Results from a Survey on

Computer Curricula in US Waldorf Schools

Jamie York, Shining Mountain Waldorf School

Winter 2006

Background

In the Fall of 2005, the College of Teachers at Shining Mountain Waldorf School asked me to find out what other Waldorf schools in the country had for a computer curriculum. This was part of our first review of our new computer curriculum. I decided to survey (via e-mail) the various Waldorf High Schools in the country in order to gather the information.

Method

The survey consisted of six quick questions. Most of those who responded did so via e-mail. A few of the responses (Washington, Kimberton, San Francisco) I typed in after a brief phone or e-mail conversation. The completed surveys are attached at the end of this report.

Participation

Fourteen Waldorf high schools in the country responded. These schools were: Saratoga Springs, High Mowing (Wilton, NH), Santa Fe, Ann Arbor, Austin, Rudolf Steiner (NYC), Sacramento, Shining Mountain (Boulder, CO), Kimberton, Washington, Green Meadow (NY), Massachusetts Bay, San Francisco, Chicago.

Summary of results (Note that 14 schools responded to the survey)

- Number of schools having *no* required computer courses: 5
- Number of schools having *at least one* required computer course: 9
- Number of schools offering *at least three* computer courses: 5
    - Number of schools having a *keyboarding (typing) course*: 5
    - Number of schools having a *intro to computers/applications course*: 4
    - Number of schools having a *circuits course*: 7
    - Number of schools having a *programming course*: 3
    - Number of schools having a *film/graphics course*: 3
    - Number of schools having a *web design/internet course*: 4
    - Number of schools having a *"media" course*: 4
    - Number of schools having a course with a *man & machine theme*: 2
- Number of schools having a dedicated computer lab: 6
- Number of schools reporting that they use a mobile stock of laptops: 3

Some of my Reflections

- Several Waldorf high schools in this country, if not most of them, are struggling with what to do with computers. What is offered varies greatly. Some schools have a relatively mainstream offering of computer courses; other schools' computer courses are very "Waldorf".
- In total there seem to be six schools that have a fairly well developed curriculum. Even with most of these schools I get a sense that their computer curriculum is in flux; next year's offerings may be completely different than this year's. And this seems to have less to do with the rapidly changing technology, and more to with the school's struggling to figure out how computers fit into a Waldorf school setting.
- Of these, only three (High Mowing, Ann Arbor, and Austin) require more than 40 classroom hours of computer study (which is about as much as two main lessons and a bit less than having one course that meets four times per week for a semester). The Austin Waldorf School has the most offerings with 9 required courses totaling about 180 classroom hours.
- Two schools (Steiner School in New York, and Saratoga Springs) have found quite creative ways to work their computer curriculum into their school schedule without it taking up a great deal of classroom time.

Resources

- Bryan Whittle (from Saragota Springs) has written a paper on a computer curriculum which can be found at www.waldorflibrary.org/pg/research/research.asp. Also in February 2002 ASWNA's David Mitchell organized a three-day computer colloquium. The transcript from this colloquium is titled "Colloquium on the Computer and Information Technology", and can be found at www.waldorflibrary.org. John Kirkilis runs the digital arts program in Austin, and can be contacted at john@austinwaldorf.org for more info. Cedar Oliver (High Mowing) has a paper on digital arts posted at http://24hourhtmlcafe.com/cedar.

1. Name of school: **Waldorf School of Saratoga Springs**

2. Name of person filling out survey: Bryan Whittle

3. Does your school offer any computer courses? Yes

4. a) Name of course: <u>Computing Machines</u>

   b) Theme and topics of the course:

Themes: (1) show how computing machines have evolved, (2) show how the relationship between people and computing machines has evolved, and (3) give insight into modern machines.
Course description (this year): We made ancient style abaci from clay; 16th century Napier's rods from wood; 18th century human computing teams, using division of labor to "manufacture" numbers; a 19th century Morse code signaling circuit to introduce binary systems; 19th century Boolean functions of AND, OR, and NOT using first batteries with light bulbs and then transistor circuits; plus a 20th century transistor-based adder. We learned to operate each device, characterized its computational advantage, and identified its limitations. Last we took a tour of personal computer subsystems, guided by what we had learned so far. By comparing machines in transparency of operation, power of operation, and extent of human delegation we were able to see into historical trends in the relationship between people and computing machines.

   c) Grade level of students taking the course: 10th

   d) Is the course required or an elective? Required part of practical arts.

   e) How often and for how long does the course meet? 2 double periods for 6 weeks.

   f) Has the course been successful? In what way? Making working instruments seems satisfying. The social side of human computing teams and Morse code signaling is enjoyed. The circuits become very difficult for some to follow – per my AWSNA curriculum I see 11th grade as a better match but we cannot fit that into our curriculum. Out of this progression through simpler machines the students seem to come to appreciate the power, inscrutability, limitations, and extent of human dependence on modern computers.

a) Name of course: <u>Computing and Human Evolution</u>

   b) Theme and topics of the course:

Course description (last year): A motif of this senior year has been to look for a synthesis of all that has been experienced by the students up to this point, both individually and throughout humanity, and to catch glimpses of the future of their own lives and that of civilization. We combined elements of computer science and human biological evolution in order to explore important questions about our future while being grounded in both individual areas. We examined several aspects of how technological advancements increasingly blur the boundary between humans and machines. From computer science we experienced examples of "intelligence" exhibited by contemporary computing machines, individually developed and analyzed an algorithm as the basis for such intelligence, and individually coded a "poetry maker" in Microsoft Q Basic programming language. From the biological side, we studied the basic processes involved in evolution, the DNA genetic code, the record of human brain capacity, and human-machine prosthetic interfaces. The two sides were interwoven such as when exploring "life-like" evolutionary algorithms with a visiting practitioner and when assessing the differential fitness of computing machines and human intelligence for diverse tasks. The course concluded with an essay as an opportunity for a personal synthesis of thoughts on computing and human evolution.

   c) Grade level of students taking the course: 12th

   d) Is the course required or an elective? Required.

   e) How often and for how long does the course meet? 4 single periods for 6 weeks.

   f) Has the course been successful? In what way? The students are interested in the Turing Test and concrete exercises where the human-machine distinction is difficult to make; they are also interested in judgment calls concerning what combination of person and machine can and should be used for a task. The students find designing an algorithm and then "making it work" through programming satisfying. The students find the computing-biology combination intriguing; I would say they are genuinely interested in how information technology, genetic engineering, and nanotechnology can be combined to create new possibilities.

   g) Is the instructor of the course a full-time teacher? Yes.

