FACILITIES

Peter A. Gisolfi, AIA, ASLA

Spaces for Teaching Science

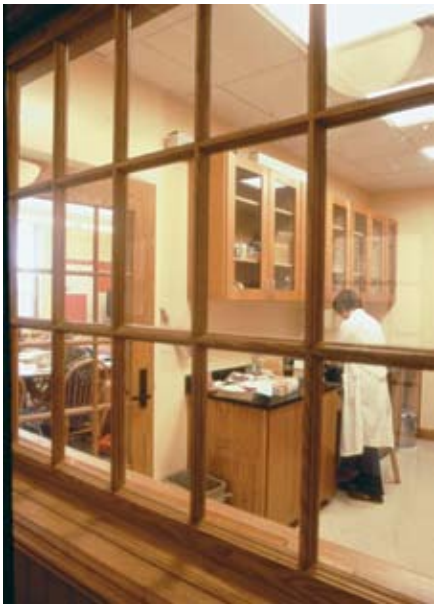
A chemistry lab isn't just another classroom. Specialized subject matter and activities call for special approaches to the design of science rooms

When planning new science space, architects are often confronted with an astounding variety of different and contradictory points of view from science faculty, laboratory consultants, and administrators who believe passionately in their opinions. Typically, the only objective on which everyone agrees is that the new facility needs to provide the best possible teaching and learning environment.

Teachers and administrators all expect that great things will happen once they have their new science space. High expectations tend to sharpen differences of opinion. It's difficult for the architect to point to a body of research on the design of science rooms.

That's because architectural research is not like scientific research—it is not particularly organized, linear, or conclusive. It relies heavily on intuition and anecdotal evidence, as well as empirical data, to lead to conclusions.

Over the last ten years my firm has designed many new secondary school science spaces, in new buildings and as renovations or reinventions of existing facilities. We have visited and studied science facilities in public and independent schools throughout the country. We have interacted with science laboratory consultants and conferred at length with science teachers who have spent their careers in secondary school science labs. Through these endeavors, we have developed a clear sense of the issues and options involved in creating successful secondary school science labs.



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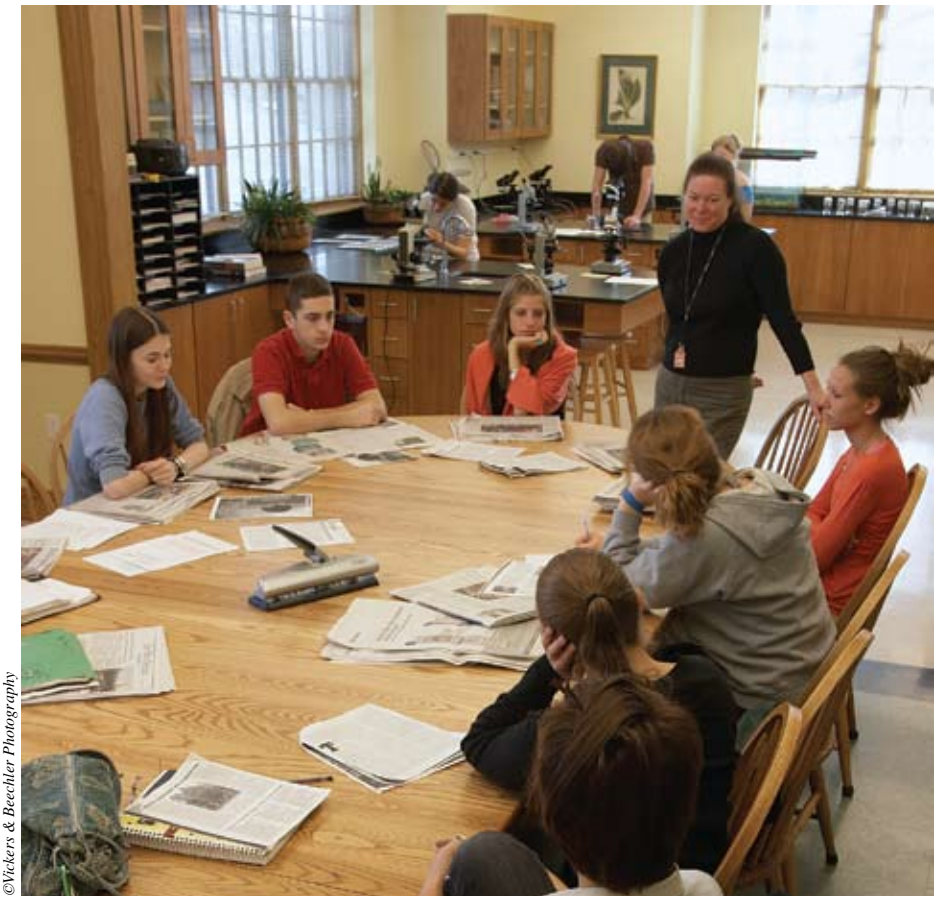

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Drawing on this experience, and on discussions with many experts, I have concluded that school leaders and planners must always ask--and answer--at least eight basic questions if the process is to be successful:

1. Should science teaching spaces be specialized by discipline or should spaces be interchangeable? Specifically, should there be different rooms designed for physics, for chemistry, for biology, for earth science? While most science teachers advocate interchangeability, there is general agreement that specialized laboratories are inevitable.

