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GROSSMONT-CUYAMACA
COMMUNITY COLLEGE DISTRICT

Education Master Plan
Information Submission Form

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Please feel free to submit as many of these forms as you would like. Please answer the following questions for each submission:

1) What is the document we should review? : Academically Adrift Limited Learning on College Campuses (UChicago Press

2) Author: Richard Arum & Josipa Roksa

3) Source: the book itself

4) Which of the following taxonomy areas does it fit into? (Please select only one):

- [x] Society
- [ ] Technology
- [x] Economy
- [ ] Environment
- [ ] Politics and Legal Issues
- [x] Education
- [ ] Other:

5) Relevance: "According to [Arum's and Roksa's] analysis of more than 2,300 undergraduates at twenty-four institutions, forty-five

6) Page / Section:

7) **Add Attachment/Hyperlink Here**: http://www.amazon.com/Academically-Adrift-Limited-Learning-Campuses/dp/0226028

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Questions: lynne.davidson@gcccd.edu *Research, Planning and Institutional Effectiveness*

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Please answer the following questions for each document you submit:

(Feel free to submit as many of these forms as you would like)

1) What is the name of the document? Prioritizing Course Enrollment at the Community Colleges

2) Author: LAO Policy Brief

3) Source: Legislative Analyst

4) Which of the following areas does this document best address? (Please select only one)

- ○ Society
- ○ Technology
- ○ Economy
- ○ Environment
- ○ Politics and Legal Issues
- ● Education
- ○ Other

5) Relevance: Focus on Priority Registration

6) Page/Section: Pages 1-8

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LAO POLICY BRIEF

The 2011-12 Budget:
Prioritizing Course Enrollment At the Community Colleges

MAC TAYLOR • LEGISLATIVE ANALYST • JANUARY 20, 2011

State Law Establishes "Open Access" Policy, Identifies Key CCC Missions. Under the state's *Master Plan for Higher Education* and state law, the California Community Colleges (CCC) operate as open access institutions. That is, whereas only the top one-third of high-school graduates are eligible for admission to the state's public universities, *all* persons 18 or older may attend a community college. (While CCC does not deny admission to students, there is no guarantee of access to a particular class.) Current law defines CCC's core mission as providing academic and vocational instruction at the lower-division (freshman and sophomore) level. Under this mission, community colleges prepare students for transfer to four-year institutions and grant associate's degrees and certificates. Other important statutory missions include providing opportunities for workers to update their job skills (such as by taking a computer class) and offering precollegiate basic skills instruction in English and mathematics.

State residents enroll at the community colleges for a variety of reasons. In 2009-10, almost one-half of CCC students indicated that they sought transfer to a four-year institution or to obtain an associate's degree or certificate. About one-third of students attended CCC for other purposes, such as learning English or taking recreational classes. (The remaining nearly one-fifth of students were "undecided.")

Need to Rethink CCC Enrollment-Management Policies. In recent years, community college enrollment has been constrained by two major factors: (1) reductions in course-section offerings as a result of state budget cuts, and (2) strong demand for CCC services by adults seeking retraining and other skills at a time of weak state and national economic growth. The CCC system reports that many students—particularly first-time students—have not been able to enroll in the classes they need to progress toward their educational goals. Thus, in effect, CCC enrollments are currently being "rationed." This access problem will become even more serious in 2011-12 to the extent that budget reductions further reduce enrollment slots.

Given limited resources, we believe that it is more important than ever for the state to target funds that best meet the state's highest priorities for community college services. To accomplish this, we recommend the Legislature: (1) adopt statewide registration priorities that reflect the Master Plan's primary objectives, (2) place a limit on the number of taxpayer-subsidized credit units that students may earn, and (3) restrict the number of times that a student may repeat physical education and other classes at taxpayers' expense.

Statewide Registration Priorities

Campuses Have Wide Discretion Over Which Students May Register Early. Before each term begins, different groups of CCC students are permitted to register for classes at different times. Some students are given enrollment (registration) priority, which means that they have an opportunity to select their classes before "open registration" begins for the general student body. Students value priority enrollment because there is considerable competition for many classes, and these classes fill up quickly.

While colleges have considerable discretion in how they assign priority, current law singles out two groups of students. Specifically, colleges must give registration priority to current or former members of the military. Statute also requires colleges to assign a "low" enrollment priority to high-school students who are concurrently enrolled at a community college to "ensure that these students do not displace regularly admitted students." (We note that this statutory language is ambiguous, since, by definition, high-school students who are given priority are able to register before—and thus potentially displace—adult CCC students who do not have priority.)

Regulations adopted by the statewide Board of Governors give campuses wide discretion as to whether any other categories of students may be given priority registration. As a result, enrollment priorities vary across the state. In December 2010, the Chancellor's Office surveyed the CCC system's 112 colleges about their priorities. Each of the 76 colleges that responded to the survey indicated that they have a registration priority system. Virtually all colleges grant earliest registration to current and former members of the military, students with disabilities, and participants in Extended Opportunity Programs and Services (a program designed for low-income, underprepared students who are attending CCC full-time). Other groups granted early registration by some campuses include athletes and students in the state's welfare program. Next, colleges usually assign relatively early priority to students who are continuing their studies at the particular college (that is, they enrolled in the preceding term). Typically, the more units that students have completed prior to the start of the term, the earlier their registration priority. (However, some colleges indicated they bump students who exceed a certain unit threshold—such as 90 or 100 units—to the lowest priority among continuing students.) In addition to units earned, a small number of colleges responding to the survey also take into account students' academic performance at CCC (such as grade point average) when assigning priority among continuing students.

Most first-time CCC students do not receive registration priority; instead, they must wait until open registration. A few colleges, however, administer an outreach program whereby recent high-school graduates who participate in pre-term assessment, orientation, counseling and other "matriculation" services receive an earlier registration appointment than new students who have not participated in the program.

Campus Policies Often Do Not Reflect Master Plan's Highest Priorities. On its surface, the priority accorded to continuing students by colleges may seem appropriate, as it gives students who are seemingly nearing completion of their educational goals "first call" on needed—but often difficult-to-obtain—classes. This approach, however, has several consequences that run counter to the Master Plan's intended goals. For example, continuing students may not necessarily be enrolled at CCC to acquire the skills they need to participate in the workforce or society (such as technical or language skills); rather, they may be taking classes for purposes of personal enrichment. Other students with a large number of credits may state that their intent is to obtain a degree or transfer, but they are not making satisfactory progress toward that goal. Yet, because these types of students are typically granted a relatively high registration priority, they can squeeze out more-focused and higher-priority students who have not taken as many units.

Recommend Statewide Registration Priorities. Given the state's likely need to further reduce course offerings in 2011-12, we recommend that the Legislature adopt statewide registration priorities that reflect the Master Plan's key goals and, to the greatest extent possible, maximize access for the state's highest-priority students. For example, we envision an approach that assigns the highest registration priority to continuing students who are fully matriculated—participated in assessment, orientation, and counseling, as well as completed an educational plan—and are making satisfactory progress toward their educational goals (for example, as defined in federal financial-aid rules).

Next-highest priority could be granted to new students—particularly recent high-school graduates—who have completed matriculation requirements and other key steps, such as applying for federal financial aid. Nonmatriculated new and continuing students, students with a declared goal of personal enrichment, and students who are not making satisfactory progress toward their goals would not be allowed to register for classes until open registration. (We believe it is reasonable to give colleges some flexibility to make individual determinations on a student's registration ranking to take into account extraordinary circumstances, such as the availability of counselors to see new students prior to the start of the academic year.) In developing these priorities, we also recommend the Legislature clarify whether its intent is to assign priority to concurrently enrolled high-school students, or to require these students to wait until the end of open registration before they are able to register for CCC classes. Our recommendation would not result in state savings *per se*; rather it would help to ensure that state resources are first directed to the highest-priority students under the Master Plan.

Cap on State-Supported Instruction

Significant Number of CCC Students With High-Unit Counts. As noted earlier, the primary purpose of the CCC system, as established by the Master Plan, is to educate students who enroll to (1) earn credits for transfer to a four-year institution, (2) obtain an associate's degree or certificate, or (3) gain basic job or language skills. Students seeking to transfer or earn an associate's degree generally need 60 units of coursework. Students who wish to obtain technical training rather than an associate's degree generally need fewer than 60 units of credit. According to the Chancellor's Office, community colleges serve a considerable number of students who have already earned more than 60 units. In fact, in 2009-10, the system provided instruction to nearly 120,000 students (headcount) who had already earned 90 or more CCC units. Over 9,000 of these students had already accumulated 150 or more units. The state continues to subsidize these students' courses while other CCC students with little or no previous access to postsecondary education may be unable to find open courses.

Recommend Limit to State-Supported CCC Coursework. Given scarce state resources, we recommend the Legislature place a limit on the number of taxpayer-subsidized units that a student may earn at CCC. We believe a 100-unit threshold would provide a reasonable maximum for state funding purposes. A 100-unit cap would permit students 40 units (over one academic year) beyond what is typically required to earn an associate's degree or credits for transfer. This threshold would allow students to earn some credit for coursework that is not applicable for a degree or transfer (such as precollegiate basic skills instruction in English or mathematics), as well as a "cushion" in case students need to take some additional classes as a result of changing their program or major.

Under our recommendation, students with more than 100 units would still be eligible to attend CCC. However, since a state subsidy would no longer be provided, the Legislature could authorize colleges to charge these students up to the full cost of instruction. Our recommendation would result in a CCC workload reduction of up to 38,000 full-time equivalent (FTE) students in 2011-12, for a savings to the state of as much as $175 million.

Course Repetition

Regulations Allow Multiple Repeats of Certain Classes. Community college regulations generally allow students to retake academic or vocational classes up to two times in an effort to make up for substandard marks (such as an "F" or "no pass" designation). In such cases, districts receive apportionment payments (general-purpose monies) all three times from the state. For "activity classes," however, regulations allow districts to receive apportionment funding for up to four times (the initial enrollment plus three repeats) regardless of a student's grade. Regulations define activity classes to include physical education (such as aerobics and bowling), dancing, drawing and painting, and certain other visual or performing arts. For physical education, "repetition" is defined as when a student completes a class (such as "beginning yoga") and then either (1) reenrolls in the same class, or (2) enrolls in a similar class that is part of the same sequence (such as "intermediate yoga"). (For visual and performing arts, by contrast, repetition is counted only when a student reenrolls in the same exact class.) Regulations place no limit on the number of times that districts may claim apportionments for a student repeating a *noncredit* activity class (such as ceramics and physical fitness for older adults).

Repetition of activity courses is fairly common. For example, according to the Chancellor's Office, in 2009-10 over 50,000 students (headcount) enrolled in the same credit physical education class that they had already taken and for which they received credit in a previous term. (The Chancellor's Office does not have data on the additional number of students who took a physical education class in 2009-10—such as "Weight Training 2"—after completing a similar-type class—such as "Weight Training 1"—in a previous term.)

Recommend Elimination of State Support for Repeats. Like virtually all types of CCC instruction, credit and noncredit activity classes can be of value to students. However, given limited resources and the Master Plan's priorities, we believe it is reasonable for the Legislature to limit the number of times that the state pays for students' enrollment in these classes. Under our recommendation, districts could claim apportionments the first time that students take an activity course. This would allow students to receive credit they may apply toward completion of their program. (For example, some four-year institutions such as California State University allow students to apply one CCC unit of physical education toward a bachelor's degree.)

We recommend that the Legislature eliminate state funding for any repeats of the same or similar (that is, part of the same sequence) activity class. (Our recommendation would exclude intercollegiate athletics and "adaptive" physical education classes, which are designed for individuals with physical disabilities, as well as students who are majoring in physical education or the fine arts.)

Colleges would be permitted to allow students to repeat these classes, though these enrollments could not be counted for purposes of calculating apportionments. Alternatively, colleges could provide opportunities for students to repeat these activities through CCC "community service" classes, which statute requires to be fully supported by student fees. The precise amount of savings generated by our recommendation is unknown. Based on available data from 2009-10, it appears that CCC's workload could be reduced by an estimated 15,000 FTE students in 2011-12, generating state savings of roughly $60 million. (This estimate takes into account students with more than 100 units who repeated an activity class in 2009-10.)

Conclusion

This brief has identified ways the Legislature can better target limited CCC funds toward the Master Plan's key missions. Taken together, our recommendations would (1) help increase opportunities for high-priority students (such as recent high-school graduates) to enroll in courses they need to progress toward their educational goals, and (2) reduce funding for lower-priority enrollment by approximately 50,000 FTE students—for savings to the state of about $235 million. Figure 1 summarizes our recommendations.

Figure 1

Summary of LAO Recommendations for the California Community Colleges (CCC)

- ✓ Adopt statewide CCC registration priorities that reflect the Master Plan's top goals.
- ✓ Establish a 100-unit cap on the number of taxpayer-subsidized credits a CCC student may accumulate.
- ✓ Eliminate state funding for repetition of physical education and other recreational classes.

Contact Information

Steve Boilard	Director, Higher Education	319-8331	Steve.Boilard@lao.ca.gov
Paul Steenhausen	California Community Colleges	319-8324	Paul.Steenhausen@lao.ca.gov
Judith Heiman	California State University, Financial Aid	319-8358	Judy.Heiman@lao.ca.gov

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1) What is the document we should review? : Inside Higher Ed re: Academically Adrift

2) Author: Scott Jaschik

3) Source: http://www.insidehighered.com/news/2011/01/18/study_finds_large_numbers_of_college_students_don_t_learn_m

4) Which of the following taxonomy areas does it fit into? (Please select only one):

- [x] Society
- [ ] Technology
- [x] Economy
- [ ] Environment
- [ ] Politics and Legal Issues
- [x] Education
- [ ] Other:

5) Relevance: • Students majoring in liberal arts fields see "significantly higher gains in critical thinking, complex reasoning, and wri

6) Page / Section: N/A

7) **Add Attachment/Hyperlink Here**: http://www.insidehighered.com/news/2011/01/18/study_finds_large_numbers_of_coll

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Please answer the following questions for each document you submit:

(Feel free to submit as many of these forms as you would like)

1) What is the name of the document? Helping Under-Resourced Learners Succeed at the College and

2) Author: Karla Kroder, Karen Becker, Henry Ingle and Susan Jakes

3) Source: Ahaprocess.com is a good resource

4) Which of the following areas does this document best address? (Please select only one)

- ○ Society
- ○ Technology
- ○ Economy
- ○ Environment
- ○ Politics and Legal Issues
- ● Education
- ○ Other

5) Relevance: At risk student populations - EOPS types

6) Page/Section: Entire document

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Helping Under-Resourced Learners Succeed at the College and University Level: What Works, What Doesn't, and Why

by Karla Krodel, Karen Becker, Henry Ingle, and Susan Jakes

In today's economy, institutions of higher education are invaluable forces of community change through both the students they educate and the engagement and advancement of the larger community. Economic forces are bringing an increasingly diverse student population to the doorsteps of these institutions. For educators to achieve maximal effectiveness in reaching these students, paradigm shifts are needed in the ways that teaching and learning are understood and actualized on campuses. This paper outlines key conditions for change, as well as strategies for success, that build upon an understanding of the theories of economic class as they relate to college students and the higher education community.

Further, this paper outlines the application of *Getting Ahead in a Just-Gettin'-By World* (DeVol, 2004) as a potential college curriculum. The *Getting Ahead* workbook was developed in the community setting in collaboration with groups of adults from poverty and is used by community agencies to equip people from generational poverty with tools essential for making the transition out of poverty. Unlike so many soft-skill training programs, *Getting Ahead* opens doors to rich areas of *academic* study related to economic class theory, language, change theory, and research into the causes of poverty. For this reason, several community colleges and universities have been adapting the semester-long *Getting Ahead* process and finding that it accelerates students' ability to reach college-level performance. Short-term outcomes and anecdotal stories are compelling enough to warrant a more intensive and intentional consideration of the approach, along with revision of the text for the college-level audience.