5. Does your school have a dedicated computer lab? No.

6. Other comments about your computer curriculum: These two courses are based on a computing curriculum developed by Bryan Whittle – a 60-page two part paper is available in electronic form from http://www.waldorflibrary.org/pg/research/research.asp and print-on-demand form from the Association of Waldorf Schools of North America. The biological evolution component is added by our life sciences teacher.
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1. Name of school: **Rudolf Steiner School of Ann Arbor**
2. Name of person filling out survey: Alex Perrin
3. Does your school offer any computer courses? Yes
4. a) Name of course: Typing
   b) Theme and topics of the course: Mavis Beacon Typing software
   c) Grade level of students taking the course: 9
   d) Is the course required or an elective? Required
   e) How often and for how long does the course meet? 3x/week for 1st quarter
   f) Has the course been successful? In what way? Yes, it teaches students to type
   g) Is the instructor of the course a full-time teacher? No

   a) Name of course: Introduction to Computers
   b) Theme and topics of the course: Windows, Word & Excel
   c) Grade level of students taking the course: 9
   d) Is the course required or an elective? R
   e) How often and for how long does the course meet? 3x/week for 2nd quarter
   f) Has the course been successful? In what way?
   So far. The students acquire basic computer skills.
   g) Is the instructor of the course a full-time teacher? N

   a) Name of course: Intro to Computer Science
   b) Theme and topics of the course: How computers work: Systems & Algorithms, Binary numbers and Logic Circuits
   c) Grade level of students taking the course: 11
   d) Is the course required or an elective? R
   e) How often and for how long does the course meet? 3x/week for 1st quarter
   f) Has the course been successful? In what way? Hard to say. Very challenging course taught at a college level. Students learned difficult material, but its applicability is questionable.
   g) Is the instructor of the course a full-time teacher? N

   a) Name of course: Intro to Computer Programming
   b) Theme and topics of the course: Programming in HTML and Javascript
   c) Grade level of students taking the course: 10
   d) Is the course required or an elective? R
   e) How often and for how long does the course meet? 3x/week for 2nd quarter
   f) Has the course been successful? In what way? Don't know yet -- in process.
   g) Is the instructor of the course a full-time teacher? N

   a) Name of course: Intro to the Internet
   b) Theme and topics of the course: Internet exploration, discussion, Web page construction.(may change)
   c) Grade level of students taking the course: 12
   d) Is the course required or an elective? R
   e) How often and for how long does the course meet? 3x/week for 3rd quarter
   f) Has the course been successful? In what way? Not sure, not yet begun.
   g) Is the instructor of the course a full-time teacher? N
5. Does your school have a dedicated computer lab? Yes
6. Other comments about your computer curriculum: It will be reviewed and evaluated in detail this year. Maintaining the computer lab is difficult because of the expense and there are significant concerns with this.

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1. Name of school: **High Mowing School**
2. Name of person filling out survey: Dick "Cedar" Oliver
3. Does your school offer any computer courses? We don't call them that, but we offer courses where computers are often used.
4. If yes to #3, then for each course please give the following information: NOTE THAT SOME DIFFERENT COURSES ARE OFFERED EACH YEAR DEPENDING ON THE NEEDS AND INTERESTS OF STUDENTS ENROLLED AT THAT TIME.

a) Name of course: <u>Media Literacy</u>
b) Theme and topics of the course: Basic media communication skills, awareness of media culture and economy
c) Grade level of students taking the course: 9th
d) Is the course required or an elective? required
e) How often and for how long does the course meet? one semester, 2 to 3 one -hour sessions per week
f) Has the course been successful? In what way? This was the first year. It convinced me to revise it but definitely offer it again.
g) Is the instructor of the course a full-time teacher? yes

a) Name of course: <u>Information Technology</u>
b) Theme and topics of the course: Wiring logic gates, memory, how a microprocessor works
c) Grade level of students taking the course: 10th
d) Is the course required or an elective? required main lesson block
e) How often and for how long does the course meet? 1.5 hours five days a week for three or four weeks
f) Has the course been successful? In what way? Yes, though it is very challenging for some students
g) Is the instructor of the course a full-time teacher? yes

a) Name of course: <u>Modern Math & Logic</u>
b) Theme and topics of the course: 20th century math, with an emphasis on mathematical logic and fractal geometry/chaos theory
c) Grade level of students taking the course: 12th
d) Is the course required or an elective? required
e) How often and for how long does the course meet? 1.5 hours five days a week for three or four weeks
f) Has the course been successful? In what way? Yes, though I do it differently every year to meet the specific senior class. Includes historical origins of the computer as an idea.
g) Is the instructor of the course a full-time teacher? yes

a) Name of course: <u>Research Science & Engineering</u>
b) Theme and topics of the course: Experimental lab science and technology engineering projects designed and built by students (many projects--not all--involve use of computers)
c) Grade level of students taking the course: 11th and 12th
d) Is the course required or an elective? elective
e) How often and for how long does the course meet? 2 to 3 one- or two-hour sessions per week. Can be taken for a semester or a year
f) Has the course been successful? In what way? This specific course is new this year, but we offer similar courses every year
g) Is the instructor of the course a full-time teacher? yes

a) Name of course: <u>Filmmaking</u> (beginner and advanced levels)
b) Theme and topics of the course: Scriptwriting, production and editing of digital films
c) Grade level of students taking the course: 9th through 12th
d) Is the course required or an elective? elective
e) How often and for how long does the course meet? 2 to 3 one- or two-hour sessions per week. Can be taken for a semester or a year
f) Has the course been successful? In what way? Yes. This extremely popular course deepens many skills, especially the sense of timing
g) Is the instructor of the course a full-time teacher? yes

a) Name of course: <u>Graphics</u> (beginner and advanced levels)

b) Theme and topics of the course: Digital photography, graphics design, animation, some graphics programming

c) Grade level of students taking the course: 9th through 12th

d) Is the course required or an elective? elective

e) How often and for how long does the course meet? 2 to 3 one- or two-hour sessions per week. Can be taken for a semester or a year

f) Has the course been successful? In what way? Yes. This very popular course is tailored to the group and individual developmental needs

g) Is the instructor of the course a full-time teacher? yes

5. Does your school have a dedicated computer lab? We have a block-sized classroom also equipped with 13 networked workstations and audiovisual equipment