Upper and lower photos:
Masters School, Dobbs Ferry, New York

2. Should recitation and laboratory work take place in one room or in separate rooms? Most secondary schools tend to combine these two functions in the same room.

3. If recitation and lab work are in the same room, should these activities take place at the same workstations or at separate workstations? That is, should each student have one place or two places within the room? Should they sit at lab tables, desks, or seminar tables during the recitation period? There is no consensus on these issues.

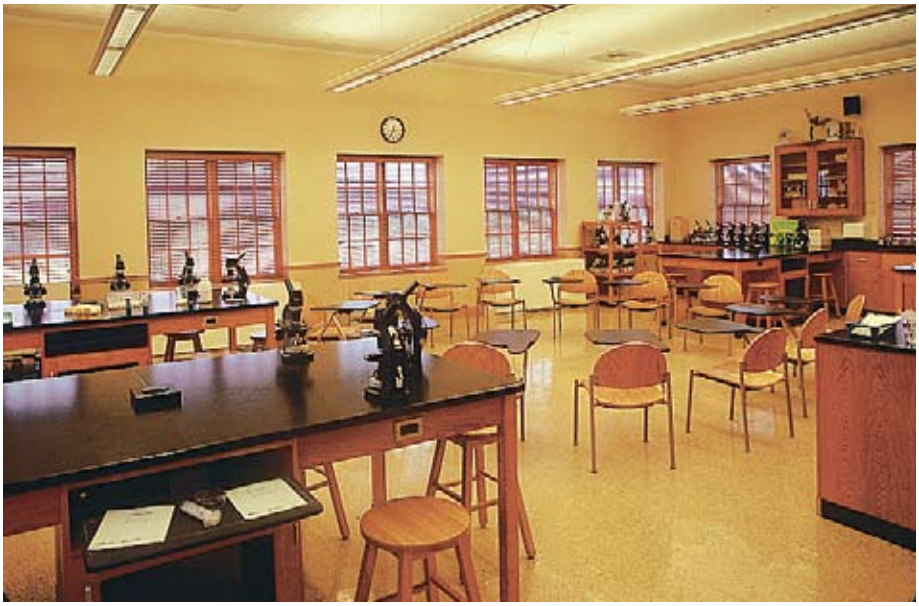
4. How much furniture flexibility should there be in a science lab--how much furniture should be fixed and how much should be movable? Should laboratory tables be attached to the floor and to the building's infrastructure (gas, water, electricity), or should the tables move horizontally, or even vertically? Conventional wisdom supports the concept of flexibility while acknowledging that certain elements, such as fume hoods, acid waste systems, or gas burners, must remain fixed. Over the years, we have observed that, as a practical matter, there isn't time in a 50-minute instruction period for moving heavy tables.

5. What kinds of arrangements do most teachers prefere for different types of furniture ? Our experience has shown that:

- *For chemistry labs, fixed tables or counters, 36 inches high without stools, are preferred. Within these labs, recitation takes place at a different location.*

- *For earth science and physics, movable tables, 36 inches high with stools, are preferred. Lab experiments and recitation often take place at the same table.*

- *For biology, fixed tables, 30 inches high, with seats or stools, are often preferred. Lab experiments and recitations occur at the same tables.*



6. Where should the space for science preparation be located? How many labs should share the same prep room? Ideally prep rooms are located adjacent to the labs that they serve; two to three laboratories share the same prep room.

7. How much contact and interaction between students and teachers should be fostered by the layout of the teaching space? Thirty or forty years ago, teachers stayed at the front of the classroom, lecturing or demonstrating experiments at a discreet distance from the students. Today, a more informal approach is commonplace and direct interaction between teachers and students is emphasized.