PARADIGM SHIFTS

As described in *America's Perfect Storm* (Kirsch, Braun, Yamamoto, & Sum, 2007), the socioeconomic survival of the United States is at stake. The convergence of low literacy levels, poverty, an aging population, immigration, and the globalization of business means that working with the growing and significant segment of the population that comes from generational poverty is no longer just a moral obligation, it has become an economic imperative. Two thirds of the students who enter higher education do not complete a degree within six years, and among low- and moderateincome students, the statistics are even grimmer. The college readiness agenda must be supported with content and methods more relevant to under-resourced students. This will enable them to have the essential tools, language proficiency, and analytical skills that higher education often assumes is operative across all social classes in our society.

Under-resourced students have limited access to external resources, such as support systems, mentors, and money. Their lack of supports makes daily demands—like childcare, transportation, one or more jobs—develop into crises that, time and again, derail their education. Amazingly resilient, these individuals often act first to solve problems and preserve personal connections with others rather than sacrifice relationships for the sake of achievement, as their middle-class counterparts would expect. The virtually endless stress that accompanies poverty traps people in the "tyranny of the moment" (Freire, 1970), overwhelming their ability to look to the future and make abstract plans to change. Postsecondary classrooms require cognitive and language skills that may not have been developed in K–12 schools, neighborhoods, and the family. Vocabulary is often insufficient for understanding texts, class discussion, and writing assignments. Without the advantage of the intergenerational transfer of knowledge that enables students to embrace the college experience, many students feel both out of place and doomed to failure. The effect of such a dearth of resources is well-documented (Bailey & Alfonso, 2005; Bailey, Jenkins, & Leinbach, 2005; Brock & Richburg-Hayes, 2006; Brock et al., 2007; Parsad & Lewis, 2003) and visibly profiled in the demographics of low student persistence, retention, completion, and graduation rates across the country, in particular for such student groups as Hispanics/Latinos, African Americans, and Native Americans, whom the educational systems generally have not served as well as Caucasians (Hill, 2008):

- Only 30% of students assigned to pre-college level Introductory English and 20% to Introductory Math completed the course within three years.
- "Of first-time college students entering a community college in 1995, only 36% earned a certificate, associate's [degree,] or bachelor's degree within six years" (Brock et al., 2007).

Meanwhile, across the nation, government, business, and communities are asking for changes in the very nature and premises of higher education. In the community college systems of the country where the majority of under-resourced learners are pursuing higher education, there are even greater challenges. A recent California report indicates that too many students who are behind in their skills are not overcoming their deficiencies in the state's community colleges, even though significant budget resources are being allocated for this purpose (Hill, 2008). Stakeholders are demanding stronger linkages between education and jobs for a more productive economy. Accreditation bodies are convincingly arguing for more rigorous accountability standards for student learning outcomes, while at the same time calling for major curricular changes to more realistically foster greater civic engagement. There is growing interest in improving the connection between teaching and learning through professional development and the alignment of faculty incentives and rewards in order to better meet the need for new modes, media, and methods in more contemporary instructional delivery systems.

Reformulating the Premises of Higher Education

Traditional Assumptions	New Paradigms
Students	
Students prepared with internal and external resources, focused on educational priority	Under-resourced students with multiple learning barriers, less-than-ideal background preparation, and competing demands brought on as a result of highly complex life conditions
Unprepared students seen as remedial, high-risk	Under-resourced students seen as problem solvers and knowledge creators
Learning Environment	
Faculty as discipline-specific experts Unsupported, autonomous, competitive learning environments	Faculty as learning facilitators using discipline-specific expertise to engage students in supported, relational, cooperative learning environments
Didactic teaching of decontextualized and theoretical knowledge	Knowledge created through service and community engagement models involving multiple individuals from diverse backgrounds, formal planning documents, and work for a given cause
Students isolated from each other and the community in the learning tasks	Contextualized and situated learning connects students to each other and to the community in the learning tasks
Institutions	
Enrollment-driven	Student retention, persistence, achievement, and completion as top priorities
Pricing and funding	Focusing on cost and value as the instructional recipe for student success
Development of human and social capital secondary to scholarship and research	Intentional structured development of human and social capital for achievement, sustainability, and prosperity

Traditional Assumptions	New Paradigms
Institutions	
Institutional outcomes connected to self-sustainability and infrastructure	Institutional outcomes become connected to community sustainability
Accreditation based on institutional assets and fiscal resources	Accreditation based on learner outcomes
Lack of concern for accountability	High accountability

These paradigm shifts call for changes across the board—from the classroom level to student services, from accreditation standards to the institution's partnerships. This is not to say that traditional higher education is misguided but rather that the traditional expectation that students will mold themselves to the institution's expectations and norms is simply too big a leap for too many students. While these major paradigm shifts are occurring simultaneously and sometimes overwhelmingly, a synergy exists among them, which, if properly tapped into, can be transformational for students, staff, the institution, and the larger community.

PROMISING PRACTICES

There is no shortage of ideas for improving the effectiveness of college and university education. More than 90 interventions to improve outcomes for under-resourced students were recently funded under the *Achieving the Dream* community college program. These strategies are significantly influenced by a growing concern to address the negative effects that poverty conditions are bringing to the classroom. Most faculty and student service-driven interventions target the individual student, seek to build support around the student … or both. For example:

- Developmental education and ongoing consistent support services for academically under-prepared students work best when delivered by full-time staff with specialized training. These are two of the most necessary interventions to get students college-ready (Bailey & Alfonso, 2005).
- Financial incentives have a positive effect on student persistence, full-time attendance, courses passed, and re-enrollment. Incentives are a concrete representation of the value of education and achievement. However, the encouraging results ended when the incentives ended (Brock & Richburg-Hayes, 2006).
- Advising, counseling, and peer tutoring are ways to provide some social capital or relationship support for students. First-semester freshman seminars, for example, are effective in teaching

students how to manage their academic work within the academic environment through orientation and direct-teaching of planning and study skills (Bailey & Alfonso, 2005).

- Student integration programs concentrate on external resources, such as supportive relationships, employment, and money as the primary causes of student retention. Scheduling to accommodate the needs of working students and creating meaningful interactions among students and teachers are effective interventions (Bailey & Alfonso, 2005).
- New media and technologies like blogs, wikis, media-sharing applications, and social-networking sites can become vehicles for informal conversations, collaborative content generation, and knowledge sharing that give learners access to a wider range of ideas and representational skills to demonstrate their learning. Creating the access to, and ability to use, these technologies is as important as developing the sites and programs themselves.
- Service learning integrates community service experiences with academic instruction as it focuses on critical reflective thinking and civic responsibility (Robinson, 1995). Students move from mediated sources of information to experiential learning in which they practice skills and roles.
- Learning communities also seek to build social capital on campus through shared academic experiences. Learning communities enroll student cohorts in clusters of courses, often around a central theme, thus promoting a deeper academic inquiry, cooperative learning opportunities, and relationships with both peers and faculty. For students with many other demands on their time, this model works well when it provides an engaging, motivating environment that does not require them to spend time in activities outside of classes. Learning communities have the most empirical evidence of success (Bloom & Sommo, 2005).

Despite earnest effort and significant resource allocation, improved outcomes are modest. A major flaw in most programs is the well-intentioned though misguided “righting reflex” (Miller & Rollnick, 2002). The righting reflex cuts directly to the corrective action, without creating an understanding of what issues are being addressed, nor explaining why the situation or condition occurred. Many programs operate without intentional understanding of what an under-resourced student is—and why this occurs—before prescribing how students should change. Being told what to do without understanding why one is doing it provokes resistance and fosters distrust of and alienation from the institution and is evidenced in high drop-out rates. As students demand greater control over their learning, institutions struggle to engage the commuter student and the working student in the extracurricular activities that create social networks of peers and mentors necessary for life’s success.

There is a need to make higher education more learning-centered so that the educational experience increases in value and promotes a more genuine learner agency that teaches autonomy, engagement, and mastery. To do this, higher education must surmount a wide range of hurdles and organizational barriers that under-resourced students experience between the real world and their academic community.

MAKING SENSE OF IT ALL AND PUTTING THE PIECES TOGETHER

A new model of integrated strategies focused on a better understanding of the pedagogy for working with the outcomes of poverty (Becker, Krodel, & Tucker, 2009) offers three components for the postsecondary environment by addressing the needs of the under-resourced student and implementing practices responsive to the changing expectations for higher education:

I. *Getting Ahead, College Edition*—a one-semester curriculum to accelerate students' progress towards being college-ready. Adapted for the college environment, the curriculum can stand alone or be integrated into civic-engagement strategies in III below (DeVol, 2009).

II. Teaching strategies that account for the effects of poverty and build relational and cognitive skills (Becker et al., 2009).

III. A means of creating high-impact civic engagement that amplifies the effect of experiential learning and can generate systemic change (Becker et al., 2009).

Using the causes of poverty as framework and economic class as lens, students and faculty develop a new landscape within which to build knowledge, skills, relationships, and resources.

The model intends to transform student learning and create a vibrant, participatory environment that taps students' problem-solving skills and supports student persistence and completion. Students are no longer viewed as passive recipients of knowledge but rather as active producers of knowledge, given the social and economic reality in which they are operating, a world much different from that of their professors. The system works for today's students who seek greater control of their own learning, and it provides a context—economic class—that is relevant to everyone on campus.

This practical approach allows staff persons to apply and practice what they seemingly "already know" but had not previously given meaning to. The model exceeds the 16 Student Learning and Development Outcome Domains set forth by the Council for the Advancement of Standards in Higher Education (Dean, 2006). In addition, it can address several broad accreditation standards, including academic performance, community engagement, and diversity.

I. Adapting the *Getting Ahead* process for college

Investigating the application of the *Getting Ahead* process and workbook in a postsecondary environment revealed a strong alignment with adult learning theory. For example, the hands-on *Getting Ahead* curriculum is intensely engaging for students because it allows them to investigate and discuss with peers an all-important topic: their lives, their families, and the impact of economic class. The *content* includes the poverty research continuum, hidden rules and resources, and theories of change. The *process* takes students from the situated, concrete learning style common in under-resourced environments (Lave & Wenger, 1991) to being able to use conceptual frameworks to analyze abstract and ill-defined issues, as is expected for educational and work/life success (Brown, Collins, & Duguid, 1989).

Situated learning occurs in a context (in this case, the context of economic class) within a set of relationships and social norms (the classroom). In the beginning, the purpose is not to learn *from* talk as a substitute for meaningful participation but to learn *to* talk as the key to legitimate participation (Lave & Wenger, 1991). This participation creates a shared repertoire of communal routines, behaviors, and vocabulary (Wenger, 1999) and fosters the relationships and extra support needed to move to formalized or decontextualized education. Pedagogically, a facilitator guides the group's co-investigation of the four causes of poverty (choices of the poor, absence of human and social capital in the community, exploitation, and political/economic structures) and their effects on individuals and society. Tacit knowledge bases—including how to use hidden rules of poverty, middle class, and wealth; how to negotiate; and how to build resources—are explored. Students translate their thinking from concrete to abstract by building mental models or paradigms. The facilitator works collaboratively to review, edit, and apply quality-assurance approaches to students' work through learning opportunities that draw on Surowiecki's "wisdom of learning from the crowds" theory (Surowiecki, 2005). The process creates learner-generated content that is not prescribed by teachers acting as dispensers of information but rather content discovered and created by the students as they become actively engaged in the construction of the knowledge base they perceive to be needed in their real world. Indeed, this approach to learning prepares students for their new roles in school and society *by using life itself as the context for education rather than positioning education as the preparation necessary for life.*

Getting Ahead is designed to create spaces of cognitive dissonance where new learning can occur, then offers concrete strategies that provide a means to act upon knowledge and create a new "future story." Long-term assignments involve assessing and planning to develop resources, learning about exploitation, and analyzing political/economic structures that influence not only wealth but all strata of economic class. Community assessment exercises encourage debate about the causes and outcomes of poverty—and strategies to address institutionalized classism—as opposed to fixating on and playing "the blame game." Upon completion, students are likely to have moved from the concrete, situated learning approach developed while growing up in a low-resource environment to reasoning with causal models at ever higher (and deeper) levels of abstraction. Students are thereby prepared to participate at the planning tables of middle-class institutions, such as schools and businesses. This material and the investigative process lend themselves to service learning and community engagement strategies—and support new learning environments and ways of organizing higher education.

Adapting Concepts from *Getting Ahead* to the New Practices and Assumptions in Higher Education

New Paradigms	Operationalized via the *Getting Ahead* Curriculum
Contextualized and situated learning connects students to each other and the community in the learning tasks	*Getting Ahead* uses economic class as the context for a cooperative investigation that is personally relevant and evidenced in the community
Students seen as problem solvers and creators	*Getting Ahead* moves students from reactive problem solving to proactive planning, knowledge creation, and "future story"
Supported, relational, cooperative learning environments	*Getting Ahead* investigative group process provides relationships with a network of peers, faculty, and staff
Student retention, persistence, achievement, and completion as top priorities	• Resource assessment provides affirmation and leads to clear personal plans to build resources for academic achievement • Creates "future story" • Relational learning increases social capital • Social network provides support and linkage to services

Getting Ahead also prepares students in certain professional majors (social work, nursing, education, etc.) for work with clients and co-workers from generational poverty. Within disciplines, these theories are relevant as well (for example, in the history of jazz or certain literary genres).

II. Learning-centered teaching strategies that account for the effects of poverty and build relational and cognitive skills

More can be done to improve education by improving the effectiveness of teachers than any other single factor (Wright, Horn, & Sanders, 1997). Professional development based on an understanding of the effects of economic class transforms faculty understanding of how instructors teach—and, consequently, how students react, respond, and *learn.* That foundation then informs the application of teaching strategies for developmental education, first year, and some content courses. Two major aspects of the teaching strategies are to:

- Build bridging social capital for students (the relationships with people outside one's personal circle who can help one achieve goals)
- Build language resources and cognitive ability, as well as other resources

Relational learning models based on the work of Greenspan and Benderly (1997) and Marzano (2007) might help instructors and staff develop the bridging social capital so essential to student success. When faculty learn to balance support, insistence, and high expectations—as well as to value students' problem-solving abilities without diminishing standards—faculty, in turn, are rewarded with more successful students and improved teaching assessments.

Cognitive teaching strategies based on Feuerstein (1980) and Payne (2003, 2008) may help students build mental resources and "teach students how to learn." Students actually build the cognitive structures necessary to support abstract learning at the postsecondary level. For example, mental models create bridges between the concrete thinking of home and neighborhood and the abstract thinking of school and technical/professional work. Other examples of classroom techniques include in-class assessments of student learning using integrated audience response systems during class to immediately assess student learning, providing grading rubrics when the assignment is given, and directly teaching and grading the processes needed for task completion.

