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The Science Resource Area in the State-of-the-Art High School

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PEB Exchange Programme on Educational Building

THE SCIENCE RESOURCE AREA IN THE STATE-OF-THE-ART HIGH SCHOOL

It appears that science education is moving more and more toward individual and small-group, hands-on projects and away from the "sage on the stage" lecture and "one size fits all" laboratory projects. The Thomas Haney Centre in Maple Ridge, British Columbia (Canada) operates on individual study plans for each student, requiring that a student demonstrate proficiency in the subject matter to complete a course, but allowing students to progress at their own rate of speed and to learn in their own most effective manner (following Gardiner's suggestions on multiple intelligences).

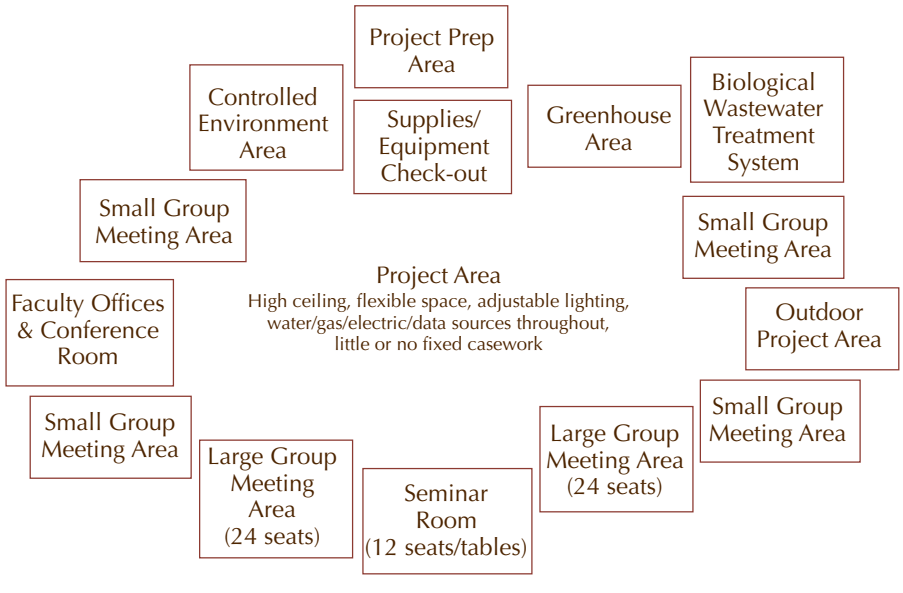
If this is truly the future of secondary education, it seems that fixed, designated-subject science laboratories may become dinosaurs. Perhaps a large, flexible student project space could be combined with a number of other, support spaces, to provide the appropriate learning environment for science. As students become more and more responsible for developing their own projects with which to explore the science curriculum, the need for individual laboratory/classrooms and prep areas should be greatly reduced. Rather than daily doses of large-group lectures in a classroom, more and more content would be delivered either by reading, study of documentation on a computer (CD-ROM or Internet), or by actual experimentation, thus requiring significantly less traditional classroom space and significantly more project space.

The diagram below suggests the science resource area of the state-of-the-art high school and includes the following facilities:

Project Area: This is the primary learning space for all students. It would have a high ceiling (or no ceiling), flexible and adjustable lighting, water/gas/electricity/data connections throughout the space, and little or no fixed casework. The primary furniture would be tables and chairs which students could arrange to suit their needs. One or more fume hoods would be provided for those projects requiring same, and increased ventilation of the project area would be required. Space and resource allocation would be the function

Flexible Project Area
Thomas Haney Centre, Maple Ridge, BC

FLEXIBLE, INTEGRATED HIGH SCHOOL SCIENCE RESOURCE AREA



of the teachers who are now truly facilitators with the knowledge and experience to guide students in their learning process. As this space would serve all students in all grades, it would necessarily be large and might, for acoustical purposes, need to be subdivided into two or more such spaces which could be connected through large, roll-up doors to permit rearranging equipment or long-term projects.

Outdoor Project Area: Ideally, the main project area could open directly, via overhead or sliding doors, to an adjacent outdoor project area where outdoor experiments such as weather observations, stream mechanics, animal and plant studies could be conducted.

Supplies/Equipment Check-out: With small group and individualised projects being accomplished on a random schedule, a centralised storage and check-out space for supplies and equipment would be required, replacing the individual storage and prep rooms normally associated with dedicated laboratory/classrooms. If the project area is subdivided, it might be necessary to have more than one supply/equipment check-out room, or one such space might be located strategically between two or more project rooms to serve all. The supplies/equipment check-out space would have a number of banks of shelving, possibly rolling, compact shelving to save aisle space, and would have service windows with roll-up grilles opening into the project areas. At the Thomas Haney Centre, kits for individual laboratory projects are put together in advance in plastic tote trays of various sizes; when a student or team is ready to do a particular project, they merely check out the appropriate tote tray which also includes instructions and safety precautions. The student or team would then proceed to a vacant workstation or table in the project area to set up and perform the project. Staffing for this area would depend on the number of project areas being served and the number of students in the student body. This space would be open at all times that the project area is open.