8. Should a science teaching space be designed as a collaborative environment where students are encouraged to work together to discover and learn, or as a competitive environment where students vie with each other to be the first with the correct answer? How mansuccessful individual teaching spaces. Certain design objectives that relate to the planning of the overall facility must be met:

Photos above:
Ethel Walker School, Simsbury, Connecticut
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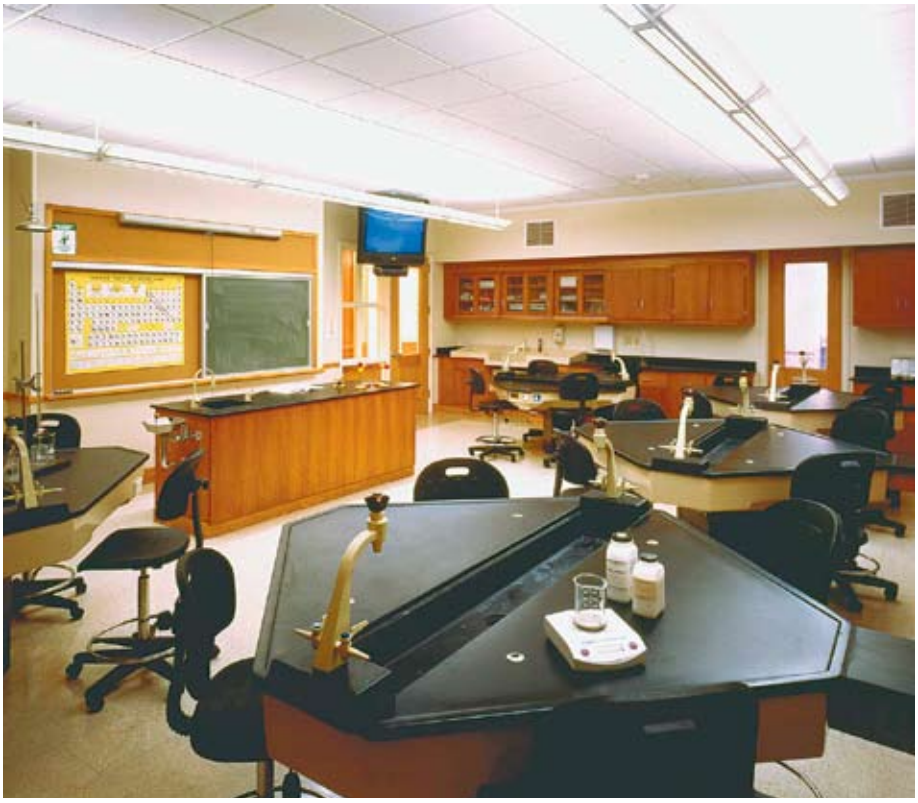
• *The space should be perceived as a place of learning where science is visible and important.*

• *It should be designed as a place where scientists—teachers and students—work together to achieve understanding and make discoveries.*

• *It should support flexibility and variety so that different styles of teaching and learning can co-exist successfully.*

• *It should support collaboration and interaction, contact and communication, between faculty and students, among students, and among faculty. It should be designed to bring people together, not*



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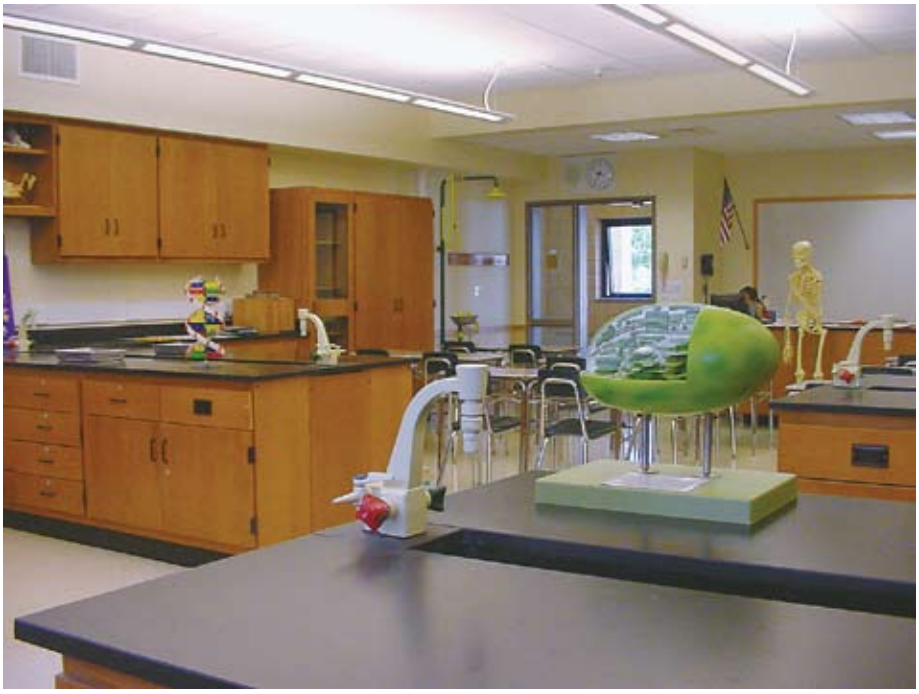
Upper photo:
Agnes Irwin School, Rosemont, Pennsylvania
Lower photo:
Sacred Heart School, Greenwich, Connecticut