Learning-Centered Strategies That Support New Paradigms in Higher Education and Improve Outcomes

New Paradigms	Teaching Strategies
Serving under-resourced students with multiple learning barriers, less-than-ideal background preparation, and competing demands brought on as a result of highly complex life conditions	• Teaching strategies build cognitive structures • Mental models build abstract thinking • Exploring tacit knowledge bases, such as using hidden rules and building resources, moves students toward economic stability • Relational learning models balance support, insistence, and high expectations
Accreditation based on learner outcomes	• Teaching strategies address cognitive deficits caused by poverty • Investigative process engages, motivates, and improves retention
Faculty as learning facilitators using discipline-specific expertise to engage students in supported, relational, and cooperative learning environments	• Professional development builds understanding of the hidden rules of class and how poverty affects resources, cognitive development • How to balance support, insistence, and high expectations

III. A means of creating high-impact civic engagement that amplifies the effect of experiential learning and can generate systemic change

Ultimately, education prepares students for participation as citizens in the economic/political structures that create our society—and which can be a cause of poverty. The theories of economic class offer program ideas that support service learning and civic engagement strategies in a robust and rewarding way. The framework also supports the new demands of accreditation bodies for the institutionalization of student engagement and what practitioners (Valverde, 2008) are calling the acquisition of “life journey” skills, attitudes, and mindsets that all individuals need to tap as they evolve and develop from childhood to adulthood. For example …

Getting Ahead might be employed as the core context for a learning community. Partnering it with other courses (composition, developmental reading sociology, anthropology, etc.) that would require additional reading related to economic class improves the quality of *Getting Ahead* group discussions, which in turn would improve the student’s learning in the partnered course. A composition course affords the opportunity to translate the casual group discussion into formal register, supported by student research, thereby building language skills required for success in education and technical/professional careers.

In subsequent semesters, service learning and community engagement assignments can then be addressed by student teams drawn from these learning communities. In essence, economic class provides the conceptual framework within which to analyze and act. Using the campus as the context for the investigation of community resources could create a salutary secondary impact on the institution's student services. Students might investigate and assess the school's capacity to serve under-resourced students, thereby contributing solutions for the redesign of programs. In such an educational construct, students experientially learn skills that prepare them to "sit at the table" and participate in planning—skills, as noted previously, that are necessary for responsible civic engagement.

If the faculty and staff have been trained in theories of economic class and cognitive and relational teaching models—and students investigate economic class in a learning community that includes community engagement assignments within the campus setting—then the institution has created an environment that provides under-resourced students authentic access to the power structures that govern institutions. It also has created the conditions for constructive change.

In such a scenario, the campus itself becomes the socioeconomic case study. Students practice skills and engage in the act of planning within an actual institution. All this can happen in class or as assignments in a course with content-appropriate research topics. Meanwhile, the institution taps into the wealth of student knowledge and ideas that otherwise would go unrecognized and unused. Examples of institutional solutions offered by postsecondary students who have participated in the *Getting Ahead* curriculum include:

- Providing childcare on or near campus
- Web-based orientation and course delivery
- Accessible, student-friendly scheduling of classes
- E-mail buddies/mentoring
- Entire family outreach
- Meeting one on one with a faculty/staff adviser once every two weeks (either in person or through e-mail)
- Recorded classroom instruction available in electronic formats for review
- Availability in the library/media center of exemplary student products/completed assignments

Educating teaching and support staff in relational and cognitive teaching strategies, combined with the *Getting Ahead* curriculum and investigative process, can become a major asset for institutions adapting to shifting demographics and educational paradigms.

Adapting *Getting Ahead* Concepts to New Paradigms for Civic Engagement Practices in Higher Education

New Paradigms	High-Impact Civic Engagement
Intentional, structured development of human and social capital for achievement, sustainability, and prosperity; institutional outcomes become connected to community sustainability	• Teaching strategies + *Getting Ahead* curriculum intentionally teaches hidden rules of middle-class success behaviors through co-investigation • Education = economic development = sustainable communities
Knowledge created through service and community engagement models involving multiple individuals from diverse backgrounds, formal planning documents, and work for a given cause	• Multi-layered model incorporates *Getting Ahead* curriculum + learning community + service learning focused on the outcomes and causes of poverty; is highly relevant to communities • Students, who have been prepared as leaders and change agents, inform institutional change; graduates, prepared as leaders, drive community development and economic growth
High accountability	Students are empowered to hold institutions accountable and are prepared to participate in planning/strategizing

BUILDING THE SYNERGY

In the new postsecondary world being shaped by the emergent demography of under-resourced students, there is likely to be a continued blending of formal and informal learning. This model synthesizes the attributes of personalization, active participation, and new content creation that give value to the world of the under-resourced student, resulting in educational experiences that are far more productive, engaging, and community-based. Application of these ideas in higher education will contribute to a productive, learning-centered environment in which faculty and staff skills develop alongside the students. This framework builds beneficial partnerships and also addresses some of the more daunting issues related to accreditation.

For more information, visit www.ahaprocess.com or call (800) 424-9484. aha! Process offers approaches that can be integrated at multiple levels to improve performance; inform students, staff, and educators; and help educators adapt to new paradigms in postsecondary education.

Authors: Karla M. Krodel, M.B.A., Youngstown State University, Youngstown, OH; Karen A. Becker, Ph.D., Youngstown State University, Youngstown, OH; Henry T. Ingle, Ph.D., San Diego Community College District, San Diego, CA; and Susan S. Jakes, Ph.D., North Carolina State University, Raleigh, NC.

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PRINT FORM | SUBMIT

GROSSMONT-CUYAMACA
COMMUNITY COLLEGE DISTRICT

Education Master Plan
Information Submission Form

The Grossmont-Cuyamaca Community College District is starting a year-long process to develop an Educational Master Plan that will serve as the blueprint for our future. The Educational Master Plan is a long-range, comprehensive document intended to guide institutional and program development at both the college and district levels. The priorities established in the Educational Master Plan will serve to guide College and District decisions about growth, development and resources allocation.

As the first step in this planning process, everyone in the GCCCD community (faculty, staff, students and community members) are invited to identify and submit information sources to be reviewed for the trend analysis in one of six areas – society, technology, economy, environment, politics, and education. We are not asking you to do research, only to identify information you already have or that you encounter during the search period (March 21- April 25) and bring it to our attention for review.

Please answer the following questions for each document you submit:

(Feel free to submit as many of these forms as you would like)

1) What is the name of the document? Vision 2020: A Report of the Commission on the Future

2) Author: Community College League of California

3) Source:

4) Which of the following areas does this document best address? (Please select only one)

- ○ Society
- ○ Technology
- ○ Economy
- ○ Environment
- ○ Politics and Legal Issues
- ● Education
- ○ Other

5) Relevance: Focuses on the student success and "completion agenda" in the CCCs

6) Page/Section: Pages 1-27

7) **Attach Document/Place URL Here:** http://cccvision2020.org/

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Please answer the following questions for each document you submit:

(Feel free to submit as many of these forms as you would like)

1) What is the name of the document? Toward a New Understanding of Non-Academic Student

2) Author: Melinda Mechur Karp

3) Source: Community College Research Center

4) Which of the following areas does this document best address? (Please select only one)

- ○ Society
- ○ Technology
- ○ Economy
- ○ Environment
- ○ Politics and Legal Issues
- ● Education
- ○ Other

5) Relevance: Focuses on student support services' role in promoting student success

6) Page/Section: pages 1-37

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Please answer the following questions for each document you submit:

(Feel free to submit as many of these forms as you would like)

1) What is the name of the document? Career Technical Education: An Essential Component of the

2) Author: National Association of State Directors of Career Technical Education Consortium

3) Source:

4) Which of the following areas does this document best address? (Please select only one)

- ○ Society
- ○ Technology
- ○ Economy
- ○ Environment
- ○ Politics and Legal Issues
- ● Education
- ○ Other

5) Relevance: Relevant to career and technical education programs

6) Page/Section:

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Please feel free to submit as many of these forms as you would like. Please answer the following questions for each submission:

1) What is the document we should review? : Badke, W. (2008) "A rationale for information literacy as a creditbearing discipl

2) Author: Badke

3) Source:

4) Which of the following taxonomy areas does it fit into? (Please select only one):

- ☐ Society
- ☐ Technology
- ☐ Economy
- ☐ Environment
- ☐ Politics and Legal Issues
- ☒ Education
- ☐ Other:

5) Relevance:

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A rationale for information literacy as a credit-bearing discipline.

William Badke, Associate Librarian, Trinity Western University, Langley, BC, Canada. E-mail: badke@twu.ca

Abstract

Purpose: While the need for comprehensive information literacy in today's society is becoming increasingly apparent, and initiatives abound within local, regional, national and international educational venues, there is evidence that information literacy within higher education today is failing to meet its dual intentions of becoming credible within the academic community and pervasive within university programs. The goal of this paper is to present a more rigorous approach to information literacy as a credit-bearing discipline.

Approach: Following a literature review, the paper will propose an educational rationale for information literacy as a discipline.

Practical Implications: If a proper educational rationale can be determined for information literacy, this can become the basis for actual information literacy credit programming within institutions of higher education.

Originality/Value: While the idea of information literacy as a liberal art or a discipline is not new, this paper is the most comprehensive attempt to date to provide a rationale for information literacy as a credit-bearing discipline.

Keywords

Information literacy; credit-bearing courses; higher education

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The information literacy movement has grown dramatically over the past quarter century. Several sets of rigorous national standards have been established, a large body of research has been published, and many library faculty positions are devoted to library instruction. Yet the actual level and extent of instruction to students in many colleges and universities remains low. The vast majority of instructional librarian time is spent doing one or two hour sessions at the invitation of subject faculty or providing basic generic instruction to incoming freshmen. Few professionals in the field would argue that such limited exposure to information literacy instruction can fulfill the goals of existing standards in and of itself.

Peter Drucker, the premier management expert of the Twentieth Century, described the outcome of inadequate information literacy instruction with the following analogy: “In today’s organization, you have to take responsibility for information because it is your main tool. But most don’t know how to use it. Few are information literate. They can play ‘Mary Had a Little Lamb’ but not Beethoven.” (Harris, 1993, p. 120)

The importance information literacy is well captured in the statement of Christine Bruce (2002): “Information literacy is the natural extension of the concept of literacy in our information society. Information literacy is the catalyst required to transform the information society of today into the learning society of tomorrow.”

To argue that information literacy should have a higher place within academia is certainly not new (most recently, Owusu-Ansah, 2007), nor is the discomfort that many information professionals feel about the disparity between the needs for an information literate populace and the amount of education in the use of information that they are able to provide. It is the premise of this paper that true information literacy will not become a reality until it is elevated to the status of an academic discipline that has a confirmed role within the curriculum.

I. Determining the Need

The need for information literacy within higher education is hardly open to question among information professionals. A few examples will suffice.

In 1991, the US Department of Labor’s Secretary’s Commission on Achieve Necessary Skills produced a report looking at five benchmark skills required by the modern workplace. One of these was information literacy, by which the worker, “Identifies the need for data, obtains it from existing sources or creates it, and evaluates its relevance and accuracy.” (Martin, 1991, p30). The report considered the role of education in developing required skills and found that schools and industry were often at cross purposes with regard to abilities needed to function at work. “Students will not acquire what they need to progress in life by osmosis, either in school or in the workplace… Today’s schools must determine new standards, curricula, teaching methods, and materials.” (p16)

Bonnie Cheuk’s (2002) study on information literacy in the workplace context detailed gaps in worker information literacy skills that lead to loss of efficiency and business opportunity. She pointed out how closely these deficiencies parallel the ACRL Information Literacy Competency Standards for Higher Education and argued that, “Information literacy will eventually become basic literacy skills comparable to language and numerical skills.”

Susan Felman (2004), Vice president, Content Technologies at International Data Corporation has reported on years of research on information use within corporations. Her findings are that while knowledge workers spend 15% to 35% of their time seeking information, they report finding the information they desire only 50% of the time. At least 15% of knowledge created already existed but was not found.

Moody and Walsh (1999) made a case for information as a "strategic business asset," arguing: "There is little point in improving the accuracy and timeliness of data if people don't know how to use it effectively. Equal emphasis, therefore, needs to be placed on improving people's information literacy skills as improving the quality of information itself." (p6)

F. Anthony Comper, president of the Bank of Montreal, commented on the growing need for information literacy in the workplace: "What we in the knowledge industries need, preferably in an endless stream, are people who know how to absorb and analyze and integrate and create and effectively convey information. And who know how to use information to bring real value to everything they undertake." (*ACRL - advocate for IL,* 2003)

It may be argued, however, that expressions of need from the workplace, even a call for students in higher education to have information skills, should not necessarily govern the development of the university curriculum. All too often the essentials of curriculum – philosophical base, program integration, higher order thinking – are subsumed to the demands of a marketplace that does not understand that university education is more than training for a career. This could be a valid complaint were it not for the fact that we are all – marketplace, university and general populace - located within an information age that places high value on efficient and effective acquiring and use of information.

Within academia, it is often asserted that the same failings found in the workplace are diminishing the level of scholarship done by students. Bundy's (2004) article calling for a joining of information literacy and information technology fluency pointed out that the various levels of formal education – primary, secondary and tertiary – are not connecting with one another in development of these essential skills. "Nor do they usually demonstrate that they have really grasped the implications of a world of infoglut, or the impossibility of an information illiterate person being able to be a lifelong learner and a full participant in society." (p8).

His view is shared by others. Whitehead and Quinlan (2003), speaking to the gap between what is needed in information literacy and what is actually being done in Canadian universities, argued, "At the root of the problem is the fact that information literacy is rarely addressed as an educational objective and therefore is not systematically covered in academic program curricula." (p11). Their assessment of current progress was that, "Information literacy initiatives in Canada remain on the margins of the education process, much to the detriment of Canada's workforce and economic potential." (p5)

Maughan (2001) demonstrated that information literacy inadequacy in higher education is leaving university graduates devoid of the very skills they require to function well within the information workplace. Surveys administered to senior undergraduates at the University of California-Berkeley in 1994, 1995, and 1999 showed that students consistently over-estimated their research ability, while, of eight discipline-specific groups of students studied, five showed failing scores even on measures of lower order information literacy. Similar findings were observed in a 2003 study of 330 incoming graduate law students, who believed their research skills were well advanced, while they failed dramatically in an actual test of skills ("2003-2004 completed research grant projects"). Perrett (2004) found that 81% of incoming graduate students required further information literacy instruction in order to meet educational standards, though many of them had self-rated their skills as good or excellent. Such results are no surprise to university reference librarians who observe significant gaps in student information literacy, even at the senior levels, on a daily basis.

In the face of growing use of Internet search engines by students, research consistently shows that 45% or more of students, even graduate students, use search engines such as Google as their initial search tools in research (Griffiths & Brophy, 2005; Liu & Yang, 2004, p26). This demands that one question whether or not students do well searching even with Google. Research, once again, shows that they do not (Griffiths & Brophy, 2005).

One must further ask whether or not students are acquiring higher level information literacy skills, such as the ability to discern among various sources of information or to evaluate the information they do find. Wang and Artero (2005) in a study of Internet use among 647 students, found that 40% believed that information found through an Internet search engine was as reliable as that in books and journals, while a further 33% were undecided on the issue. Though 78% reported that they evaluated Web resources before using them, 58% indicated that they would use a piece of information so long as it fit with their point of view. The authors concluded that students were creating their own highly subjective evaluation criteria. "Although the students in this study judged that they had critically evaluated Web information, their responses to the survey questions showed that they were not equipped with sufficient knowledge and skills to critically evaluate Web resources." (p80)

It is regularly asserted, as well, that in many universities worldwide, while information literacy may be on the agenda of the institution, the actual practice tends to be at the level of short, optional instruction rather than training that rests solidly within the university curriculum (Corrall, 2007; Owusu-Ansah, 2007).

II. Existing Initiatives

Since the mid 1970s, information literacy has taken on growing importance within national educational planning, accrediting organizations, and educational institutions. While the following is only representative, the extent of initiatives around the world is impressive.