6. Other comments about your computer curriculum: We intentionally don't have a "computer curriculum" other than the one Information Technology block. We do have a strong media and communications curriculum that is integrated with our traditional arts programs. For example, we teach traditional black-and-white chemical photography and also digital photography. We teach both stage acting and film acting (sometimes together in one course, sometimes separately). Computers are also used quite heavily in our science & engineering tracks and senior math block, though the point of these classes isn't to teach "computers" but to learn about subjects where information technology is necessary or helpful.

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1. Name of school: **Santa Fe Waldorf High School**

2. Name of person filling out survey: Greg Shultz

3. Does your school offer any computer courses? Yes.

4. If yes to #3, then <u>for each course</u> please give the following information:

a) Name of course: <u>Keyboarding</u>

b) Theme and topics of the course: By the beginning of 10th grade students should be able to touch-type a computer keyboard. A good program for this is the Mavis Beacon typing course that operates right on the computer. Use of this program can begin in 9th grade or during the summer between 9th and 10th grades.

c) Grade level of students taking the course: 9

d) Is the course required or an elective? Required by the English Department.

e) How often and for how long does the course meet? Students use the Mavis Beacon typing application during the summer between 9th and 10th grades.

f) Has the course been successful? In what way? Yes. All students have learned to touch-type on the keyboard.

g) Is the instructor of the course a full-time teacher? Yes. She’s a full-time English teacher.

a) Name of course: <u>Using the Personal Computer</u>

b) Theme and topics of the course: Most students either have their own personal computer or have access to their parents’ PC or one at the school. Windows XP and Apple OSX are now quite similar in many of their basic desktop and file organizing features; students can learn to use either environment and acquire similar skills. The most commonly used application on the computer is a word processing application, and of these, Microsoft Word is the most widely used. Microsoft Word is available for both the Windows and Apple operating systems. The current versions of Word, when run on the current Windows or Apple operating system, do not require translation from one operating system to another. This means the current version of Word for Windows functions nearly identically to the current version of Word for the Mac, and students may use either version with equal results. This particular course shows students how to manage their desktop and filing system, name and save files, send and receive e-mails with attachments, save files to media (hard drives, Zip discs, floppy disks, CDs, etc.), print documents, and use Microsoft Word for their word processing needs. Students will also learn how to care for their equipment (laptop, media, printer, etc.) and protect their computer from malware (viruses, adware, etc.), bugs, spam, and disk problems, and other maladies.

c) Grade level of students taking the course: 10

d) Is the course required or an elective? It has not yet been offered, but when it is it will be required.

e) How often and for how long does the course meet? We haven’t worked this out yet.

f) Has the course been successful? In what way? N/A

g) Is the instructor of the course a full-time teacher? We don't know yet who will teach this course, but we have several candidates.

a) Name of course: Logic Gates and Computing

b) Theme and topics of the course: Students are now fairly familiar with the use of their PC's desktop and operating system, saving to removable media, using a word processing application, e-mailing attachments, and printing documents. Now the students learn about the binary logic behind their computer. Students examine the properties of logic and its application in performing calculations, particularly those involving the use of binary numbers. If…then… propositions using not, and, or, and other operands are explored mathematically and by using physical devices to carry out operations using these logical expressions. Among these are water flows, electrical relays, and transistors (integrated circuits). Truth tables and circuit diagrams are used to develop logic gates using integrated circuits to perform simple binary operations. From this a half adder is constructed, and then an adder. The course ends with an overview of how these principles and materials are used to create computers.

c) Grade level of students taking the course: 11

d) Is the course required or an elective? Elective

e) How often and for how long does the course meet? Four 90-minutee periods per week (afternoons) for three weeks.

f) Has the course been successful? In what way? Yes, it was. The students were amazed that in the end they had constructed a simple computational device, and yet this represented but a minute fraction of what takes place in the CPU of a personal computer. They could compare a half adder built from electrical relays—large and clumsy but very visual with enjoyable clicking sounds—to one built from transistors—now much smaller and elegant but devoid of any sensory content—to one built from integrated circuits, which showed the progression away from sense-experience to purely conceptual experience. We also made a binary adder using running water to help us see that electricity is not the only thing one can use to construct logic gates. With more time, we could have built logic gates from Lego's, as well, showing a mechanical perspective.

g) Is the instructor of the course a full-time teacher? Yes. I taught this course, and am a full-time math and science teacher.

a) Name of course: Computer Languages

b) Theme and topics of the course: Building on the students' knowledge of computer use and binary computing, they begin to learn about computer programming languages. After an over view, students begin to learn Java, which is the language currently recommended and in use by most high schools. Students examine the properties of the codified languages employed to program a computer at the level of the operating system and in the writing and compiling of applications. The interrelationships between hardware and software are explored. A computer programming language (Java) is studied and applied to the development of one or more applications; students learn to use debugging techniques.

c) Grade level of students taking the course: 12

d) Is the course required or an elective? Elective

e) This course has not yet been offered, nor have we identified anyone to teach it.

