

Intro

•H.S. 21+ is not a real school -- it's a hypothetical school, invented for the purposes of this presentation, but nonetheless within the realm of possibility, existing within the scope of current technologies and educational regulations. Nothing pictured here at H.S. 21+ is impossible in today's environment.



6:30 AM

• Sally Student wakes to the ping of an instant message arriving on her laptop. It's from another student at H.S. 21+ who is working with her on an environmental chemistry project.

•Schoolwork starts early for our hypothetical student, as it must if we are to achieve our objectives. The 180 days times six hours per day that's allowed in most states is simply not sufficient to develop the skills and talents of youth necessary to success in the 21st century. And new communication technologies, such as instant messaging, allow students to be connected with their schoolwork and their colleagues all day, every day.



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6:35 AM

- She researches, from her laptop, the various laws and guidelines on allowable concentrations of PCBs in drinking water. She finds that the U.S. Environmental Protection Agency has set the Maximum Contaminant Level at 0.5 parts per billion.
- •Our student has learned, from her teachers and librarians, how to search effectively the online sources that are increasingly available to her, how to determine the authority and reliability of a source, and how to skim the search results to find the germ of truth that she seeks. And she can do this from home as well as from school.



6:40 AM

 She sends an instant message to the members of her project group, explaining that she saw concentrations of PCBs of 0.7 and 0.8 ppb at times over the last 24 hours. And she attaches a graph of the ups and downs, that she constructed with the spreadsheet program on her laptop.

•From the weather data collected by NOAA buoys at sea, to webcams at highway intersections, real-time data from all over the world is available to anyone who can connect to the right web page. As more and more information is linked to the web, school curricula need to be adjusted to take advantage of it, and to develop student skill in using it.



6:50 AM

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•Sally is a member of a collaborative project group, assigned by her teachers to come up with a solution to an issue of public interest as well as academic importance. The kinds of problems they get, and the ways they work on them, are similar to those in the 21st century world of work. Note that they use instant messaging to share their findings -- they do not wait for a scheduled face-to-face meeting, nor do they limit themselves to text -- whatever media best expresses they idea is what goes over the wire.



6:55 am

• She sends a short report of her findings, with attached data, sources, and graph, to her personal online academic portfolio on the school's web server.

•Student work at H.S. 21+ is seldom handed in on paper. Rather its kept by each student in an online portfolio, a collection of work that provides evidence of learning to their teachers and might later be used for admission to college or interview for a job.



7:00am

After practicing her violin for five minutes, she breakfasts with her mom and dad. She is careful not to drink
any water from the tap.

•Even though she's a thoroughly modern student at an advanced school, Sally and her family know that students from families that share meals together at home experience more success than students who don't. At meals, they often discuss the ideas Sally encounters at school. In fact, the school provides on its web site family discussion questions that tie in to the curriculum.



7:20 AM

On the subway on the way to school she listens to a podcast of last week's debate in the state senate on the Clean Water bill, that she downloaded from the school server.

•H.S. 21+ takes advantage of the information devices that students carry in their pockets, by developing and collecting educational podcasts that provide background and extension to the core curriculum materials. The faculty has learned to use these to extend learning into students' commuting times. In fact, the podcasts are downloaded automatically to their iPods as soon as they connect to the school network.



7:30 AM

The subway is delayed, so she has time to read, from the same iPod, the next chapter of Thoreau's Walden for English class. She downloaded this and many other readings from the school server.

•In addition to providing the full illustrated textbook for each subject online, the school provides an extensive library of electronic texts that can be downloaded to students' laptops or to their iPods, formatted for ease of reading on these ubiquitous portable devices. Like the podcasts, these are automatically downloaded as they are needed in the syllabus.



• 7:55 AM

 At the school library, she meets with two other members of her project group to discuss what they've found over the last two days, and what hey need to do next. She learns that the PCB limit in the Senate bill is set at 0.7 ppb.

•The library at H.S. 21+ is no longer just a place to store books -- it's become the hub of the school, with spaces designed especially to facilitate the small-group project meetings that have become an important mode of learning at the school. Not all communication between students is through instant messaging and email: face-to-face interaction is a key skill academic success and for the world of work.



8:10 AM

In a large-group math class in the small auditorium, Sally learns about statistical sampling techniques in environmental analysis, from a scientist at the EPA in Washington who appears through WebEx connection.

•New desktop videoconferencing capabilities turn any computer at H.S. 21+ into a distance-learning station. Subject-matter experts, guest speakers, and remote teachers make regular appearances in classrooms and at worktables, extending the human resources available to students as they learn. And not all of the classes are small -- many sessions are conducted for large groups of students who all need to learn the same ideas.