American statements on information literacy abound, from the US Department of Labor's report, "What Work Requires of Schools," which lists as one of five competencies, "Information - acquiring and evaluating data, organizing and maintaining files, interpreting and communicating, and using computers to process information" (Martin, 1991, p10) to the US Department of Education's National Educational Technology Plan presented to Congress, which sets as one of its five goals that, "All students will have technology and information literacy skills." (Riley, 2000, pp6, 39-44). The Association of College and Research Libraries has developed standards for information literacy (Association of College and Research Libraries, 2000) with a number of accompanying guidelines (Association of College and Research Libraries, 2001, 2003a, 2003b)

Other countries have followed the same pattern with extensive position papers and standards. Australian and New Zealand university libraries have created a comprehensive information literacy framework (principles, standards and practice) that has adopted the ACRL standards but added two more sections related to creation of new information and lifelong learning (Bundy, 2004a). In Australian higher education, the concept of "information literacy" is well accepted, and various types of training are in use, though a comprehensive instruction framework is still difficult to attain (Peacock, in Lau, 2007, p7-23). Fafeita (2006) reported increased information literacy initiatives within the Technology and Further Education sector in Australia, though actual research instruction was minimal and there were barriers to further development, including lack of resources, and lack of understanding from subject faculty and administrators.

The Canadian Association of Research Libraries has developed its own Information Literacy Policy Statement and created an Information Literacy Working Group (Canadian Association of Research Libraries, 2005).   At least one institution, University of Alberta, Augustana, has an extensive set of discipline-oriented credit courses (University of Alberta, 2007; Goebel & Neff, 2007). Whitehead and Quinlan (2003), however, are pessimistic about the extent to which information literacy has been integrated into most universities' academic agendas.

In Britain, following upon the Society of College, National and University Libraries 1999 paper "Information Skills in Higher Education," (Society of College, National & University Libraries, 2003) the Big Blue Project was established to survey higher education information literacy efforts and ensure "a coherent approach to the development of an information literate student population in the UK" (The Big Blue). The British-based Chartered Institute of Library and Information Professionals has produced a comprehensive definition of information literacy and its components, thus essentially laying out the standards to be met in information literacy instruction (Chartered Institute of Library and Information

Professionals, 2006). Several universities have developed credit courses either live or online, and the number of tutorials and other information literacy instruction resources is growing (Virkus, 2003). At the same time, Webber and Johnston (2003) found a “prominence of the library, digital resource, and IT skills orientation over Information Literacy” in many initiatives. For more comprehensive surveys, see Webber and Johnston (2003) and Webber and McGuinness, in Lau (2007, p121-133)

In Continental Europe, information literacy is gaining increasing prominence within higher education, particularly in Scandinavia, where the number of courses and comprehensive courses available is growing rapidly (Virkus 2003). The NordINFOLIT collaboration, though lacking government funding, provides a venue for Nordic countries to share information and resources. Spanish Universities offer a number of optional information literacy courses (Pinto & Sales, in Lau, 2007, 84). Virkus (2003) notes, however, that in Europe there is a lack of government interest and initiative in information literacy programming, though training in technological skills is significant. See also the survey by Rader (2002).

In other parts of the world, information literacy is of uneven quality and extent. Lau (2007, p33) reports the information literacy in Latin America is a “scattered activity” mostly found in private education. An online course in Mexico is being used among nearly thirty universities. In African countries information literacy is generally taught within courses on computer and information skills (Fidzani, in Lau, 2007, p116). While still uneven, the African experience is robust where information literacy is taught, as, for example, the case study of Wema & Hepworth (2007). In South Africa, during a time in which higher education is undergoing significant change, several institutions are now offering mainly generic information literacy credit courses (Jager**,** Nassimbeni & Underwood, in Lau, 2007, p161).

International information literacy initiatives abound: In 2003, information professionals from 23 countries in all 7 continents met in Prague for The Information Literacy Meeting of Experts, resulting in The Prague Declaration, calling for information literacy to be “an integral part of education for all.” (Thompson, 2003, p1) UNESCO, under the mandate of a 2001 UN General Assembly resolution, has held two World Summit on the Information Society conferences in Geneva in 2003 and Tunisia in 2005, which produced the “Geneva Declaration of Principles” and the Tunis Commitment”. (*World summit on the information society, Geneva 2003 - Tunis 2005.*2006) The Information Literacy Section of the International Federation of Library Associations and Organizations (IFLA) has sponsored the creation of a comprehensive statement of “International Guidelines on Information Literacy” (Lau, 2004). The result of the UNESCO sponsored *High Level Colloquium on Information Literacy and Lifelong Learning* in Alexandria, November 2005, was a large report along with the

Alexandrian Proclamation on Information Literacy and Lifelong Learning (Garner, 2006).

III. The Perceived Inadequacies in Information Literacy

All of this activity should be encouraging to most devotees of information literacy beating, but the reality is that much of the literature being produced by this growing movement is found within the circles of librarians and information professionals, not in the mainstream academic community. While there are scattered instances of universities and even nations or geographical regions adopting information literacy educational criteria and using them to develop programs with measurable outcomes, there are few institutional, let alone national, strategies that are actually succeeding at the level of comprehensive instruction. With all the energy being put into agendas for information literacy, we should surely by now be seeing significant results in student populations. But studies continue to report that most students are not exhibiting information literacy knowledge and skills that meet the common standards, such as those of ACRL.

Part of the difficulty is that many initiatives tend to see information literacy as a series of skill sets, with the implication that a corresponding series of training opportunities will make students literate with information. This is overly optimistic when one considers the knowledge base that accompanies true information literacy – What is information (or can we even speak of "information" as a singular entity in our Postmodern age)? Where does it come from? Who determines that it is published or that it takes the form that it does? What is the difference between a scholarly journal article and a webpage (or is that even a legitimate question, considering the confluence of formats available for information today)? Why do I have to pay for some information while I do not have to pay for other information? What is metadata, and how can it help me? What are the implications of electronic searching and electronic documents for the way we do research? How do we evaluate what we have found? What are the legal and ethical considerations that will have an impact on what is available to us and how we can use it?

It is one thing to create a tutorial or hold a class to teach someone how to search a database. It is quite another to help that same person to navigate the troubled waters of the information revolution with such skill that the right information for the task is effectively and efficiently found, evaluated, and then used to optimum advantage within legal and ethical boundaries. Teachers of information literacy all too often concentrate skill sets (Corrall, 2007) while the overarching framework of understanding the nature and proper use of various information sources (the philosophy of information) is simply not taught, though it is clearly delineated in standards like those of ACRL (Association of College and Research Libraries, 2000).

Another challenge comes from the ever-present reality that subject faculty still tend to see information literacy instructors as intruders and thus remain resistant to implementing it beyond allowing the occasional class session for "library instruction." Information literacy is not generally on the agenda, in any significant way, of the average history or sociology or physics class, even though its students are expected to use the skills of information literacy in course assignments. (Hardesty, 1995; Badke, 2005)

A great deal of what passes for information literacy is really old style bibliographic instruction in the form of single sessions that major on library use. There are, to be sure, strategic initiatives in university systems such as California State University (*CSU information competence project,* 2001) and The Five Colleges of Ohio (2006), as well as national initiatives like the Big Blue of Britain (The big blue) and the Australian and New Zealand Information Literacy Framework (Bundy, 2004a). But most universities and university systems lack such comprehensive programs. The statement by Webber & Johnston (2003) that UK universities are characterized by "a limited appreciation of the wider implications of the information society for higher education curricula, teaching and learning," summarizes the findings of many studies worldwide.

As a result of tentative and abortive efforts to make information a viable part of higher education, the movement, even as it is growing, is beginning to run out of energy. In 2005 the Canadian Library Association conference included an agenda item entitled, "The Great Debate: Be it Resolved that we Teach them Nothing - Library Instruction Doesn't Work" (*Rediscover the Library Movement,* 2005) To be sure, the proponent view failed, and the conference's business meeting passed a resolution to make information literacy a priority in its advocacy, but the fact that it was even debated at national level shows cause for concern.

The 2006 ACRL President's Program at the American Theological Library Association convention of June 2006 was a debate on the resolution: "The Emperor Has No Clothes: Be It Resolved That Information Literacy Is a Fad and Waste of Librarians' Time and Talent" (ACRL in New Orleans*,* 2006) Such a debate in no way proves that information literacy is dead, but it does signal a growing opposition based primarily on the premise that what has been promised in this movement has not been delivered in terms of real advances within the student population.

Why, then, given the power of so many initiatives, is information literacy struggling to find a place in higher education? Librarians would probably blame subject faculty and academic administrators who refuse to advance the information literacy agenda. Librarians may well feel that those in academia see little need to increase the role of information literacy in the curriculum and rarely understanding what the information literacy movement is seeking to accomplish. Front line information literacy instructors could point to the enormous number of single sessions that they teach to a bored and resentful student body. The academy in general could argue that the segregation of information literacy research within publications that only librarians read makes the whole movement peripheral.

This paper will argue that, while all of these factors may be part of the problem, the real failure of information literacy to this point is that it is simply not robust enough. To invoke the analogy of Peter Drucker (Harris, 1993, p. 120), today's information literacy has "Mary Had A Little Lamb," not Beethoven, written all over it. To this challenge we now turn.

IV. The Discipline Called "Information Literacy."

Information literacy has been studied extensively. It has been defined, standardized, discussed, debated, initiated, discussed, re-defined, and so on until most scholars in this field now believe they have a fairly good idea of what it entails. They have generated best practices for teaching it (Association of College and Research Libraries, 2006), and they have guidelines for instruction programs in academic libraries (Association of College and Research Libraries, 2003b). But have they fully understood what creating an information literate student population actually entails?

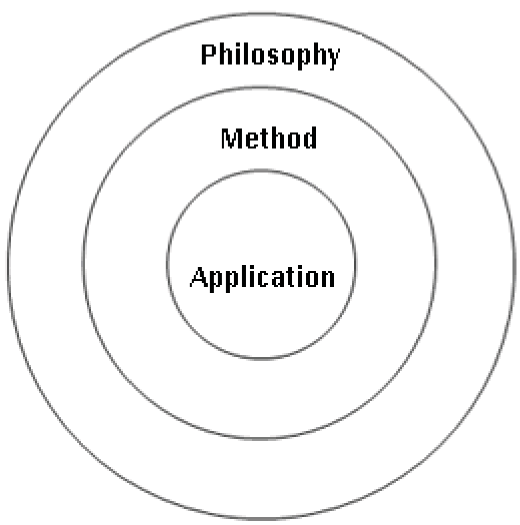
Let us consider the average information literacy initiative in a university. It may begin with a generic single session of an hour or two, which generally focuses on the tools of research. This may be followed up by subject-specific sessions, sometimes with a small research assignment, or even by significant credit-bearing components of information literacy within existing courses, usually tied to an assignment, but often governed more by the pedagogical goals of the subject faculty member than those of the librarian instructor (who is a guest in the classroom, no matter how collegial the arrangement may be). A smaller number of universities (perhaps 30% according to Shirato and Badics, 1997) offer one to three credit courses either as stand-alone offerings from the library or within subject disciplines. Very few of such courses are part of the required core.

The results overall are disappointing. Students continue to use Google as their primary doorway to information, many of them fail to appreciate the value of gatekeeping in the production and publication of scholarly books and articles, and search skills in the electronic environment remain minimal. Studies of incoming students in postgraduate programs show significant gaps in information literacy that presumably should have been filled in undergraduate programs ("2003-2004 completed research grant projects;" Perrett, 2004) The result for the marketplace is that workers, who for the most part depend on information for much of what they do, have a poor understanding of the nature of the information they are working with, waste large amounts of time acquiring it (if they find it at all), and use it in inappropriate ways that put the enterprises they work for at risk. Many graduated students come into the workplace performing inadequately in the realm of information handling, even when they have passed through our information literacy programs.

The time has come to recognize that information literacy needs to move to the next level and be considered a viable, core academic discipline that is taught with the same rigor as any other discipline. Not only must information literacy achieve full academic status, but it must be required in every program in higher education. The ability to handle the information that comprises the heart of academic study is foundational to genuine education in the information age.

What would such an academic discipline look like? First, it would most likely locate itself at various points in the curriculum, finding the subject content with which it works in the majors of the students who takes it. Such multi-faceted disciplines already exist in the form of philosophy, ethics, and so on. The discipline of ethics can form a good analogy as it ranges through the academy as philosophical ethics, bioethics, business ethics, professional ethics, and so on. While the philosophical framework within which it operates has a strong consistency, it works out its methodology and application in different ways, depending on its subject matter.

Second, it would consist of three elements in concentric circles. The outer consists of philosophy, within which lie method/strategy, and the innermost circle is application:



Why should we make our students deal with the philosophy of information as well as learning research method? We should do so because, all too often, information literacy instruction begins and ends with application - the skills of information acquisition and evaluation, often involving learning how to search databases and how to use of evaluation checklists. The application realm of information literacy, however, is the most changeable and thus the least likely to be valued in the long term of the student's academic studies and workplace experience. What is more, teaching application without teaching method and philosophy is akin to showing someone how to steer and use the brakes on a car without teaching overall driving technique and the rules of the road.

V. The Epistemology of Information – Framework for a Philosophy of Information Literacy

There was a time in which the concept of "information" could be summed up as "that which provides us the foundation for the discovery of truth." Postmodernism and Poststructuralism have challenged the assumption that the sources of our information are sufficiently objective and values-neutral to make the acquiring and use of information a task for skill development alone. Kapitzke (2003), for example, has argued that information can no longer be seen as operating in some sort of vacuum, separated from the social and historical processes that shape it and justify its existence. Information is not neutral, nor is it apolitical.

Kaptizke goes on to call for recognition of a hyperliteracy (a literacy that recognizes the various forms and media in which information is found) to better explain the many environmental factors operating when information is created and used. Hyperliteracy includes "intermediality," the contextualizing of the information process within the worlds of the producer and user so that a constant critique of the assumptions within the whole process, and of epistemological assumptions behind it, is maintained.

This is in perfect accord with our call to have information literacy live within a philosophy of knowledge, yet it neglects one aspect of epistemology – the reality that a source of information needs to be evaluated by criteria that are more or less universally acceptable. We contextualize the information process by recognizing why the writer writes, the processes by which the information was allowed to be published, and how the reader reads it. But a proper epistemology also looks at the qualifications, presuppositions and biases of the writer.

Here we need to use criteria that clarify the extent to which the information is to be believed, relied upon, or used for the purpose it appears to be seeking to achieve. Unless our epistemology makes a god of subjectivity, any philosophy of knowledge has to ask questions like "Who wrote this? Does she have the required knowledge base to make her writing reliable? What presuppositions have set the direction for her approach to this topic? What value will this piece of information ultimately have to my quest?"

A reality that comes into play at this point is that academic information generally lives within the context of a subject discipline, within which discourse is carried out by specific though often unwritten rules that make any particular piece of evidence or product of research either valid or invalid, based on the criteria established by the discipline. We may well accept the warning of Martin (1998) regarding the political bias within disciplines, but Keresztesi (1982) has made clear in his pioneering article, "The Science of Bibliography," that the recognition of an area of study as a discipline with the university is the only way for it to achieve widespread approval in society.

Keresztesi clarified the way in which information literacy (or, in his older terminology, "bibliography") could work as a discipline within the context of an existing subject area. He pointed out that there are two kinds of discipline-related knowledge. One relates to "structural manifestations," that is the depth and substance of the subject matter. The other relates to "surface or topographical manifestations." This second dimension deals with epistemology – the factors that the discipline values in its search for knowledge, the norms it recognizes, and the research and communication processes it uses. Topography is that part of discipline-related knowledge that is the special sphere of "bibliography." Keresztesi argued that, not only was topography generally unimportant to the scientist's interests, but it was territory so far only staked out by bibliographers. That same territory now lies in the hands of the information literacy specialist.