5. Does your school have a dedicated computer lab? No. Every time we get ready to plan one, the technology progresses, especially with wireless and broadband connectivity, CPU development (Apple's plan to use Intel chips), OS development (Window's new OS that we haven't seen yet), and security, both with students as well as with the Internet. We think one more year of development will bring out the new systems, which will, of course, continue to progress, but we will set up anyway.

6. Other comments about your computer curriculum: The 9th and 10th grade courses are practical courses for how to properly use the personal computer. Many students have problems using their computers: losing files in the chaos of their desktop; not attaching files in e-mails; having no idea how to back-up data or burn it to a disk; etc. The whole question of students using computers to compose and print assignments and the parallel problem of plagiarism off the Internet remain as living questions with the faculty.

The 11th and 12th grade courses are computer technology courses. The grade 11 course on logic gates and computing develops the topics from the ground up, so to speak, by working from logic itself, then to truth tables and logic gates, and from there to the wedding of logic gates to binary math to create computational devices. This process leads the students through the phenomenology and concepts to the paradigm or gestalt of computing with logic gates. The intention of the grade 12 course is to introduce students to computer languages as the software equivalent of how we examined the hardware equivalent in grade 11.

1. Name of school: **Austin Waldorf School**
2. Name of person filling out survey: ***John Kirkilis***
3. Does your school offer any computer courses? ***Yes***
4. If yes to #3, then <u>for each course</u> please give the following information: ***see Additional Pages***
5. Does your school have a dedicated computer lab? ***Yes***
6. Other comments about your computer curriculum:
   - When our high school began in the Fall of 2000, our fledgling computer curriculum was taught by our very capable math teacher. As we started to fill each grade, it became clear that his math teaching load would not allow him to deliver the computer classes. The high school chair convened a meeting at a local restaurant with school parents in the high-tech community and asked what it would take to create a "state-of-the-art" computing curriculum that resonated both with Waldorf pedagogy as well as Austin's high-tech demographic. One of the parents just so happened to be a VP at Dell and put down the money to start the process including a part-time salary for a computer teacher for 2 years, new computers, and an endowment to keep up with ongoing expenses. If the high school chair hadn't called that restaurant meeting and laid out a bold challenge, we would most likely be nowhere near where we are today.
   - The first two teachers we hired were total disasters. I was in the midst of taking a year off to consider what I wanted to do with the second half of my professional life, after having worked for 20 years in the software industry. The same high school chair found a way to bring me in as a full-time employee by having me serve as the school's systems administrator as well. We've since outsourced that role now that I have a full-time teaching load. The school absorbed the teacher's salary into the operating budget after the first two years.
   - Our Eurythmy instructors work with a maximum of 15 high school students in any one period, which also happens to be the current capacity of the computer lab (825 sq ft). While half a class is taking Eurythmy, the other half is in computer class twice a week for 45 minutes. It can be difficult to maintain momentum when meeting only twice a week for a single period, which is why I'm experimenting with web-based collaboration software so I can maintain an ongoing dialogue with my students between classes. This year, we also started to require that our 10th graders install our Java IDE on their home computer so that they can practice their programming skills through homework outside of class. I also have a hope that it will supplant some of their mindlessly recreational uses of their home computers, not the least of which is MySpace.
   - Another important step in creating room in the daily schedule for computer classes was to jettison all study halls except for 9th grade. We found that a very small percentage of students actually used them productively. No other pedagogical program had to suffer to make room for the computer curriculum. The final scheduling piece fell into place when we started offering electives, one in the fall and one in the spring, which allowed for special topics to be offered and which met for 90-minute periods instead of 45.
   - Although I've been teaching now for five years and sent my daughter to AWS for twelve, I am not a trained high school Waldorf teacher with certification. I've attended study groups and done some of my own reading, but I cannot yet wax esoteric about my subject area, which somehow reassures some of the nervous parents who work in engineering fields. I spent 20 years in the corporate high-tech arena, so I tend to speak their language.
   - To determine which topics belonged in which grade, I relied upon the general themes of each high school grade. Ninth grade focuses on polarity, so information theory and digital circuits were a natural fit. Tenth grade's theme is process & relationships - how things work, so computer architecture and programming were a great fit. Identity is the theme of 11th grade, so digital self-portraits provided a surprisingly introspective way for students to present themselves. I've had to put constraints on the portrait project to keep the boys from avoiding the honest introspection. You can view some of these

portraits at http://www.awslab.org/coppermine. Twelfth grade's theme is World Consciousness, so taking on an issue in the community and publishing a study through a variety of media seemed relevant. Conversely, we also explore how mass media tries to target the students' demographic.

- In the Austin area at least, there's a misconception that a Waldorf school is a "hippie art school". Having a comprehensive computer curriculum and a dedicated up-to-date computer lab and science lab helps offset that myth in an easily discernible manner. There's also the issue of retaining top students interested in technical fields. We have magnet schools in Austin that can be very attractive to students and parents who think that specialization even at the high school level is what they need. A tangibly strong computer, math and science curriculum can help mollify that knee-jerk desire. We all know that it's not about the gear. The ability to inspire and enlighten in a heart-warming manner doesn't have anything to do with hardware, but it doesn't hurt from a pure marketing perspective. (Is my corporate slip showing?)

- Integrating a comprehensive computer curriculum into a Waldorf High School is not a straightforward matter. The Waldorf pedagogy and the established courses of study are the clear priority. In the allotment of class time that's been devoted to the computer curriculum, we've tried to provide the students with a wide variety of learning experiences in the use of digital technologies and which also reinforce the pedagogical themes of each grade. The goal is to help students marshal their ability to think creatively, critically, and mindfully and we see that it's the task of our Digital Arts & Sciences curriculum to help students create a healthy working relationship with digital technologies that can support them in their noble pursuits; in other words... the application of good taste, good judgment and appropriate technology in the fulfillment of good deeds.

