
    - What size rooms get overused/underused?
    - How do the rooms get used for other non-class events?
4. What plans do you have for changing your curriculum in the coming years?
    - How will this impact the number and size of rooms needed?
    - How have your current rooms not allowed for changes to your curriculum?
5. Have you taught classes in another department's classrooms?
    - Why or why not?
    - What did you like/dislike about these rooms?
6. How are classrooms at your peer institutions configured?
    - Does their curriculum vary differently from your department's?
7. Do any of your classrooms contain equipment or other elements that cannot be used by another department?
    - How is this currently secured?
    - How can they be secured in the future to allow for other departments to use the classroom?
8. Are any of your current rooms tiered or sloped?
    - Do you desire tiered/sloped rooms in the future?
9. Are there spaces near your classrooms where students and faculty can congregate before and after class?
    - If yes, will similar space be retained after renovation/construction?
    - If no, are there plans to have such space after renovation/construction?
10. Could your current or future classes be held in any other classrooms styles outlined above in this document?
    - Why or why not?

QUESTIONS SPECIFICALLY FOR FACULTY AND INSTRUCTORS ABOUT FACULTY TEACHING

APPENDIX 2

METHODS AND TECHNOLOGY

1. How you teach?
    - Lecture, discussion, demonstration?
    - Do you sit, stand, and/or walk around the room? How often do you change?
2. What materials do you bring in and use to teach?
    - PPT, books that you pass around, slides, DVD [possibly VHS?], CDs or cassettes, examples/objects that you pass around?
    - How often do you bring them in?
3. Do you just focus on one thing at a time or do you often need multiple foci for student attention (projection and blackboard, multiple projectors)?
    - Do you do that every day or do you switch over the semester?
4. Do you bring in guest speakers with different teaching needs?
5. Do you need to connect to people outside of the classroom during class?
    - Video conference, students abroad, distance students?
6. Do you need to record the audio or video of your class?
7. Do you ever (or want to) connect your mobile device or your students' devices to the classroom systems?
8. Do you use any special software in your lectures or elsewhere in your teaching?
9. What type of exams and quizzes do you give in the room?
10. What special needs/unique features of your field?
    - HD quality video, special sound systems, room blackening vs. normal shades

ABOUT STUDENT LEARNING STYLES

1. What do your students do in class?
    - Take notes, participate in large group/whole class discussions, participate in small group discussions, participate in partner work, give presentations?
2. Do you students need/want to use laptops?
3. Do you have the students move around a lot?
    - Rearrange furniture, get up and move about the classrooms for interviews/surveys?
4. How often do you change teaching and learning modes?
    - How many times per class, times per week, times per semester?
5. Do you ever need additional space for breakout groups?
    - Computer classrooms for single sessions/workshops during class?
6. Are there special needs that students in your field have that we should be aware of?
7. What sort of assignments do students do outside of class?
    - Field work, video production, modeling and forecasting, information sharing, social network activities?
8. Are there things that you currently do in class that you wish you could have students do outside of class?