Thus, in any philosophy of information literacy as a discipline, the role of subject disciplines, particularly their topographical manifestations, must be integral. A relevant model might be that of a core information literacy course within each major, where it can be informed by the discipline involved (Badke, 2003, 2005), though, of course, the material could be embedded in one or more courses within a discipline. While a generic information literacy course could deal with the philosophical purposes in a minimal way, a full-blown philosophy of information literacy would have to take the appropriate subject discipline(s) into account.[1]

VI. The Methodology of the Information Quest

Information literacy instruction in practice has often lacked a coherent methodological core. Part of the problem has been the fact that much of what passes for information literacy in practice is really bibliographic instruction that focuses only on information acquisition. But, even when there is a clear philosophy of information literacy in place, the idea of a guiding method that shows students how to move from point A to B to C is often lost in the rush to move from philosophy to application. This creates what might be called an architectural model of instruction – here is the catalog, these are the databases, and here is how you use them. An overarching research methodology, consisting of strategies-based approach based a research model, is required in the place of mere application.

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[1] An alternative view is presented by Webber and Johnston (2000), who argue that "information literacy can be taught as a stand-alone subject in its own right and does not have to be incorporated into other classes to be meaningful to students." (p393) Their case, however, is a rejection of the often fragmentary nature of the through-the-curriculum model, rather than a lack of appreciation of the role of subject disciplines

Research models, however, are open to criticism. The widely used information processing model that sees a progression from data to information to knowledge has been criticized by many as being too structured and not open enough to the possibility that information can just as easily lead to confusion. Marcum (2002), in particular, has pointed out that knowledge is not organized information but a quantum leap from information to cognition, understanding and experience. He argues: “Knowledge is not certainty but is a set of beliefs about causal relationships between phenomena.” (p12). Further, Marcum points out that the information processing model, as well as most information literacy models, fail to take into account the crucial role of the researcher in formulating knowledge. “Too little acknowledgment is afforded to the context brought to the process by the learner.” (p12)

We might, therefore, assume that there is no methodological framework, no research model, within which we can lodge instruction. Knowledge acquisition is indeed an eclectic and multi-party process involving acquiring data, making sense of it, considering both its biases and ours. Thus it may well be that defining a single research method is at best artificial and at worst impossible. But the alternative is simply to explain to our students how information works within the discipline and then turn them loose on the tools without giving them any process to follow in moving from point A to Z in their research.

There is a time-honored methodology available to us, however, that can answer most of the methodological doubts we have raised to this point. It is the scientific method. Instant objections can, of course, be raised – the scientific method too is artificial, limits creativity, and is too rationalistic to deal with all the subjectivity involved in turning information into knowledge. But as a method it brings together the main features of most problem-solving in the human enterprise – development of a working knowledge of the issue, creation of a statement that crystallizes the nature of the to be addressed at hand (hypothesis or research question), a review of what is currently known about the issue (including a delineation of the various points of view that are held), an exercise to compile and/or evaluate evidence, and a conclusion that weighs all that has been discovered and takes a position on it. This method can take many views on an issue into account, can properly address the bias brought by the researcher, and can help discern what passes for “information” to determine its quality/usefulness/reliability in helping to deal with the stated problem.

Clearly, many students struggle in the early stages of research, not seeing a path ahead and feeling a great deal of anxiety that is not alleviated simply by providing them with a rubber-stamp method (Kuhlthau). It is a fact, as well, that the actual research process is often cyclical so that initial information gathered leads to reformulation of the research question/hypothesis, leading to more information gathering and writing, which may cause the researcher to return to the acquisition stage to bolster the knowledge base or even back to the hypothesis once again to clarify it further. This is particularly true of research scholars, whose methodologies are varied and often appear to have no organized structure (Stoan, 1984). But we do not have sufficient reason to avoid putting the application of information literacy within a methodological framework. As Bodi (2002) has pointed out, established scholars have a knowledge base that allows for the ambiguities and potential confusion of circular research. University students, lacking a knowledge base and, indeed, any coherent sense of the purposes and techniques of the research process, flounder in their research, often rejecting whatever method they have been taught but substituting nothing better.

Bondi argues: "Librarians tend to teach a step-by-step, linear search strategy, but research, especially in an electronic environment, is interactive and circular. A coherent, flexible research model that can be adapted to various instructional sessions is necessary,
but we need to be clear that one strategy does not fit all circumstances" (p113). Without some sort of flexibly conceived framework for research method, any mechanical skills remain orphans, lacking a blueprint to determine when they should be used. The best way to instill a research methodology is to build assignments around a research process, providing examples that indicate when, and in what manner, the researcher will need to deviate from the normal pattern. In this way, students do not just have a set of tools and some skills to use them, but they also have a process by which use of the tools can lead to understanding and problem-solving.

VII. Instruction in Application Skills

Teaching the application of the information process – how to use keywords and controlled vocabularies; how to search catalogs, databases, and the Internet; how to evaluate information sources – is the predominant territory for many information literacy instructors today. Application skill is important, but as we have argued, it needs to be taught within the spheres of philosophy of information and a flexible research method if students are to bear fruit in the effective acquiring and use of information.

To use an analogy, the application of research is like a tradesperson's skill with his/her tools. Proper use of the tools is problematic if the tradesperson has not been educated in the engineering and regulatory aspects of the trade and has not developed expertise in using the right tool to accomplish each stage of the task.

VIII. Conclusions

The idea that information literacy should constitute its own discipline is not a new one. Frances Hopkins (1981) proposed that bibliographic instruction (patterned very much on the lines of current information literacy) as an emerging professional discipline could be based on the movement within the sciences called “the science of research.” The development of standards, a large literature, and defined teaching positions in information literacy now make the possibility of viewing information literacy as a discipline even more feasible, and, indeed, other scholars of information literacy continue to advocate its role as a discipline. (Peacock, 2001; Johnston & Webber, 2003)

We are not, however, thinking of a generic information literacy teaching subject area in referring to this discipline (as proposed by Johnston & Webber, 2000; Owusu-Ansah, 2004, 2007, among others). Rather, we are looking at it as a discipline with many possible venues, informed by subject matter in existing subject disciplines. Thus information literacy taught in the Communications Department would be distinct from information literacy taught in the History or Physics Departments. This is not to say that there would not be a commonality to all such courses, but each would adapt to the subject matter of its environment.

Essential to any such discipline is a philosophy or theory related to the nature of and human interaction with this nebulous thing we call “information.” Such a philosophy would recognize that not all information is created equal, that subjectivity and politics and economics and legalities all shape the information we receive as well as the way we use it, and that understanding the nature of the information we deal with is foundational to using it well.

The discipline would also have a strong process element in the flexible yet coherent research methods that are taught and in the application of skill development that is essential to proper hands-on use of information in our highly technological age. The best way to do this is to structure assignments around actual research projects in which the stages of the student’s work are critiqued. While this paper is not the venue to consider extensive details of pedagogy, the example of this author’s graduate research syllabus makes the teaching process relatively clear (Badke, 2007). This syllabus lodges instruction in study of the world of information, presents a flexible model for doing informational research, and requires extensive assignments in which students carry out actual research projects and have those developing projects critiqued at every stage.

Turning information literacy into an academic discipline could, of course, be a sterile dream in our current academic environment where getting even a one credit information literacy course into the curriculum as an elective seems nearly impossible in many institutions. What we are envisioning is a campus-wide, hopefully required, plan to lodge information literacy courses into the cores of majors or making them significant components of courses across the curriculum. The sheer logistics of altering curricula to this extent and then finding instructors to teach it may make such a proposal appear unworkable. Such, however, are the challenges of any educational revolution, and we are, admittedly, looking for a revolution, not just a token adjustment.

Librarians know one fact that could make the difference, if the rest of the academy were to discover it – information literacy, or rather the lack of it, is the biggest blind spot in higher education today. Should the academy wake up to the reality of a world filled with people who know how to play little more nursery songs with the information tools that are essential to our economy, we will have a vision ready for a better way to do things. One day, perhaps all of our students will be able to play Beethoven.

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PRINT FORM SUBMIT

Grossmont-Cuyamaca Community College District

Education Master Plan
Information Submission Form

The Grossmont-Cuyamaca Community College District is starting a year-long process to develop an Educational Master Plan that will serve as the blueprint for our future. The Educational Master Plan is a long-range, comprehensive document intended to guide institutional and program development at both the college and district levels. The priorities established in the Educational Master Plan will serve to guide College and District decisions about growth, development and resources allocation.

As the first step in this planning process, everyone in the GCCCD community (faculty, staff, students and community members) are invited to identify and submit information sources to be reviewed for the trend analysis in one of six areas – society, technology, economy, environment, politics, and education. We are not asking you to do research, only to identify information you already have or that you encounter during the search period (March 21- April 25) and bring it to our attention for review.

Please answer the following questions for each document you submit:

(Feel free to submit as many of these forms as you would like)

1) What is the name of the document? Facilitating Student Learning Through Contextualization

2) Author: Dolores Perin

3) Source: Community College Research Center

4) Which of the following areas does this document best address? (Please select only one)

- ○ Society
- ○ Technology
- ○ Economy
- ○ Environment
- ○ Politics and Legal Issues
- ● Education
- ○ Other

5) Relevance: student success

6) Page/Section:

7) **Attach Document/Place URL Here:** http://ccrc.tc.columbia.edu/Publication.asp?UID=866

Download the free Adobe Reader X: http://www.adobe.com/accessibility/products/reader/

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Questions email: lynne.davidson@gcccd.edu Research, Planning and Institutional Effectiveness

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COMMUNITY COLLEGE DISTRICT

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Please answer the following questions for each document you submit:

(Feel free to submit as many of these forms as you would like)

1) What is the name of the document? Course-taking patterns, policies & practices in developmental

2) Author: Mary Perry, Matthew Rosin, Kathryn Morgan Woodward, Peter Riley Bahr

3) Source: EdSource

4) Which of the following areas does this document best address? (Please select only one)

- Society
- Technology
- Economy
- Environment
- Politics and Legal Issues
- Education
- Other

5) Relevance: developmental course-taking patterns in California Community Colleges

6) Page/Section: executive summary

7) **Attach Document/Place URL Here:** http://www.edsource.org/assets/files/ccstudy/ES-CC-Developme

Download the free Adobe Reader X: http://www.adobe.com/accessibility/products/reader/

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Please answer the following questions for each document you submit:

(Feel free to submit as many of these forms as you would like)

1) What is the name of the document? American Graduation Initiative

2) Author: President Obama

3) Source:

4) Which of the following areas does this document best address? (Please select only one)

- ○ Society
- ○ Technology
- ○ Economy
- ○ Environment
- ○ Politics and Legal Issues
- ● Education
- ○ Other

5) Relevance: Focuses on degree completion in the community colleges

6) Page/Section:

7) **Attach Document/Place URL Here:** http://www.whitehouse.gov/the_press_office/Excerpts-of-the-Pre

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Please answer the following questions for each document you submit:

(Feel free to submit as many of these forms as you would like)

1) What is the name of the document? Professional Development Learning Environments (PDLEs)

2) Author: Roland vanOostveen

3) Source: Canadian Council of Learning

4) Which of the following areas does this document best address? (Please select only one)

- ○ Society
- ○ Technology
- ○ Economy
- ○ Environment
- ○ Politics and Legal Issues
- ● Education
- ○ Other

5) Relevance: Use of technology to create a professional learning environment. Many good principles.

6) Page/Section: Sections 1 and 2.1 highlight sources and strategies for problem-based learning.

7) **Attach Document/Place URL Here:** http://bit.ly/hBK3rL

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Please answer the following questions for each document you submit:

(Feel free to submit as many of these forms as you would like)

1) What is the name of the document? The Structure of Student Decision-Making at Community

2) Author: Judith Scott-Clayton

3) Source: CCRC Brief

4) Which of the following areas does this document best address? (Please select only one)

- ○ Society
- ○ Technology
- ○ Economy
- ○ Environment
- ○ Politics and Legal Issues
- ● Education
- ○ Other

5) Relevance: "interventions" that can provide additional structure for community college students

6) Page/Section: Research in Brief (summary of longer working paper)

7) **Attach Document/Place URL Here:** http://ccrc.tc.columbia.edu/Publication.asp?UID=848

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Please answer the following questions for each document you submit:

(Feel free to submit as many of these forms as you would like)

1) What is the name of the document? y

2) Author: Ruby Payne

3) Source: Ahaprocess.com is a good resource

4) Which of the following areas does this document best address? (Please select only one)

- ○ Society
- ○ Technology
- ○ Economy
- ○ Environment
- ○ Politics and Legal Issues
- ● Education
- ○ Other

5) Relevance: low income; disadvantaged

6) Page/Section: site

7) **Attach Document/Place URL Here:**

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Please answer the following questions for each document you submit:

(Feel free to submit as many of these forms as you would like)

1) What is the name of the document? Rebalancing the Mission: The Community College Completion

2) Author: Christopher M. Mullin

3) Source: AACC

4) Which of the following areas does this document best address? (Please select only one)

- ◯ Society
- ◯ Technology
- ◯ Economy
- ◯ Environment
- ◯ Politics and Legal Issues
- ◉ Education
- ◯ Other

5) Relevance: current issues affecting community college completion rates

6) Page/Section:

7) **Attach Document/Place URL Here:** http://www.aacc.nche.edu/Publications/Briefs/Documents/rebalar

Download the free Adobe Reader X: http://www.adobe.com/accessibility/products/reader/

To attach a document: **Reader 9: Use "Tools"-"Comments and Markups"-"Attach a File as a Comment"**
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Questions email: lynne.davidson@gcccd.edu Research, Planning and Institutional Effectiveness

Educational Master Plan

Information Submission Form

1) Title: Sallie Mae brings back deferred payment option

2) Author: CANDICE CHOI

3) Source: Associated Press- March 25

4) Taxonomy Area:

- ☐ Society
- ☐ Technology
- ☐ Economy
- ☐ Environment
- ☐ Politics and Legal Issues
- ☑ Education
- ☐ Other: __________

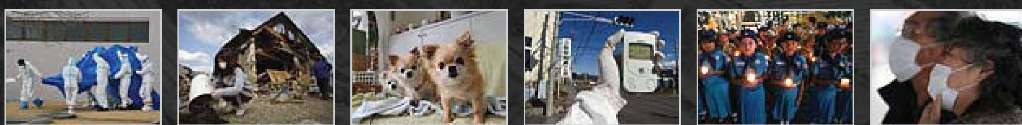
5) Relevance: Financial Aid

6) Page / Section: Finance

7) Link to document: __________

or

8) Attach Document Here:

DISASTER IN JAPAN

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Sallie Mae brings back deferred payment option

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By CANDICE CHOI, AP Personal Finance Writer – Fri Mar 25, 6:33 pm ET

NEW YORK – Sallie Mae is bringing back an option that lets students wait until after graduation to start repaying loans.

The private student lender, formally known as SLM Corp., had done away with its signature deferred payment option loan during the credit crisis in 2009.

At the time, Sallie Mae instead began requiring borrowers to make interest payments right away while in school. The company said the in-school payments helped defray long-term costs for students by reducing the amount of interest that accumulated on the loan.

The company was also looking to reduce its exposure to defaults during the credit crunch.

Students who are approved for loans in the 2011-2012 academic year will now be given three payment options:

_Interest payments. Students who opt to make interest payments in school will be given a more favorable interest rate, which varies depending on their credit profile.