Computer Lab Infrastructure

Shared

- Color Laser Printer, Photo Quality Inkjet (up to 13x19" prints), Scanner, LCD Projector
- File Server with accounts for each student
- Gigabit Ethernet & Wireless Access in the lab, fiber-optic between buildings
- 2 TB Digital Video Storage
- Lab Management Software to clone drives over the network, blank screens, disable keyboards, disable Internet access, broadcast teacher or any workstation display to all other workstations

15 student workstations

- 2.6 - 3.0 GHz IBM Think Centre Towers *(donated by a parent working at IBM)*
- 17" to 19" flat panels and 20" CRT Displays (*most donated by a parent)*

- Over this coming summer, the *uBuntu* Linux distribution will be installed on all workstations in a dual-boot configuration. A migration to open source software will take place over the coming year so students aren't raised in a monoculture of one vendor's products.

- The high school sponsored a computer/electronics recycling drive and collected over 3 tons of equipment. This provided an opportunity for the students to become aware of the full life-cycle of manufactured products and the toxic substances that are commonly used in CRTs, plastic cases, and PCBs.

- The lab now has its own hosted web presence to keep it separate from the school's web hosting service. The open source online learning platform, Moodle, has been deployed on this site to support online collaboration between teacher and student outside of the classroom for all Digital Arts & Sciences blocks.

- One full-time faculty member is devoted solely to delivering the Digital Arts & Sciences program.

- Typing Instruction is provided by the school using a web-hosted service from TypingMaster.com. After an initial 45 minute orientation, students are expected to attain a minimum level of proficiency (25 accurate words per minute) on their own time as a graduation requirement. The service can be accessed from the students' homes or any Internet-connected computer. We used to offer it as a class, but found that there was little that Waldorf pedagogy could bring to the skill of typing and that we should better leverage our time. We also made a conscious decision to stay away from videogame-like typing software such as Mavis Beacon and most others.

Courses Offered at the Austin Waldorf School

a) Name of course:	***Foundations of Digital Communication and Computation***
b) Theme and topics of the course:	Theme: Polarity, Question: WHAT? **Part One:** Study the basics of Claude Shannon's Information Theory and learn why the polarity of the binary number system emerged as the foundation of digital communication and computation, and why the encoding and decoding of information can be viewed as the basis for all communication from prehistoric times to the present. We studied encoding schemes, checksums, lossy vs. lossless compression. And encryption. **Part Two:** Explore the difference between reality, an analog representation of that reality, and finally a digitized representation by using the phenomenon of sound as the focus. Te entire analog to digital process is covered including quantization, sample rate, resolution and channelization. **Part Three:** Boolean Algebra, logical vs. physical circuit diagrams. Review basic logic operations taught in 9th grade math class (AND, OR, NOT) and add XOR, BUFFER, NAND, NOR, and XNOR operations. The students design, build and test digital circuits to compare and add numbers using digital logic lab kits.
c) Grade level of students taking the course:	9th Grade
d) Is the course required or an elective?	Required
e) How often and for how long does the course meet?	Taught as a skills class (not mainlesson). One semester (16 weeks) two 45-minute periods per week
f) Has the course been successful? In what way?	Yes
g) Is the instructor of the course a full-time teacher?	Yes

a) Name of course:	***Computer Programming***
b) Theme and topics of the course:	Theme: Process, Parts, Relationships Robotic role-play group exercise to discover the need for and benefit of variables, functions, parameters, conditional statements and looping constructs. Object-oriented Programming with Java. Modeling classes of objects by analyzing their attributes and actions. Initial foray revolves around graphics programming while the majority of the semester uses robotics as the programming focus.
c) Grade level of students taking the course:	10th Grade
d) Is the course required or an elective?	Required
e) How often and for how long does the course meet?	Taught as a skills class (not mainlesson). One semester (16 weeks) two 45-minute periods per week
f) Has the course been successful? In what way?	Yes
g) Is the instructor of the course a full-time teacher?	Yes

a) Name of course:	***Computer Architecture***
b) Theme and topics of the course:	Theme: Process, Parts, Relationships, Question: HOW? **Part One:** disassemble a PC and all of its constituent components providing opportunities to understand the speed vs. cost vs. capacity trade-offs amongst various storage media and how step-down transformers, optics, motors and electromagnetism are harnessed to produce a machine which is capable of carrying out a wide variety of tasks **Part Two:** write simple assembly language programs using a computer simulator with a pedagogically-driven instruction set. Students learn how to use conditional branching and repetive loops. Students learn how the arithmetic logic unit, program counter, instruction register, accumulator, mux, decoder and RAM are conparticipate in the orchestrated fetch-increment-decode-execute cycle of a CPU. *We've received permission from the authors to take their Java source and enhance the CPU simulator to fit our needs.*
c) Grade level of students taking the course:	10th Grade
d) Is the course required or an elective?	Required
e) How often and for how long does the course meet?	Taught as a skills class (not mainlesson). One semester (16 weeks) two 45-minute periods per week
f) Has the course been successful? In what way?	Yes
g) Is the instructor of the course a full-time teacher?	Yes

a) Name of course:	***Digital Imagery***
b) Theme and topics of the course:	Theme: Identity: Questions: WHO? During the digital imagery topic, students are introduced to the foundations of bitmap images and learn how visual images are represented using various color models ultimately encoded in binary numbers. Students learn how resolution, bit depth, and image size influence the final image. Once the key concepts were studied, the lab portion of the block focused on learning how to use Adobe Photoshop to alter existing images and finally how to create an original composition. For the final project, each student is asked to leverage their artistic sensibilities to create an introspective digital self-portrait.
c) Grade level of students taking the course:	11th Grade
d) Is the course required or an elective?	Required
e) How often and for how long does the course meet?	Taught as a skills class (not mainlesson). One semester (16 weeks) two 45-minute periods per week
f) Has the course been successful? In what way?	Yes
g) Is the instructor of the course a full-time teacher?	Yes