8:20 AM

She realizes that her data-gathering from the online probe might not be accurate, because of the small number of sample readings she collected. She questions the scientist in real time over the WebEx connection.

• The statistics concepts she learns in the math class are especially designed to coordinate with the topics and assignments of the science curriculum: it's not by happenstance that Sally's small-group project task requires data-sampling and conclusion-making that calls for certain mathematical understandings, that coalesce in a single day.



8:30 AM

From the auditorium, Sally re-examines the data in her spreadsheet with one of her colleagues in the library, sharing their screens to compare their findings. She begins to re-think her conclusions.

•Students at H.S. 21+ are encouraged to stay in touch with each other and with online resources, even while they are engaged in a lecture or presentation. Multitaskers all, the have learned to carry on these back-channel conversations without disturbing others and without missing essential concepts. In fact, the faculty rewards students who interrupt the class with ideas and resources from the outside.



9:00 AM

In the social studies discussion group, she learns the realities of how a bill becomes a law, with the help of animated diagrams presented by the teacher.

•Teachers at H.S. 21+ use class time to engage students in well-prepared presentations that employ the latest technologies that invoke spirited discussion.

•Though it may seem that Sally enjoys a completely open schedule, in fact her day is organized in a familiar manner:

•8:00		Homeroom
•8:10		Math Lecture
•9:00		Social Studies
•9:55		Math Section
•11:00	English	
•11:55	Lunch	
•12:30	Chemist	try
•1:25		Project Meeting

•2:20 Study

•The difference occurs in the coordination of the curriculum among the subjects, and the key role of the group project.



9:20 AM

Sally sends an instant message to a local senate staffer, double-checking on allowable concentrations of PCB in latest version of the clean water bill.

•Students at H.S. 21+ use the same communication tools that are used in business, government, and higher education, enabling them at any time to tap into community resources that are relevant to their schoolwork.



9:55 AM

Math class begins. sally asks a question about sampling rates in measurement statistics. The teacher connects to the online water quality probe, copies the data into a spreadsheet, and uses the SmartBoard to show the class how to perform a simple test of significance. She copies the formulas to her laptop.

•The math curriculum at H.S. 21+ has shifted toward the kinds of math actually used in science, business, and engineering, such as probability and statistics. It also integrates common software tools and presentation devices, moving away from pencil and paper. Most importantly, it welcomes coordination with the team projects that drive students' work.



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11:00 AM

The English class discusses the chapter of *Walden* they read last night. The teacher brings up a topographical map of the pond area from Google Earth. Following along on her laptop, Sally switches to a satellite view, and notices a factory very near the pond.

•A theme for this semester at H.S. 21+ is the relationship between humans and their environment, and even the English department goes along. It took some time for the English teachers to live with laptops in the classroom, but they have found that the cross-referencing ability of the online environment makes their discussion more interesting.



11:30 AM

She uses FaceBook to locate a student at a school near Walden Pond that's interested in environmental science. She sends a note suggesting a collaborative project to measure PCB levels in the pond.

•H.S. 21+ prides itself on developing students who are selfstarters and resourceful researchers, who use whatever tools are necessary to get the job done and who identify opportunities to extend their studies in new directions. Rather than block students form using social networking systems, the school encourages them to find ways to exploit these systems for academic purposes.



11:55 PM

At lunch, project colleague Xu En-lai connects to the web site of China Daily. She translates for the others at the table the fact that they are considering a guideline for a 0.6 ppb limit on PCBs in drinking water, starting in 2010.

•The online environment at H.S. 21+ encourages access to multilingual and multicultural resources and connections, and encourages students to apply them to their projects.



12:30 PM

Sally finds the chemistry teacher in lab learning to use some new probes and software. She asks to learn more about PCBs are, where they come from, and why they are harmful.

•Teachers as well as students are learners at H.S. 21+. Faculty members do not wait to be "in-serviced" on new technologies in their field; instead they seek out the latest developments and learn how to use them.



12:35 PM

The chemistry teacher suggests a self-paced online course on the EPA's web site, which helps Sally and her group to better understand the scientific and social issues.

•Each department at H.S. 21+ has assembled a directory of online courses and tutorials relevant to their field, to which they send students. They realize that they have neither the time nor the expertise to present in class all that students might need to know, so they exploit these online resources to provide background material to students and to extend their learning in new directions.



1:25 PM

Sally and her team report to their faculty project coach on their progress. He reminds them to save a daily progress report to their academic portfolio, and suggests they focus their study on a single aspect of the proposed clean water bill.