On a $10,000 loan, the typical in-school payment would be about $70 a month. The loan is repaid within seven years after graduation. Over the life of the loan, students would pay about $16,700 depending on the interest rate they're given.

_Fixed payments. A second option, which was introduced last year, requires a fixed monthly payment of $25. This comes with a slightly higher interest rate and a repayment period of 10 years. On a $10,000 loan, students would pay a total of about $20,000 over the life of the loan.

_Deferred payments. Those who choose to defer payments until graduation are given the highest interest rates. The repayment period is 12 years. Students still get statements each month detailing how much they could save by making interest or fixed payments. On a $10,000 loan, students would pay a total of $23,100 over the life of the loan.

Currently, Sallie Mae said about 40 percent of borrowers opt to make interest payments and rest opt for the fixed $25 payment. Charlie Rocha, a senior vice president at company, said his early guess is that only about 10 percent of borrowers will opt for the deferred payments, which were made available Thursday.

Rocha said he doesn't expect the reintroduction of the deferred payment option to dramatically increase the company's loan volume.

That's a figure that has dropped dramatically in recent years amid a tightened credit environment.

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For 2011, Sallie Mae executives are projecting the company will originate $2.5 billion in private loans. That's up from the $2.3 billion originated last year, but just a slice of the $7.9 billion originated in 2007.

The drop comes as private student lenders scramble to adjust to a changing marketplace. In March of last year, President Obama signed a law that essentially cut private lenders out of the federal loan program and made the government the primary direct lender to students. The market for private loans meanwhile has been shrinking; total private loan volume last year at $7.7 billion, down from $20.1 billion in 2007, according to The College Board.

Private student loans, which come with higher, variable interest rates, are seen as a last resort for families who have tapped out other resources, such as federal loans.

Sallie Mae, the nation's largest student lender, has been restructuring and slashing jobs as it responds to the new law and increasingly emphasizes its servicing business for federal loans.

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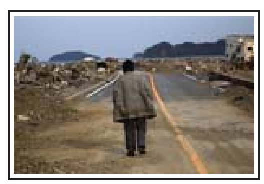

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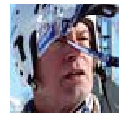

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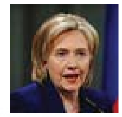

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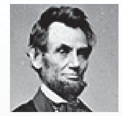

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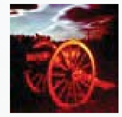

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The humanitarian focus of socially useful projects promises to motivate community-minded undergrads in and out of CS.

BY RALPH MORELLI, ALLEN TUCKER, NORMAN DANNER, TRISHAN R. DE LANEROLLE, HEIDI J.C. ELLIS, OZGUR IZMIRLI, DANNY KRIZANC, AND GARY PARKER

Revitalizing Computing Education Through Free and Open Source Software for Humanity

WHAT IF UNDERGRADUATE students viewed computer science as, in part, a discipline that designed and built free software to help one's friends and neighbors in need? Would that bring more of them in the front door of academic computing departments? What sort of curricular and pedagogical changes would be required to support such opportunities for these students? Would these changes help revitalize computing curricula and enrollments throughout the U.S.?

The Humanitarian Free and Open Source Software (HFOSS) Project is addressing these questions. The goal is to help revitalize U.S. undergraduate computing education by engaging students in developing FOSS that benefits humanity. What started as an independent study by two undergraduates in 2006, the Project today includes students from a number of U.S. colleges and universities engaged in a range of FOSS development projects, both global and local. Here, we provide an overview of the Project, along with some of the lessons learned and the challenges that remain. Our experience over the past three-and-a-half years suggests that engaging students in building FOSS that serves society is a positive step toward strengthening undergraduate computing education.

The Project has been supported since September 2007 by a National Science Foundation CPATH[a] grant, aiming in part to build a collaborative community of individuals from multiple educational institutions, computing and IT organizations, and nonprofit social-service agencies to support undergraduates in the development of socially useful FOSS. In general, the Project aims to answer whether getting students involved in humanitarian FOSS indeed also helps revitalize undergraduate computing education.

Inspiration came from the Sahana project, a FOSS disaster-management system developed by a group of Sri Lankan volunteers in the aftermath of the December 2004 Asian tsunami. The Project began working with Sahana in January 2006 after the author Trishan de Lanerolle learned about it during a visit to Colombo, Sri Lanka (see the sidebar "Five HFOSS Software Projects"). That spring, two Trinity College students installed Sahana on an Apache server and began exploring its LAMP architecture (Linux/Apache/MySQL/PHP) as part of their independent-study course. They worked with the code and seemed to enjoy the opportunity and challenge of being engaged in a real-world software project (as opposed to a class exercise). That summer, with support for a research student and in collaboration with community-minded volunteers from Accenture Corporation (http://accenture.com), it developed a volunteer-management module that was eventually accepted into Sahana's code base. Thus began an ongoing collaboration with the Sahana community.

The initial experience with Sahana dovetailed with two ideas outlined by former ACM president David Patterson in his "President's Letter" columns in *Communications*. In "Rescuing Our Families, Our Neighbors, and Ourselves" (November 2005), he suggested it might be the civic duty of computing professionals to be more involved in helping their communities recover from natural disasters while simultaneously helping the profession.[5] In "Computer Science Education in the 21st Century" (March 2006), he explored the disconnect between how programming is taught in the classroom and how cutting-edge software is written in industry, urging educators to involve themselves in the open source movement.[6]

The call to build open source software to help our neighbors resonated with the Sahana experience, suggesting that a project organized around this theme might yield beneficial outcomes for undergraduate computing:

- Give computing students experience with the open source development process in a real-world practitioner environment;
- Let them see firsthand the importance of software-engineering principles;
- Enable them to use their programming and problem-solving skills to contribute to the expanding volunteerism movement that characterizes many of today's college campuses;
- Make it possible for them to gain firsthand contact with IT professionals in the computing industry;
- Enable computing faculty to experiment with a variety of approaches for incorporating FOSS into the curriculum; and
- Invite all participants—faculty, students, IT professionals, and the humanitarian community—to join in a mutually beneficial educational and social enterprise.

Problems that beset undergraduate computing education in the U.S. include sagging enrollment, out-of-date curricula, changing demographics, and rapidly evolving technologies. While they are most closely associated with the academic computing discipline, they are also associated with a number of myths and misconceptions that extend well beyond the academy to society in general: computer science is nothing but coding; computing students are geeks; programming is an isolating activity; and computing jobs are being outsourced to Asia and Eastern Europe.

These problems and myths cannot be addressed within the academy alone. Rather, what's needed is a sustained effort involving a broad coalition of computing educators and industry professionals. Only such an effort can change false perceptions about computing in the larger society. The effort also requires substantial support from the computing industry, which stands to benefit from a revitalized computing curriculum. It also may require the kind of infrastructure and publicity one finds in other communities (such as Teach for America and Habitat for Humanity) that attempt to mobilize students and others to take on real-world projects for the social good.

Serve Society

While FOSS applications run the gamut of computer software, HFOSS, as we define it, is software that serves society in some direct way. This deliberately broad definition is meant to be inclusive of a wide range of socially beneficial projects and activities.[b] To date, the HFOSS Project has not had to face the question of where to draw the line between humanitarian and non-humanitarian FOSS. As a practical measure we use the guideline that any software artifact the Project creates must intrinsically benefit a nonprofit organization pursuing some kind of public-service mission.

As described by Chopra and Dexter[2] the free-software movement has roots going back 60 years to the beginning of the computer age when sharing programming ideas and code was the norm. The modern free-software movement began in 1983 when Richard Stallman defined "free software" as the freedom to use, study, copy, change, and redistribute software "so that the whole community benefits" (http://www.gnu.org/philosophy/free-sw.html).

Following the spectacular success of the GNU/Linux project (http://www.gnu.org/), the free-software movement has grown in scope and importance. An April 2008 study by the Standish Group (http://www.standishgroup.com/) estimated that open source software costs the software industry $60 billion in potential annual revenue.[9] SourceForge (http://source-

a CPATH is a National Science Foundation program within the Directorate for Computer & Information Science & Engineering, formally known as CISE Pathways to Revitalize Undergraduate Computing Education (http://www.nsf.gov/cise/funding/cpath_faq.jsp).

b See also a similar definition in http://en.wikipedia.org/wiki/Humanitarian-FOSS.

2008 HFOSS summer-internship program students and faculty, Trinity College (http://2008.hfoss.org).

PHOTOGRAPH BY ELI FOX-EPSTEIN

forge.net), the primary open-source hosting site, lists more than 180,000 projects and 1.7 million registered users worldwide. Many top software and Internet–related companies, including Dell, Google, Hewlett-Packard, IBM, Intel, and Microsoft, support the FOSS model in one way or another. According to an August 2008 Linux.com article, students are beginning to join open source projects as a way to gain relevant work experience needed for many entry-level computing positions (http://www.linux.com/archive/feature/143415).

The free-software movement is characterized by the way it distributes its products. The GNU General Public License (GPL) was the first of many free-software licenses stipulating how the software can be freely used and shared. As Stallman wrote, software freedom, in this sense, is "a matter of liberty, not price"; it is free as in free speech and not (necessarily) as in free beer. The free-software philosophy is supported and promoted by the Free Software Foundation (http://www.fsf.org).

The free-software movement is also characterized by an open development process, a highly distributed, nonhierarchical, peer-based activity. The FOSS approach stands in sharp contrast to the top-down, hierarchical, legacy-based model of traditional commercial software development. This distinction is often exemplified by the difference between how Linux and Microsoft Windows were developed. FOSS programmers collaborate in loosely organized communities, freely working on the projects and problems that are of most interest to them. The FOSS development process is also closely tied to the user community and marked by frequent releases closely monitored and tested by end users. To use a metaphor coined by Eric Raymond, author of *The Cathedral* and *The Bazaar*,[7] the free software development process resembles a "babbling bazaar," unlike the "cathedral" model historically employed in commercial software development.[7]

The free-software movement split into two competing philosophies in 1998 when a group led by Raymond and Bruce Perens co-founded the Open Source Initiative (OSI) to make free software more commercially attractive (http://www.opensource.org). OSI has since become the steward of the open source definition and serves (together with the FSF[8]) as a standards body for vetting and approving open source licenses, of which there are dozens (http://www.opensource.org/licenses/alphabetical). As reflected in its name, the HFOSS Project accepts the principles and practicalities of the FOSS movement as characterized by both FSF and OSI.

Since spring 2006 the HFOSS Project has engaged students from Bowdoin College, Connecticut College, Trinity College, Wesleyan University, the University of Connecticut, and the University of Hartford in a number of software-development projects serving the community. Its main software-development activities take place during its annual 10-week summer internship program, now in its third year (see the figure here). But students also work on HFOSS projects in courses, independent studies, and thesis projects (outlined in the sidebar).

Given its primary goal of contributing to the revitalization of undergraduate computing education, the HFOSS Project has six specific objectives that, if met, would represent significant progress toward its overall community building and revitalization goal:

- Introduce new concepts and methodologies;
- Attract a new demographic;
- Debunk the computing-is-coding myth;
- Unite town and gown;
- Contribute to society; and
- Create a portable and sustainable model.

Concepts and Methodologies

As a concept, HFOSS is clearly attractive to university computer science students and may help attract new students to computing. This is reflected not only in the interest that has been generated in the summer HFOSS Institutes, where typically two to three times more students apply than can be accommodated but also in the feedback we receive from students in HFOSS software-engineering and software-development courses throughout the curriculum.

Five HFOSS Software Projects

The first three projects are international in scope and involve students in global communities and ongoing software development. The other two projects engage students in local nonprofit organizations to develop custom software that helps the organizations directly. Participation in all five depends on Internet-based communication, collaboration, and software-development technologies. In addition to list servers for shared email messages, students use wiki pages and version-control repositories to share documentation and code with one another and with their mentors. Development teams in each project hold regular virtual meetings through videoconferencing and Internet relay chat.

Sahana. Sahana (Sinhalese for relief) is a FOSS disaster-management system built initially by Sri Lankan volunteers in the aftermath of the 2004 Asian tsunami (http://www.sahana.lk). It addresses the common coordination problems that arise during disaster recovery—finding missing people, managing aid and volunteers, and otherwise assisting the effort. It has also been deployed in numerous disasters around the world, most recently in the 2008 Burma cyclone and 2008 earthquake in China. From its beginnings in Colombo, Sri Lanka, it has grown into a worldwide community of individuals and organizations that support ongoing development, receiving the 2006 Social Benefit Award from the Free Software Foundation (http://www.fsf.org/social-benefit-award-2006).

Beginning in January 2006, our involvement with Sahana focuses on development and support of the volunteer-management (VM) module incorporated into the Sahana code base in December 2006.[3] A first prototype of the module, which supports registration and management of relief volunteers, was field-tested with Sahana at the June 2006 Strong Angel III Disaster Response Demonstration in San Diego (http://www.strongangel3.net). One student said, “This isn’t a typical computer science project. How many students get to publish software that can potentially affect millions of people’s lives?” (http://www.trincoll.edu/AboutTrinity/News_Events/trinity_news/061013_sahana.htm).

Over the past three years HFOSS has become both an integral contributor to and a beneficiary of the Sahana community. The author Trishan de Lanerolle now serves on Sahana’s management committee, and two HFOSS alumni have been granted “committer” status, giving them direct access to the Sahana repository.

On the educational side, Sahana has been used as a teaching platform in numerous courses, independent studies, and summer internship projects.[c] Students in the 2007 HFOSS Summer Institute performed a complete refactoring of the VM module based on a model-view controller design.[d] In spring 2008 Sahana was used as the software platform for an introductory course involving 13 Trinity and Wesleyan students.[4] And in summer 2008 a team of four undergraduates developed a credential-verification module under the direction of Frank Fiedrich of George Washington University’s Institute for Crisis, Disaster, and Risk Management (http://www.gwu.edu/~icdrm).

Figure 1. Field testing the Sahana volunteer-management module at the Strong Angel III disaster response exercise, San Diego, CA (http://www.strongangel3.net).

In May 2008, in an engagement that illustrates how the HFOSS community makes a positive contribution, a team of six students and faculty worked closely over 10 days with a Sahana team in Sri Lanka and an IBM team in China to support deployment of Sahana in Chengdu following the devastating earthquake there (see Figure 1). One China team member later said, “It was really an emotional moment of truth when we saw the happy tears as people were reunited with their families. Eventually, we can say with pride that what we have done is worth remembering for our whole life. We helped people in the disaster area with our technology” (see Figure 2) (http://blog.hfoss.org?cat=29).

Finally, in keeping with the sharing nature of FOSS culture and licensing, the VM module has found application beyond the Sahana system and disaster-recovery domain. For example, a modified version of the original VM module is now incorporated into a coastal-flood emergency-preparedness system for the New York City Office of Emergency Management. The system is designed to manage the potential evacuation of 1.2 million people from low-lying areas and shelter 600,000 evacuees in temporary shelters. Similarly, the Office of Emergency Management in Galveston City, TX, is looking at Sahana and the VM module for its own disaster-preparedness purposes. Using Sahana as the basis for other disaster-preparedness systems could provide a way for students in many schools around the U.S. to involve themselves in HFOSS development projects.

Open Medical Record System (OpenMRS). This FOSS electronic medical record system assists health professionals in the treatment of AIDS, malaria, and tuberculosis in the developing world, particularly in Africa (http://www.openmrs.org). The project began in 2004 as a joint venture of the Regenstrief Institute (http://www.regenstrief.org) and Partners In Health (http://www.pih.org), aiming to provide health-care professionals the information-management tools they need to combat these diseases and provide quality care. OpenMRS has since been deployed in Kenya, Lesotho, Mozambique, Rwanda, South Africa, Tanzania, Uganda, and Zimbabwe.