a) Name of course:	***Digital Networks and Applications***
b) Theme and topics of the course:	Research everything that happens from the time a link is pressed on a web page until the page appears on their display, including the role of switches, routers, protocols such as HTTP, TCP, IP, and finally to the physical layer where the rubber hits the road in the form of electronic, fiber-optic, or wireless pathways. Geographical Trace Routes are employed to plot the path of a web request across the Internet. Backbone bandwidth capacities of major providers are plotted and analyzed. Students use vector-based drawing software to create block diagrams of computer networks. In contrast to bit-mapped images, students will learn how to work with object-oriented graphics programs to create images and study the pros and cons of each type of image representation. Students will learn how to use bezier curves, layering, transparency, scaling, duplication, and rotation to create images for a variety of purposes. Their work is presented using presentation software, web-site tools, advanced word processing, page-layout and animation software. The data model behind presentations, slides and topics, are quickly learned and students understand 80% of the useful capabilities of computer-assisted presentations within an hour. Students are asked to read several articles and transcripts of Internet-based discussions on the pros and cons of computer-assisted presentations. We studied why some companies and events have banned the use of such tools since it tended to change the nature of discourse in several arenas from conversation to presentation.
c) Grade level of students taking the course:	11th Grade
d) Is the course required or an elective?	Required
e) How often and for how long does the course meet?	Taught as a skills class (not mainlesson). (6 weeks) two 45-minute periods per week
f) Has the course been successful? In what way?	Yes
g) Is the instructor of the course a full-time teacher?	Yes

a) Name of course:	***Computer Aided Design***
b) Theme and topics of the course:	The students use a Computer-Aided Design software package to design living spaces or mechanical objects. Students work with both two-dimensional and three-dimensional tools. Students survey and measure actual structures and landscape on campus, at home, or elsewhere in Austin and produce 3D models. Students may also build miniature models from their designs developed on the computer.
c) Grade level of students taking the course:	9 to 12
d) Is the course required or an elective?	Elective
e) How often and for how long does the course meet?	Fifteen 90-minute periods over a 6 to 8 week timeframe
f) Has the course been successful? In what way?	Yes
g) Is the instructor of the course a full-time teacher?	Yes

a) Name of course:	***Digital Media Studies***
b) Theme and topics of the course:	The purpose of this new block is to empower the students to communicate responsibly and powerfully through a variety of digital media including web-site design, print, digital audio, and digital video. Our goal is for each student or perhaps groups of students to select a non-profit organization or humanitarian subject and develop a treatment for print, web, radio, and video. In addition to learning how to use media, the students will engage in a study of how the media of our popular culture influences their view of themselves and the world. The impact of the invention of the printing press, telegraph, radio, television, and the Internet will be studied to understand the impact of each medium on the structure of human discourse. Students will read and write critical essays that explore the impact of the Internet on a wide range of human virtues and vices. Last year, students offered essays on Plagiarism, Free Speech, Family Relationships, Identity Theft, Privacy, Internet Addiction, and Copyright issues. The theme of the twelfth grade is World Consciousness, so it is fitting that we ask them to study an issue in the world today and to prepare powerful treatments of that subject through a variety of media. We also hope to deepen their understanding of the technology behind the art of saying something that is compelling, thought provoking, and moving through digital media.
c) Grade level of students taking the course:	12th Grade
d) Is the course required or an elective?	Required
e) How often and for how long does the course meet?	Taught as a skills class (not mainlesson). One semester (16 weeks) two 45-minute periods per week
f) Has the course been successful? In what way?	Yes
g) Is the instructor of the course a full-time teacher?	Yes

a) Name of course:	***Digital Music Composition***
b) Theme and topics of the course:	Students leverage their knowledge of music to produce original works on the computer using MIDI (Musical Instrument Digital Interface) instruments, synthesized audio, and sampled audio. Music sequencing software will be used to arrange multiple tracks of audio. Students will use MIDI keyboards to record, arrange, and produce music. This block has been offered as an elective along with the Music department.
c) Grade level of students taking the course:	9 to 12
d) Is the course required or an elective?	Elective
e) How often and for how long does the course meet?	Fifteen 90-minute periods over a 6 to 8 week timeframe
f) Has the course been successful? In what way?	Yes
g) Is the instructor of the course a full-time teacher?	Yes

a) Name of course:	***Information Management: Data Modeling, Storage, and Retrieval***
b) Theme and topics of the course:	The block begins by polling the students for their current understanding of the word "database" and asking them to offer examples of where they believe information on themselves and their family is kept. We study drivers licenses, doctor bills, phone bills, and other artifacts to reverse-engineer the data model institutions such as the Department of Motor Vehicles, the Auto Insurance company, the Social Security Administration, and their bank use to capture and track information. Students learn how to design their own databases by coalescing units of information into entities and attributes through an informal approach to third-normal form. Once the concepts of data partitioning are established, the students examine and build several small databases and learn how to manage, sort and filter information in a relational database.
c) Grade level of students taking the course:	11th Grade
d) Is the course required or an elective?	Required
e) How often and for how long does the course meet?	Taught as a skills class (not mainlesson). (6 weeks) two 45-minute periods per week
f) Has the course been successful? In what way?	Yes
g) Is the instructor of the course a full-time teacher?	Yes

a) Name of course:	***Word Processing& Page Layout***
b) Theme and topics of the course:	By the time a student reaches high school, they've already used word processing software. Our focus in the high school is to learn how to create well-structured word-processing for a variety of applications. Rather than learn by rote the location of menu and toolbar items, the students probe the data model behind the word processing software. Once the concepts of characters, words, paragraphs, pages, and sections are understood, the students then study the commands that operate on those constructs. This is consistent with the object-oriented paradigm that will be taught in the Computer Programming blocks. The students will create different types of documents that utilized character and paragraph formatting, page breaks, headers/footers, images, margins, tabs, and tables.
c) Grade level of students taking the course:	11th Grade
d) Is the course required or an elective?	Required
e) How often and for how long does the course meet?	Taught as a skills class (not mainlesson). (8 weeks) two 45-minute periods per week
f) Has the course been successful? In what way?	Yes
g) Is the instructor of the course a full-time teacher?	Yes