•To bring the disparate areas of the curriculum together, to make learning more relevant to the world around them, and to develop collaboration skills, H.S. 21+ schedules each student into a team project group with a faculty coach, with time allotted for them to work together during the school day. The topics for the team projects are carefully concocted by the faculty to enable contributions for all departments, and to aim at problems and issues in the real world.



1:45 PM

Sally connects to the city online water-quality probe and downloads a much larger sample of readings into her spreadsheet. After applying the statistical tests she learned earlier, she is less sure that the PCB level is dangerous.

•Students in the H.S. 21+ system cannot get out of the eighth grade without knowing how to use the basic productivity software tools such as spreadsheets and word-processors, and to apply them to what they are studying. And when they get to the high school, their teachers seek out opportunities for them to practice these skills.



1:55 PM

She also notices a pattern to this longer string of data points -- it seems to rise and fall over time. She plots it on her spreadsheet. Her teacher suggests she try fitting a curve to the data, and shows her how. It is close to a sine curve, with a period of about six hours.

•The faculty at H.S. 21+ is prepared to deliver just-in-time learning: when a situation arises that demands the application of a new skill or concept, the teacher is ready to teach it. The role of faculty coach to the project groups provides many opportunities for this kind of learning. And the careful design of the group topics helps guarantee that the most important of these ideas rise to the surface.



2:20 PM

Three members of the project team meet in the library during their study period. This will be their last face-toface meeting before tomorrow's presentation of their findings. They discuss the periodic nature of the PCB levels, and realize it times perfectly with the rise and fall of the tide: the PCB levels rise as the tide falls.

•Students at H.S. 21+ know they will be rewarded for discovering new patterns and relationships so they actively seek them out. And the school is designed to provide spaces and scheduled time for students to work together to make these discoveries.



2:30A PM

The team assigns tasks to each other: one will go down to the riverside to capture video of the tide; another will animate the spreadsheet with the sine curve; Sally will record some introductory music from her violin; another agrees to assemble all these pieces into a multimedia podcast.

•Neither the students, the faculty, nor the staff at H.S. 21+ is afraid of the new media. The support students' application of images, video, music, and animation to their work whenever they contribute to the understanding of the topic. And they provide a lending library of devices that make media capture and editing and display possible.



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3:00 PM

At basketball practice, Sally talks with her scrimmage partner, who is doing an internship at the local office of the state senator. The clean water bill is in her committee. Sally explains her group's findings, and promises to send a copy of their podcast tonight as soon as it's done.

•Sports builds a different kind of teamwork and competition that's important to success in the 21st century, and so they are integrated into the program of the school. So are community internships, which are required of all students.



4:30 PM

Before leaving school, Sally finds an open practice room and records a bit of Bach on her iPod, which she will later send to the team member who's assembling the podcast. She chooses a piece whose melody rises and falls, just like the PCB data.

•The arts are also integrated, not just in their own studios, but as part of the rest of the curriculum. Artistic appreciation, composition, and expression are required for all students, since they have proven themselves to be essential elements of academic and career success.



6:30 PM

The first draft of the team podcast arrives in her email. Sally sends a draft copy to her friend at the senator's office, and suggests a few corrections to the assembler. Just before she's called to supper.

•Schoolwork does not end at 3 PM. Students are expected to complete much of their academic work after school hours. They don't call it homework, and it seldom consists of problem sets or repetitive exercises -- it's mostly work on the group project that happens outside of school.



8:00 PM Sally settles in to the novel she's been reading.

•Not everything is online for the students of H.S. 21+. They and their teachers realize that books are best for some kinds of ideas in some settings, and that reading remains the key skill for success.



8:30 pm

The ping of an instant message interrupts her reading. Her basketball buddy says a senate staffer wants to play the podcast at the committee meeting, which is still going on, deadlocked on the issue of PCB levels in the clean water bill. Sally gets the rest of her project team in a video chat window, and they all give permission.

•Students at H.S. 21+ learn to use a variety of tools for collaborative work, including videoconferencing. This not only builds the kinds of skills they will need to succeed in the future, bet enables them to extend their learning beyond the school day.



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10:00 PM

Sally's parents call her in to see the TV news report on the compromise that got the clean water bill out of committee on a 6-4 vote. In the back of the committee room she glimpses a fleeting shot of her animated data plot playing on a senator's iPod.

•Schoolwork takes on a new meaning when it links with what's happening in the world outside of school. Faculty at H.S. 21+ carefully craft the group projects to maximize connection with the important issues of the day.



10:30 PM END

After a short IM chat with her team, Sally sleeps contentedly. But she wondered -- Why would the PCB level vary with the ocean tide?

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