Like Sahana, the OpenMRS community is a worldwide network of individuals and organizations contributing to the development of the software. It makes extensive use of Java-based development technologies, including Java server pages and servlets, the Spring application framework, and other advanced FOSS tools. Unlike Sahana’s relatively simple PHP/MySQL platform, OpenMRS is substantially more complex and challenging. Nevertheless, HFOSS students have made several important contributions to the OpenMRS project.

During summer 2007, they developed a module to enable the system to be used with a touchscreen monitor, an effort that continued as a senior thesis project and resulted in a generic touchscreen application, AutoTouch, providing an API to add a touchscreen interface to any Web-based application (http://sourceforge.net/projects/autotouch). During the summer 2008 HFOSS Institute, students created an OpenMRS module for uploading and editing patient medical images and

c These and other activities involving Connecticut College, Trinity College, and Wesleyan University are funded by a Mellon Foundation grant for videoconferencing facilities.

d The 2007 HFOSS Summer Institute was funded by a grant from the Aidmatrix Foundation (http://www.aidmatrix.org).

defined and implemented a new systemwide data structure that allows physicians to input numeric observations as ranges (1–5), inequalities (<100), ratios (2:5), and qualitative values (too few to count).

During spring 2009, a software-development course based on OpenMRS was offered (via videoconference) to students at Connecticut College, Trinity College, and Wesleyan University. Focusing on how software-engineering techniques play out in an FOSS setting, it required students to put theory into practice by contributing to OpenMRS.

***Innovative Support To Emergencies, Diseases and Disasters (InSTEDD).* This lab is devoted to developing software for early disease detection and disaster response (http://www.instedd.org). Founded in 2006 by Larry Brilliant of the Google Foundation, it is funded in part by Google and the Rockefeller Foundation (http://www.rockfound.org) and aims to integrate, tag, classify, and visualize data from various sources (such as news, weather reports, sensor data, and field reports) with the goal of detecting and managing disease outbreaks. Like Sahana and OpenMRS, InSTEDD is an international effort.**

Two students in the summer 2008 HFOSS Institute collaborated with researchers in Seattle and Buenos Aires to develop and test data mining algorithms for the Evolve project. After studying support-vector machines and Bayesian networks and mastering software tools (such as Eclipse and LIBSVM, http://www.csie.ntu.edu.tw/~cjlin/libsvm/), they developed the Alpaca Light Parsing and Classifying Application (ALPACA), a parsing and classification tool for categorizing documents into user-provided classes (http://2008.hfoss.org/ALPACA). ALPACA allows Evolve developers and others to test classification technologies across a number of data sets. Two other students are following up on this work as part of the 2009 HFOSS Summer Institute.

***Ronald McDonald House Homebase.* This project involves a Web-based volunteer-management-and-scheduling system used at the Ronald McDonald House in Portland, ME (http://www.rmhportland.org). Developed in spring 2008, it addresses the need for software to replace the Portland Ronald McDonald House's error-prone, time-consuming manual rolodex and calendar-scheduling process. The development team included four Bowdoin College students, one professor, Bowdoin IT staff, and several Ronald McDonald House employees and volunteers who would eventually use the system. The development took place almost entirely within a software-development course (http://hfoss.bowdoin.edu) using a distributed-development process and the same FOSS tools used in the global projects.[10]**

Figure 2. Screenshot of the Chinese-language version of the volunteer-management module (http://blog.hfoss.org/?p=28).

The four students earned independent-study credit in computer science, as well as a valuable learning experience. The Portland Ronald McDonald House gained a valuable piece of software that arguably would never have been developed outside the FOSS framework. The software is published on Sourceforge (http://www.sf.net/projects/rmh-homebase) under a GNU GPL and is available to other volunteer organizations.

One difference between this project and the three international projects is the software was designed and built from scratch, though it followed careful study of the Sahana system. Also, unlike the international projects, it involved close interaction with end users throughout the development process. It also provides a potential basis for groups of students and faculty at other colleges and universities to join in by, say, customizing and adapting the system for other Ronald McDonald Houses or other local nonprofit organizations.

***AppTrac.* Literacy Volunteers of Greater Hartford provides literacy training to adults, mostly through specialized software applications in its Hartford, CT, computer lab. The staff manually tracks student logins, the applications the students use, and other information it then painstakingly compiles into reports to the organization's board and funding agencies.**

In spring 2008, students from the University of Hartford developed requirements and built a prototype application-tracking system (AppTrac) as part of an upper-level software-engineering course. During the 2008 HFOSS Summer Institute a four-student team from three colleges—Connecticut College, Trinity College, and the University of Hartford—developed the prototype into a kiosk-based system (http://sourceforge.net/projects/apptrac/). In fall 2008, working through virtual meetings, code-sharing repositories, and wikis, the same students modified the system for eventual release as a generic kiosk system for similar applications.

Unfortunately, due to the loss of its technical staff position, the Literacy Volunteers of Greater Hartford ultimately decided not to deploy AppTrac in its lab. However, the software is being modified by students in the 2009 HFOSS Summer Institute (http://2009.hfoss.org) for deployment in the Hartford Public Library's computer lab, another example of how software sharing benefits both the community and the educational process.

To explore this concept further, in spring 2008 a "general education" course called "Open Source Software for Humanity," was taught (via videoconference) at Trinity College and Wesleyan University.[4] Its "hook" was getting students to reflect on their own experience with FOSS products (such as Wikipedia and the Firefox browser). Not surprisingly, the students were receptive to the ideals of sharing, community, and the public good. They were also enthusiastic about discussing their experience with Wikipedia, blogging, open source politics, and other aspects of the free and open culture they had grown up with. As suggested by Benkler and Nissenbaum,[1] they see the distributed FOSS model as an alternative means of producing culturally useful goods (Wikipedia) and services (SETI@home). Similarly, students generally see elements of the FOSS ethic in their own experience with file sharing. They recognize that this is a time of change in public thinking about intellectual property and the common good.

But despite their everyday use and enjoyment of FOSS products and their widespread acceptance of the freedom and openness characterizing the FOSS model, few students recognize the connections between the FOSS movement and the overall computing discipline. As one said, "Wow, I really got to look at how computer science can relate to humanitarian efforts. I now really understand [FOSS] and know why it came about."

As a methodology, the FOSS development model represents a revolutionary break from traditional software development.[7] However, despite its commercial success, relatively little effort has gone toward incorporating the FOSS development model into undergraduate computing curricula. Our effort to see how others have incorporated FOSS into their curricula revealed only a handful of reports (reviewed by Ellis et al.[3]). Our experiments with introductory and advanced courses, independent studies, and summer internships have shown that FOSS software and tools, including Apache, PHP, MySQL, Eclipse, PhpMyAdmin, and SVN, are quite accessible to today's undergraduates.

Students are also eager to engage the HFOSS methodology, which differs from the traditional mode of undergraduate instruction. Working with mentors and in teams on real-world development projects is a motivator for students, despite the extra challenge it means for instructors. Similarly, working with local clients and international development communities is another motivator. For example, students get to see directly that writing good documentation is as important as writing good code. The quality of their work improves as they recognize their increased level of public accountability. This message is constantly reinforced by mentors, peers, and clients.

Depending on the specific course or project, students come with different levels of expertise, ranging from no prior programming experience for an introductory course to having nearly completed the major requirements for upper-level and software-engineering courses. Engaging students through HFOSS must be done with sensitivity to their backgrounds and interests. But the projects themselves are rich and varied enough to accept contributions from students with different backgrounds. For example, students with no programming experience are still able to make significant contributions in requirements-gathering and documentation-writing.[4]

We've found the sudents are comfortable working in virtual teams and groups, having grown up with Facebook and Instant Messenger and interacting with friends through all kinds of electronic media. They respond equally well to wikis for working collaboratively on documents and presentations and sharing their source code on Sourceforge. One student said, "I now have a better understanding of what it is like to work with and contribute to a team of people, even when I may never meet them in person."

The HFOSS development process has no room for lone programmers working in isolation.

New Demographic

Computer science has not been broadly attractive at the undergraduate level, especially to women and other underrepresented groups. An April 2006 article in *Computing Research Association Bulletin*, based on data from the National Science Foundation and other sources, reported "[c]omputer science has the dubious distinction of being the only science field to see a fall in the share of its bachelor's degrees granted to women between 1983 and 2002" (http://www.cra.org/wp/index.php?p=83).

Attracting women and other underrepresented groups to computing remains a particularly challenging HFOSS Project objective. Only four women were enrolled in a 13-student introductory course in spring 2008, and for the summer 2008 internship program, only six out of 29 applicants were women. Of the 10 CPATH-funded summer interns only three were women, and two others were African-American. These numbers are not good, though they are somewhat better than the numbers in non-HFOSS computer science courses. For example, the fall 2008 CS1 courses offered at Connecticut College, Trinity College, and Wesleyan University included only 10 women and two African-American students out of a total of 69 students.

While this data is too sparse to support conclusions one way or the other regarding the appeal of HFOSS to women and other historically underrepresented groups, evaluations received from participating students suggest that the HFOSS approach has the potential to attract more women students to computing in the future. The responses from them suggest they speak positively about the project to their female friends. To help address this issue, we will, in summer 2010, extend the HFOSS Project to include a women's college and a traditionally black university. However, given the relatively small number of women and minorities who come to college with an interest in computing in the first place, the initiative may not solve the problem altogether; the solution, if there is one, may ultimately extend beyond the academy.

A widespread misconception about computing is that it is all about programming or coding. At most U.S. schools the introductory sequence focuses largely on teaching a programming language, further reinforcing this misconception. The HFOSS approach addresses it by contextualizing programming within a broader problem-solving activity. Being engaged in real-world projects with teams of developers, students see that programming is part of a complex, team-oriented, creative process that produces software to benefit society. Working closely with real clients, they see the need for transparent and secure code, extensive testing, and writing excellent user manuals and other supporting materials. They want to master these activities to improve their systems rather than step through mere academic exercises.

Another important HFOSS element is the ethic of sharing and collaboration. For this reason, the HFOSS Project teams students with one another, as well as with mentors, IT professionals, and HFOSS community members. The HFOSS development process has no room for lone programmers working in isolation.

Student feedback on these points reflects these observations. For example, one student said, "[this activity] shows how computer science can be a very helpful field of study than what we just know of it as programming in different programming languages." Another said, "[this activity] definitely changed my views of how effective software projects can be run. If we work collectively for the greater good, then we can get much more done."

The HFOSS Project has focused on individual courses and internships and only just begun to address how its approach might fit into an undergraduate curriculum. Reinforced throughout our experience is the longstanding view that computer science must be presented as a problem-solving discipline, and the more this value is built into the computing curriculum the more attractive it will be to a wider variety of bright students eager to solve problems. Georgia Tech and other institutions have begun exploring curricular models that contextualize programming within broader applications of computing (http://www.insidehighered.com/news/2006/09/26/gatech). The HFOSS approach would clearly complement such a model.

A common software industry complaint is that new computing graduates are strong on theory but lack practical understanding of the modern IT workplace. A common complaint from academics is that IT professionals want colleges and universities to serve as training centers for their latest programming languages and software platforms. HFOSS addresses both by recruiting computing and IT professionals as advisers and mentors for its summer interns. For example, IT consultants from Accenture Corporation help mentor HFOSS students and serve as advisers in project management and other areas. Students appreciate the mentoring as they begin to understand the complexity of software development. They see that challenging problems rarely yield to "textbook" solutions and that the design process is often a protracted interaction between programmers and end users. One student said, "[this activity] definitely helped me understand more options of the IT profession. Now I know one more aspect of it, and how exciting it can be."

Logo of the Humanitarian FOSS Project (http://hfoss.org).

Portable, Sustainable Model

If the HFOSS model is to make a positive contribution to undergraduate computing curricula, it must continue to grow beyond the three campuses—Connecticut College, Trinity College, and Wesleyan University—where the Project began. During the past 18 months, with the support of the CPATH grant, we have seen evidence that such growth can be accomplished, as new HFOSS efforts began at Bowdoin College, Brunswick ME, and the University of Hartford, Hartford, CT. However, continued growth requires development of a supportive infrastructure and portable model that is easily adopted by other institutions.

Part of the effort to build a sustainable HFOSS model must include faculty development. Toward this end, we held outreach workshops for faculty at SIGCSE08 in Portland, OR, and CCSCNE08 in Staten Island, NY, (http://www.cs.trincoll.edu/hfoss/wiki/SIGCSE_2008_Workshop) to promote the HFOSS model as something worth trying. Feedback from workshop participants indicates that the humanitarian and FOSS aspects of the effort both have substantial appeal to computing faculty. However, despite this basic appeal, many challenges remain before more than a few other schools are able to integrate HFOSS into their computing curricula:

Faculty development. As with any new pedagogical endeavor, developing a new approach to teaching software design requires considerable initiative, time, and support. Faculty need time to learn new languages and tools and become active in the HFOSS community on their own before they are able to introduce HFOSS into their courses. To support this endeavor we are planning a summer training experience for faculty, similar to the week-long NSF-funded Chautauqua workshops (http://www.chautauqua.pitt.edu).

Software-tool support. Although FOSS software technology is free, creating a platform of FOSS tools to support a course or student project requires considerable time and effort. Faculty do not normally have time for downloading and installing software and making sure it works. One potential solution is a one-click installation that works on a variety of platforms. Another is for instructors to enlist such support among their universities' IT staff. The HFOSS project has begun to develop resources and processes to help, including a set of free and open Web-based resources, software tools, and other support materials (http://repository.hfoss.org).

Community development. Being involved in HFOSS means taking an active role in one or more HFOSS communities or projects, a process that can be somewhat bewildering and intimidating, especially for large well-established projects. We have identified and worked with communities and projects (described in the sidebar) that are accessible and welcoming. Sahana, OpenMRS, and InSTEDD are appreciative of student contributions and accepting of the compromises imposed by academic calendars and curricula. This summer we are working with the GNOME project on user-accessibility problems (http://projects.gnome.org/accessibility/). And a group of HFOSS students from several schools are currently working on the Portable Open Search and Identification Tool (POSIT), a disaster-management tool for the Google Android phone (http://code.google.com/p/posit-android/). All are ongoing projects that welcome contributions from faculty and students at other schools.

Cultural, institutional, curricular buy-in. Creating a new course or revising an existing one requires department support and approval. So the computer science academic community needs a more widespread and systematic discussion of how HFOSS might fit into the curriculum. Similarly, faculty development itself is not possible unless faculty and their departments recognize such engagement as an important form of community outreach and are therefore willing to invest the time and accept the complexity it requires. This may represent something of a cultural shift for some faculty.

Helping address these challenges, the HFOSS Project organized the first of what are planned to be an annual symposium on "Integrating FOSS into the Undergraduate Computing Curriculum" (http://www.hfoss.org/symposium09/). The March 2009 symposium's main goal was to bring together representatives from academia, industry, and the FOSS community to explore ways of integrating HFOSS into undergraduate teaching. The lively discussion that took place in Chattanooga, TN, helped identify a number of issues that stand in the way of more widespread adoption of the HFOSS model. For example, faculty participants identified a number of activities that could help them get involved, including summer training workshops and support for hosting open source code repositories.

Discussion focused on the kinds of support faculty and students would need to get started. One of the most promising ideas now being explored is establishment of a number of "HFOSS Chapters" whereby a faculty member and some students could take on a FOSS project (summer 2010). The software industry and FOSS-community representatives at the symposium expressed their eagerness to support the effort, including by helping train faculty to use FOSS tools and by providing "on ramps" to help faculty and students be integrated into the FOSS community.