a) Name of course:	***Numerical Analysis***
b) Theme and topics of the course:	Using Rainwater Collection as our study. Students measured the square footage of the high school buildings, developed usage models, incorporated monthly rainfall statistics, and conducted what-if scenarios to better understand how rainfall amounts, collection area, storage capacity, and usage models contribute to the entire system. This experience solidified our plans to base as much of our instruction on real applications versus canned lesson plans based on hypothetical examples. At first it seemed odd for students in a computer class to be measuring the dimensions of the roof area of the buildings on campus, but it grounds them in the discipline of leveraging information technology to solve real problems. To support the students in deepening their ability to apply numerical analysis, the students were asked to choose a topic for which they felt a personal interest or connection, and to analyze it by harvesting and analyzing numerical data. Examples included analyses on The Spread of AIDS, Weather Patterns, Collegiate Graduation Rates and Athletics, Endangered Species, and Elective Cosmetic Surgery in the Unites States.
c) Grade level of students taking the course:	11^{th} or 12^{th} Grade
d) Is the course required or an elective?	Required
e) How often and for how long does the course meet?	Taught as a skills class (not mainlesson). (8 weeks) two 45-minute periods per week
f) Has the course been successful? In what way?	Yes
g) Is the instructor of the course a full-time teacher?	Yes

a) Name of course:	***Web Site Design & Programming***
b) Theme and topics of the course:	Students design and build both static and database-driven websites using HTML, CSS, JavaScript, Ajax, PHP and SQL. Three teams of four students each focus on a separate area of expertise. One group specializes in digital photography, graphics and video. The second group focuses on CSS-based web design and the third group learns server and client-side programming and database access.
c) Grade level of students taking the course:	9 to 12
d) Is the course required or an elective?	Elective
e) How often and for how long does the course meet?	Fifteen 90-minute periods over a 6 to 8 week timeframe
f) Has the course been successful? In what way?	It is being offered in this form for the first time this semester.
g) Is the instructor of the course a full-time teacher?	Yes

1. Name of school: **Rudolf Steiner School (New York City)**
2. Name of person filling out survey: Marisha Plotnik
3. Does your school offer any computer courses? Yes
4. If yes to #3, then for each course please give the following information:

7th & 8th Grade: Keyboarding

- Students use the program Mavis Beacon Teaches Typing to learn keyboarding skills.
- The class takes place in a 6 or 8 week block, one block per year, twice per week for about 30-40 minutes per class.
- It is required of all students.
- It is taught by full-time faculty and staff.

9th Grade: Introduction to our network

- The first two weeks of math track class in 9th grade includes having the students, in small groups, introduced to our computer network: usernames, passwords, saving files, printing, folders, available programs, etc. Required, taught by full-time faculty and staff.

10th Grade: Main Lesson – "computation"

- This is a main lesson that has been evolving. When taught by our chemistry teacher, Rich Turner, it was primarily a main lesson in the development of computing devices, mostly from a "how does the hardware work" point of view: from Napier's Bones through vacuum tubes machines to the modern computer. Now it is taught by our math teacher, Dan Marsch, and it primarily focuses on the thoughts of those machines: logarithms, number bases, binary addition, etc.

11th Grade: Solid-state circuitry work

- A two/three week block in the 11th grade math track class (5 days per week 40 min per day) is devoted to circuitry work on breadboards. From lighting an LED through transistors, logic circuits with transistors, then using IC's to create a full binary adder: In great years, we connect the adders together to form a multi-bit (12? 15?) adder. Much fun. Taught by me.
- Also, graphing calculators are introduced this year, during a different block in the track class (maybe 2/3 week block). Primarily the programming capabilities are explored, to investigate, for example, convergence of infinite series. This then sometimes moves into similar work with QBASIC.

12th Grade: Programming Elective

- There has not been student demand for this year-long course in several years, but we have offered it.
- It has usually been staffed by a part-time teacher.

5. Does your school have a dedicated computer lab?

We have two mobile computer labs: locked carts each containing 12 laptops. This is an excellent solution to the hardware problem! We also have multi-media capabilities (overhead projector with dedicated computer) in several classrooms.

6. Other comments about your computer curriculum:

We have unusually rich resources at our school, primary among which are a full-time Technology Coordinator and a full-time Network Administrator

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1. Name of school: **Sacramento Waldorf School**
2. Name of person filling out survey: Andrew Silvert
3. Does your school offer any computer courses? Yes.
4. If yes to #3, then for each course please give the following information:
   a) Name of course: Computer Literacy
   b) Theme and topics of the course: No set curriculum. Completely left up to the teacher to decide what to teach. Not integrated with the rest of the school (in my opinion). Current curriculum consists of keyboarding instruction, use of powerpoint to present a pro/con presentation on a technology related topic, and a software application presentation on a program of each student's choosing. I am also adding a financial literacy component to the course in which the students will learn to build financial spreadsheets.
   c) Grade level of students taking the course: 11th grade.
   d) Is the course required or an elective? Required. Our high school does not offer electives.
   e) How often and for how long does the course meet? Twice a week for 50 minutes. Last year this course was taught as a trimester course. This year, it is a semester.
   f) Has the course been successful? In what way? That is hard for me to guage as I am in my first year. However, I would say that moving forward, the course curriculum needs to be explored and evaluated as a whole school effort and that computer skills needs to be offered in 9-12th grade, not just as one class in 11th grade.
   g) Is the instructor of the course a full-time teacher? No, I am not. The previous teacher was full-time until she gave up teaching this class. She had been teaching it for the past five years.
5. Does your school have a dedicated computer lab? Yes, up until just a few months ago, the lab consisted of 20 5-8 year old networked PCs that had become too slow or broken down to be of any value to the students. It got so bad this year, that the Board quickly approved the purchase of a completely new lab. We currently have brand new DELLs and a dedicated server. Unfortunately, the school has so far declined to pay for professional networking setup and support and there are serious problems with our Internet connection, so even though we have had the new hardware for almost two months now, the students are not yet able to fully utilize the new machines...
6. Other comments about your computer curriculum: Up until this year, the school also offered a "Keyboarding" Course in 10th grade. The curriculum consisted of typing instruction, understanding the hardware and software components of a computer, and learing how to use standard software such as microsoft word, Excel, and Powerpoint. This course was replaced by a "Health" class this year.
It seems that there is a deep divide within the teacher community about the proper place of the computer lab in the life of the school. As a result, the issues of lab maintenence and curriculum have not been explored or addressed by the faculty or administration in any systematic way. Things have been left up to the individual teacher/s and parent volunteers. I am hoping that the investment in the new lab will motivate such an exploration in the coming year. I am very intersted in how other schools have dealt with similar issues and what other schools have come up with in terms of curriculum and integration.