Project Prep Area: This would be the make-up area for the project kits. Rather than scurrying to prepare a dozen laboratory set-ups for a class of 24, a teacher would prepare several tote tray kits for each project at a convenient time, and place them in a pre-assigned location in the supplies/equipment check-out space. When kits are returned, the various glassware and instruments must be cleaned and the consumables replaced. This work could be performed by students or by teachers as convenient.

Greenhouse Area: Rather than provide the type of environment appropriate to a greenhouse in the entire project area, a separate greenhouse area should be

Greenhouse
Samuel Shepard Jr. Gateway Education Park, St. Louis, MO

constructed. This space could be located adjacent to the project area, or be remote, but should have access to the supplies/equipment check-out space. The size and equipment of the greenhouse will depend on the planned curriculum which would make use of this facility. It could be used for long-term demonstrations of composting, solid and liquid waste processing, growing of biological specimens such as fish and plants, etc.

Biological Wastewater Treatment Area: Where possible, the use of an environmentally sensitive, biological wastewater treatment system could act as both a building utility and a science demonstration area similar to that installed at the Boyne River Ecology Centre of the Toronto (Canada) Board of Education. This space should be located on the exterior wall with direct sun and could be adjacent to or a part of the greenhouse area.

Biological Wastewater Treatment
Boyne River Ecology Centre, Toronto, ON

Controlled Environment Area: This space would offer the opportunity to conduct projects requiring a more controlled environment than would be available in a large, open project area. Dust control, humidity control, lighting, temperature and other variables could be different in this space than elsewhere in the resource area. As with the greenhouse, this space could be

Weather Station
Samuel Shepard Jr. Gateway Education Park, St. Louis, MO

located adjacent to the main project area or be remote. It probably should not connect directly to the supplies/equipment check-out space so as to avoid contaminating the controlled environment, but should be near by this space. The space is meant to be as flexible and functional as the main project area.

Small Group Meeting Areas: These conference rooms should open directly off the main project area and should have glass partitions to allow for supervision and to create a sense of connection to the projects in the larger space. The small group meeting areas are meant as places for small groups or teams to meet to discuss the progress of their projects or to analyse the appropriate method for achieving a particular project goal. As separate spaces they can have sound isolation from the general noise of the larger space while allowing the small group to conduct their own discussions without disturbing those in the project space. It might be possible for a team to check out such a space for several days at a time if the requirements of a project produced a need for extended discussions, paperwork and computer-related activities. The space should be equipped with electrical outlets, appropriate lighting, computer networking capabilities and, possibly, a desktop computer connected to the Internet. A markerboard and tack surface should be standard equipment.

Larger Group Meeting Areas (24 Seats): In spite of the individualised or small group nature of the science experience, there will still be times when teacher and students need to meet as a group to present a new concept, lay out ground rules for a new project, etc. Other uses might include a group presentation of project results by an individual or team or the group viewing of a film or other media presentation. The room should be sized to hold an entire class group (*i.e.* 24) and should be equipped with markerboard, tack area, projection screen, LCD projector, computer network connections, adjustable lighting and adjustable seating to permit a wide variety of functions to make use of the space. The number of such lecture areas should be calculated by determining the likely number and frequency of group presentations in the curriculum. These spaces would **not** be assigned to individual teachers as "home" spaces.

Seminar Room (12 Seats/Tables): In the Thomas Haney Centre experience, full class size meetings are rare; teachers make presentations on a particular issue when a sufficient group of students are ready for the material. One or more smaller seminar-sized spaces with movable tables and chairs should be provided. Teachers can hold group discussions, or review material with two or three teams of students at once; the spaces could also be used by groups of students working as a larger team or several teams working on the same project to discuss findings or plan out a method of attack. Both the lecture areas and the seminar rooms could open directly off of the project area or be more remote.

Faculty Offices & Conference Room: These are the "home" spaces for the faculty and may be individual offices, small cubicles in a larger space or offices shared by two teachers. They should be adjacent to the project area so as to allow students to visit with teachers as necessary during the course of their projects, but should also have enough privacy that a teacher can conduct a private meeting with a student or carry on a private telephone conversation. One or more small conference spaces should be provided in this area to allow teachers to meet with small groups of students, or with a student and his/her parents, or for groups of teachers to meet to plan curricula and projects. If a science library is part of the school's resources, it might also be located in this area.

In the contemporary high school where individualised study and group project spaces are the rule, such a science resource area will fit right into the plan; whether the science resource area could be integrated with other project areas depends on the types and extent of science projects attempted. It might be possible to equip the multipurpose project space used by all disciplines with the appropriate utilities for science; the question remains, however, if the noise, clutter and smells of science projects would be tolerable if integrated with the other disciplines.

Many of the individual concepts elaborated in this paper have been constructed in schools within the United States and Canada by various architects. However, the proposal of combining all of them into a flexible science resource area is the intellectual property of Inside/Out Architecture, Inc. and is copyrighted material.

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