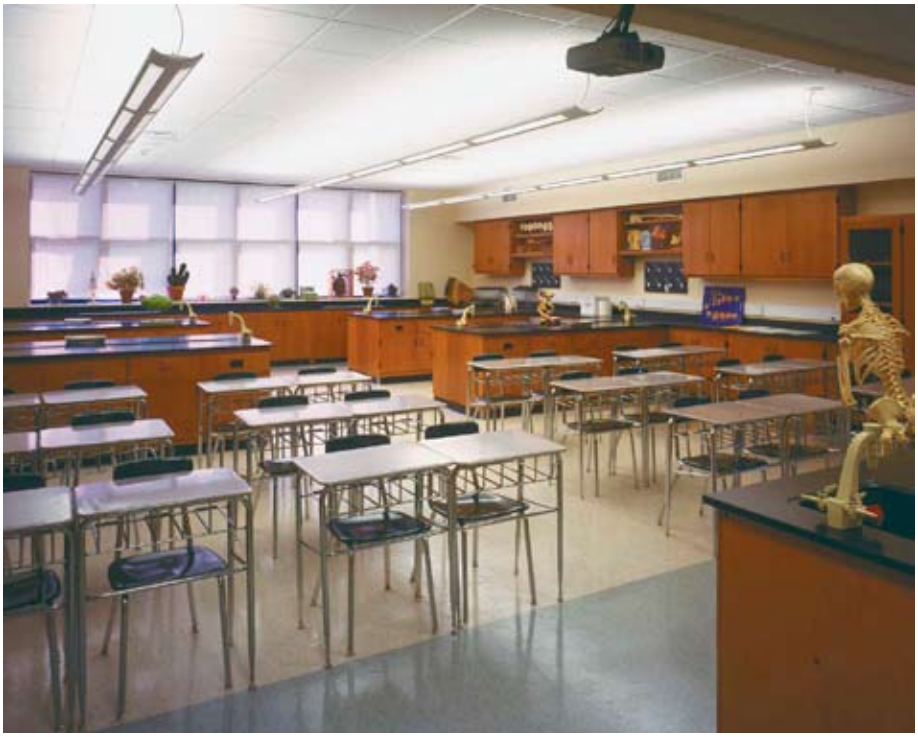
to keep them apart.

Most important, the design of a new science facility should reflect the institution's point of view about pedagogy and social development. We have designed science facilities for schools where the overall mission was collaborative (ncompetitive) learning; where project-based learning was the most important factor; where specialized seminar tables (Harkness tables) and learning through Socratic dialogue were imperative; where faculty oversight of 24 students working on experiments was the most important consideration.

Architectural design of science spaces is based on practical, functional considerations and on ideas that satisfy more esoteric objectives. The technical and ergonomic issues involved in designing spaces for teaching and learning science are complex and intimidating, but solving those specific problems alone won't necessarily result in the creation of a successful science facility. Science teachers, administrators, and architects must be both tactical and visionary. Functional requirements must be defined and met, but vision and purpose must also be articulated and realized. It is possible to create spaces for science that satisfy practical needs and simultaneously address broader, more subtle pedagogical and social objectives.

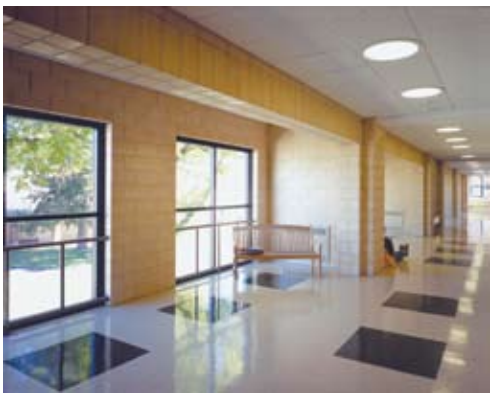
Peter A. Gisolfi, AIA, ASLA, is senior partner of Peter Gisolfi Associates. He established the firm in 1976 to provide professional services in architecture, landscape architecture, interior architecture, and planning. His work has been consistently published in major national magazines and newspapers, and has been featured in numerous books and on many websites. Mr. Gisolfi is also a Professor of Architecture and Landscape Architecture at The City University of New York.





Irvington HS/MS Community Campus
Irvington, New York:

Top and middle photos: Science labs'
Lower photo: Science wing corridor overlooking the Main Quad.



Peter Gisolfi Associates
Architects • Landscape Architects • Interior Architects
Hastings-on-Hudson, NY and New Haven, CT
914-478-3677 • www.petergisolfiassociates.com