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1. Name of school: **Shining Mountain Waldorf School (Boulder, CO)**
2. Name of person filling out survey: Jamie York (not the instructor)
3. Does your school offer any computer courses? Yes
4. a) Name of course: Intro to Computers
   b) Theme and topics of the course: Various computer applications
   c) Grade level of students taking the course: 9
   d) Is the course required or an elective? Required
   e) How often and for how long does the course meet? two 90-min periods/week for _ of the year
   g) Is the instructor of the course a full-time teacher? No

   a) Name of course: Web Design
   b) Theme and topics of the course: Learning how to design your own web page, etc.
   c) Grade level of students taking the course: 10, 11, or 12
   d) Is the course required or an elective? elective
   e) How often and for how long does the course meet? two 90-min periods/week for _ of the year
   g) Is the instructor of the course a full-time teacher? No

   a) Name of course: Digital Film
   b) Theme and topics of the course: Students make their own movies, etc.
   c) Grade level of students taking the course: 10, 11, or 12
   d) Is the course required or an elective? elective
   e) How often and for how long does the course meet? two 90-min periods/week for _ of the year
   g) Is the instructor of the course a full-time teacher? No
5. Does your school have a dedicated computer lab? No, we recently bought 20 laptops and have wireless.
6. Other comments about your computer curriculum: The College of Teachers is finding it challenging to evaluate the computer curriculum. We are trying to figure out what the real pedagogical value of the computer curriculum is and what would make it a true “Waldorf” curriculum. In the greater community, some think we should have far more with computers – others think it isn’t “Waldorf” or is a waste of time.

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1. Name of school: **Kimberton Waldorf School**
2. Name of person filling out survey: Hezi Haut
3. Does your school offer any computer courses? Yes.
4. a) Name of course: Keyboarding
   b) Theme and topics of the course: Learning to type
   c) Grade level of students taking the course: 9^{th}
   d) Is the course required or an elective? Elective
   e) How often and for how long does the course meet? ??
   f) Has the course been successful? In what way? Mixed.
   g) Is the instructor of the course a full-time teacher? Yes

   a) Name of course: I-Search
   b) Theme and topics of the course: English course regarding how to wisely gather info through the Internet
   c) Grade level of students taking the course: 11th
   d) Is the course required or an elective? Required
   e) How often and for how long does the course meet? One semester, twice per week
   f) Has the course been successful? In what way? Yes.
   g) Is the instructor of the course a full-time teacher? Yes
5. Does your school have a dedicated computer lab? Yes, with 14 Dell computers. Not well utilized.
6. Other comments about your computer curriculum: Looking into making changes.

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1. Name of school: **Washington Waldorf School**
2. Name of person filling out survey: Hartmut Doebel
3. Does your school offer any computer courses? Not at the moment
6. Other comments about your computer curriculum: Things were tried in the past, but were not very successful. We are now thinking about what to do in the future.

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1. Name of school: **Green Meadow**
2. Name of person filling out survey: Harlan Gilbert
3. Does your school offer any computer courses? Up until now, there have only been modules as parts of math courses. This year, however:
4. a) Name of course: <u>The Information Revolution</u>
   b) Theme and topics of the course: History and development of computers, nature of computing technology and information transfer, social implications.
   c) Grade level of students taking the course: 12th grade
   d) Is the course required or an elective? A main lesson for those who do not go on internship
   e) How often and for how long does the course meet? 3 weeks, an hour and 40 minutes per day (main lesson time)
   f) Has the course been successful? In what way? This will be the first year.
   g) Is the instructor of the course a full-time teacher? Yes
5. Does your school have a dedicated computer lab? 4 desktops in the library serve as a research space and are used intensively by the yearbook designers (students led by a graphic designer). In addition, 17 laptops travel to classrooms as needed.
6. Other comments about your computer curriculum:

I have been trying to introduce programming in 10th grade with simple coding applications (to calculate square roots, etc.) We are also going to build logic circuits using DPDT switches with the 10th grade this year, for the first time.

In 11th and/or 12th, we use Macromedia Flash to produce coding-driven applications with sophisticated user interfaces (e.g. an address book with lookup features). We hope to introduce next year's 11th grade to integrated circuits, as well.

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1. Name of school: **Waldorf High School of Massachusetts Bay**
2. Name of person filling out survey: Dan Raizen
3. Does your school offer any computer courses? No (though I'll maybe offer a programming elective in the spring)
4. If yes to #3, then for each course please give the following information:
   a) Name of course: ???
   b) Theme and topics of the course: Learning to program
   c) Grade level of students taking the course: 9-12
   d) Is the course required or an elective? Elective (all of these answers are tentative)
5. Does your school have a dedicated computer lab? Yes, 9 machines - 6 Windows, 2 Macs, 1 Linux

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1. Name of school: **San Francisco Waldorf School**
2. Name of person filling out survey: Paolo Carini
3. Does your school offer any computer courses? Not this year
6. Other comments about your computer curriculum: We had been taking time out of the math curriculum to teach computers, and we had to stop doing so. We had planned to incorporate computer stuff in our own math classes, but in the end it did not happen. So, this year the computer curriculum was on hold.

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1. Name of school: **Chicago Waldorf School**
2. Name of person filling out survey: Brian Gleichauf
3. Does your school offer any computer courses? No
5. Does your school have a dedicated computer lab? No
6. Other comments about your computer curriculum: We do not really have a computer curriculum. We have only recently hired an IT person to manage the faculty computers. It's a area in which we have much growing to do.

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