Students see that challenging problems rarely yield to "textbook" solutions and that the design process is often a protracted interaction between programmers and end users.

To date, 15 additional schools have expressed interest in becoming HFOSS Chapters. Similarly, several more industry and FOSS-community supporters have volunteered to serve on the HFOSS Project steering committee and advisory board, including representatives from the GNOME project, Google, the Mozilla Foundation, RedHat, and Sun Microsystems.

Sustainability. No project can succeed in the long term without first encouraging the wide adoption of its methodologies and goals. But what would a sustainable model look like? In order to broadly influence undergraduate computing, high school and college students must be able to learn about FOSS and its humanitarian applications, thus requiring some kind of national organization and infrastructure to manage three functions:

- Funding internships (summer and, perhaps, academic year, too) to support student involvement in specific HFOSS projects;
- Funding a campaign to advertise HFOSS to prospective students, much as Teach for America and Habitat for Humanity advertise themselves; and
- Creating and managing an infrastructure whereby students are matched with specific HFOSS communities (such as Sahana and OpenMRS). The Google Summer of Code project, in which FOSS projects apply to Google for student-internship support, could serve as an adaptable model (http://code.google.com/soc/).

The hope is that the computing industry and FOSS communities embrace the potential value of HFOSS for computing students. In addition to revitalizing undergraduate computing education, a strong and diverse cohort of U.S. college graduates who come into the work force with FOSS experience will enrich the computing industry, along with the various FOSS communities.

Conclusion

Given the relative youth and scale of the HFOSS Project, it would be premature to make sweeping claims on its behalf. However, its ongoing objective is to systematically monitor its effects on undergraduate education to determine what would happen if students see computing as a discipline that develops software to help their friends and neighbors in need. Toward this end, the Project employs instruments and metrics, including student and faculty questionnaires, presentations at computing-education venues, and outside consultants from academic institutions and industry.

Though this evaluation is still preliminary, a number of promising signs have emerged.

First, HFOSS as a concept and methodology can indeed be introduced into the undergraduate computing curriculum. Our pedagogical experiments suggest that positive results are achievable through several approaches. For example, a general-education course can provide a coherent one-semester introduction to HFOSS techniques and to the broader cultural and societal effect of the HFOSS movement. Independent-study projects and internships provide a flexible venue through which students and faculty contribute to specific HFOSS projects in both the academic year and the summer. Upper-level software-engineering courses can be used to engage students in real-world HFOSS projects as part of their course work.

Second, feedback from faculty outreach activities, including the 2008 SIGCSE and CCSCNE workshops and the 2009 symposium, suggest there is significant faculty interest in integrating FOSS into the computing curriculum in many undergraduate institutions. Despite ongoing questions involving where, when, and how best to do it, the FOSS model is flexible enough to allow different institutions to answer these questions in ways that best suit their own programs.

Third, the students engaged thus far are attracted to the HFOSS concept for the opportunity to learn concepts, languages, and skills they don't see in other courses and for their interest in community service. Over the long run, these motivations promise to attract a wider range of capable students to computing, including more women and members of other underrepresented groups.

Fourth, student feedback suggests that engaging students in HFOSS projects helps foster a more constructive perception of the craft of programming and problem solving while generally reducing the computing-is-coding misconception. The ongoing HFOSS challenge is to spread this more positive perception across the entire undergraduate landscape. To some degree it will happen through word of mouth, as students share their positive HFOSS experiences with one another. But, as noted earlier, truly changing perceptions of computer science requires a concerted and sustained effort with broad support from the computing industry, the FOSS communities, primary and secondary schools, and society at large.

Finally, the HFOSS Project has expanded from its three initial schools, single corporate partner, and single software project into a vibrant community that today includes active faculty participants from eight U.S. colleges and universities (and expressed interest from many more), industry representatives from five IT corporations, and ongoing software-development projects with two local nonprofit organizations and five international FOSS communities. This growth—largely unplanned at the beginning of the Project—is indicative of a latent (inter)national interest in the HFOSS concept. If such expansion is sustained, it will help demonstrate that HFOSS can significantly affect the undergraduate computing curriculum, culture, and enrollment demographics.

Acknowledgments

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Ralph Morelli (ralph.morelli@trincoll.edu) is a professor of computer science at Trinity College, Hartford, CT.

Norman Danner (ndanner@wesleyan.edu) is an associate professor in the Department of Mathematics and Computer Science at Wesleyan University, Middletown, CT.

Allen Tucker (allen@bowdoin.edu) is the Anne T. and Robert M. Bass Professor Emeritus in the Computer Science Department at Bowdoin College, Brunswick, ME.

Heidi Ellis (hellis@wnec.edu) was a visiting professor at Trinity College at the time of this work and is now an associate professor and chair of Computer Science and Information Technology at Western New England College, Springfield, MA.

Gary Parker (parker@conncoll.edu) is an associate professor and chair of the Computer Science Department at Connecticut College, New London, CT.

Danny Krizanc (krizanc@wesleyan.edu) is a professor of computer science at Wesleyan University in Middletown, CT.

Trishan R. de Lanerolle (trishan.delanerolle@trincoll.edu) is project director of the Humanitarian FOSS project based at Trinity College, Hartford, CT.

Ozgur Izmirli (oizm@conncoll.edu) is an associate professor of computer science at Connecticut College, New London, CT.

Educational Master Plan

Information Submission Form

1) Title: Why an Informatics Degree?

2) Author: Dennis P. Groth and Jeffrey K. MacKie-Mason

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Dennis P. Groth and Jeffrey K. MacKie-Mason

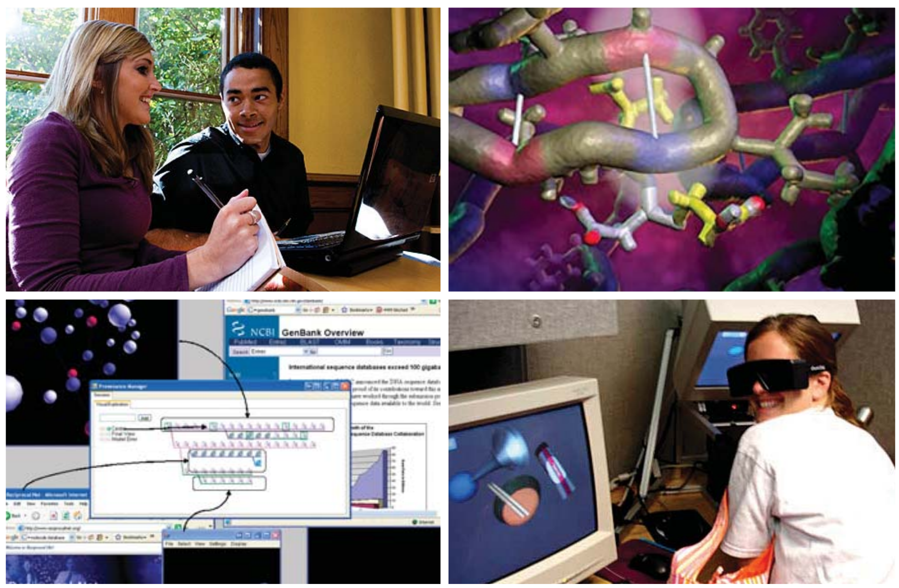
Education

Why an Informatics Degree?

Isn't computer science enough?

What is an informatics degree, and why? These are questions that have been posed to us on innumerable occasions for almost a decade by students, parents, employers, and colleagues, and when asked to prepare a *Communications* Education column to answer that question, we jumped at the opportunity.

The term "informatics" has different definitions depending on where it is used. In Europe, for instance, computer science is referred to as informatics. In the U.S., however, informatics is linked with applied computing, or computing in the context of another domain. These are just labels, of course. In practice, we are educating for a broad continuum of computing disciplines, applications, and contexts encountered in society today.



Informatics programs offer diverse applications, as shown in these scenes from the informatics program at Indiana University, Bloomington.

IMAGES COURTESY OF INDIANA UNIVERSITY SCHOOL OF INFORMATICS AND COMPUTING

From Computer Science to Informatics

Computing provides the foundation for science, industry, and ultimately for the success of society. Computing education traditionally has focused on a set of core technological and theoretical concepts, and teaching these concepts remains critically important. Meanwhile, advances in computing occur and are driven by the need to solve increasingly complex problems in domains outside traditional computer science. Students, teachers, and scholars in other fields are keenly interested in computational thinking, and computing itself increasingly is informed by the challenges of other disciplines.

For example, to design good online auction technology, computer scientists found that they needed to understand how humans would select bidding strategies given the system design, and indeed how to design the system to motivate certain types of behavior (truthful value revelation, for example). This co-design problem led to fruitful interdisciplinary collaborations between computer scientists, economists and, increasingly, social psychologists. Likewise, designing successful technology for trust, privacy, reputation, and sharing in social computing environments requires both computer science and behavioral science.

These interactions between problem domain context and computational design are characteristic of the maturing of computer science. Computing is no longer owned solely by computer science, any more than statistics is owned solely by faculty in statistics departments. Computing and computational thinking have become ubiquitous, and embedded in all aspects of science, research, industry, government, and social interaction. Consider the flurry of excitement about "e-commerce" in the late 1990s. Quickly e-commerce moved from being seen as a new field to being absorbed in "commerce": the study of business communications, logistics, fulfillment, and strategy, for which the Internet and computing were just two technologies in a complex infrastructure.

How then does computing education need to change to respond to the new reality, and more importantly, to be equipped to respond to future developments? We must embrace the diversity of ways in which problems are solved through the effective use of computing, and we must better understand the diverse problem domains themselves.

The vision for informatics follows from the natural evolution of computing. The success of computing is in the resolution of problems, found in areas that are predominately outside of computing. Advances in computing—and computing education—require greater understanding of the problems where they are found: in business, science, and the arts and humanities. Students must still learn computing, but they must learn it in contextualized ways. This, then, provides a definition for informatics: informatics is a discipline that solves problems through the application of computing or computation, in the context of the domain of the problem. Broadening computer science through attention to informatics not only offers insights that will drive advances in computing, but also more options and areas of inquiry for students, which will draw increasing numbers of them to study computation.

Informatics Programs

Computer science is focused on the design of hardware and software *technology* that provides computation. Informatics, in general, studies the intersection of people, information, and technology systems. It focuses on the ever-expanding, ubiquitous, and embedded relationship between information systems and the daily lives of people, from simple systems that support personal information management to massive distributed databases manipulated in real time. The field helps design new uses for information technology that reflect and enhance the way people create, find, and use information, and it takes into account the strategic, social, cultural, and organizational settings in which those solutions will be used.

In the U.S., informatics programs emerged over the past decade, though not always under the informatics name, and often in different flavors that bear the unique stamp of their faculty. Prominent examples include "Informatics" (Indiana University, University of Michigan, University of Washington, UC Irvine), "Human Computer Interaction" (Carnegie Mellon University), "Interactive Computing" (Georgia Tech), "Information Technology and Informatics" (Rutgers), and "Information Science and Technology" (Penn State). Some programs emerged primarily from computer science roots; others from information and social science roots. They do all generally agree on the centrality of the interaction of people and technology, and thus regardless of origin they are multidisciplinary and focus on computation in human contexts.

The success of computing is in the resolution of problems, found in areas that are predominately outside of computing.

Informatics is fundamentally an interdisciplinary approach to domain problems, and as such is limited neither to a single discipline nor a single domain. This is evident in another type of diversity in such programs: some take a fairly broad approach, with several distinct tracks or application domains, which can range as widely as art and design, history, linguistics, biology, sociology, statistics and economics. Other programs are limited to a single application domain, such as bioinformatics (for example, Iowa State, Brigham Young, and UC Santa Cruz). Thus, informatics programs can have as many differences as they have commonalities. This has been reflected in some confusion and frustration about how to establish a community of interest. For example, there is an "iSchool" caucus (about 27 members), and a partially overlapping CRA (IT) Deans group (about 40 members). To illustrate some of the issues, we will describe two of the broader programs with which we are most familiar.

The School of Informatics and Computing at Indiana University Bloomington offers a traditional CS degree and an informatics degree, which was first offered in 2000. Its informatics curriculum is focused along three dimensions that are first presented in an introductory course: foundations, implications, and applications. Unlike most traditional computer science curricula, the introductory course does not focus on programming as the sole problem-solving paradigm. Instead, a number of skills, concepts, and problem solving techniques are introduced and motivated by context-based problems, including logical reasoning, basic programming, teamwork, data visualization, and presentation skills. Following this introduction, foundations courses include discrete math and logical reasoning, a two-course programming sequence, and a course on data and information representation, while implications courses include social informatics and human computer interaction. The foundations topics are similar to those in a computer science program; however, the ordering is quite different, in that programming comes last rather than first. This sequencing increases retention in the major because students have more time to develop their technical skills.

At Indiana, the interdisciplinary component of the curriculum is accomplished through a mixture of three methods: elective courses covering technology use and issues in specific problem domains; a required senior capstone project, aimed at solving a "real-world" problem; and a required cognate specialization of at least five courses in another discipline. There are currently over 30 different specializations from around 20 disciplines available, including: business, fine arts, economics, information security, biology, chemistry, telecommunications, and geography.

The School of Information (SI) at the University of Michigan has offered master's and Ph.D. degrees in Information since 1996. In 2008 SI joined with the Computer Science and Engineering Division, and the College of Literature, Science and Arts, to offer a joint undergraduate informatics degree. To enter the major, students are required to complete one prerequisite each in calculus, programming, statistics, and information science. They then take a 16-credit core in discrete math, data structures, statistics, and information technology ethics. Each then selects a several-course specialization track, which is interdisciplinary but focuses on providing depth in a particular domain: computational informatics, information analysis, life science informatics, or social computing. This program establishes a strong foundation, domain depth and interdisciplinary training. However, to accomplish all of this, it also imposes on students the heaviest required-credit burden of any liberal arts major.

The equal participation by the Computer Science and Engineering Division in the Michigan degree emphasizes the ability to design an informatics program as a complement to a traditional computer science degree; indeed, the Computer Science and Engineering Division continues to offer two traditional CS bachelor's degrees (one in engineering, one in liberal arts). One advantage expected for the contextualized informatics degree is higher enrollment of women, and indeed, about half the class of declared majors is female. On the downside, managing a degree that spans three colleges and schools is challenging, with natural hurdles such as teaching budgets and credit approvals across units.

Looking Forward

Informatics curricula are young and developing, but have proven popular. Indiana has over 400 students in the major. In just its first year, Michigan attracted 40 undergraduate majors. Evidence comes also from successful courses offered outside a formal informatics program. For example, a computer scientist and an economist at Cornell enroll about 300 students annually in interdisciplinary "Networks," which counts toward the majors in Computer Science, Economics, Sociology, and Information Science.[a] At the University of Pennsylvania, "Networked Life" (taught by a computer scientist) attracts about 200 students, and satisfies requirements in three majors: Philosophy, Politics, and Economics; Science, Technology, and Society; and Computer and Information Science.[b]

Informatics enables students to combine passions for both computation and another domain. Since almost all domains now benefit from computational thinking, an informatics program can embrace students and concentrations in art and design, history, linguistics, biology, sociology, statistics, and economics. This diversity has costs, of course. One is that for now, in the early years, students and faculty must continuously explain "informatics" to potential employers. Another is providing strong enough foundations in both computation and another discipline to produce competitive, successful graduates.

The desire to deeply understand how computing works is what has drawn most researchers to study computer science. These same individuals are then invested with the responsibility to develop curricular programs and teach computing to the next generation of computing professionals. The current (and all future) generations of students entering the university have largely grown up in a world where computing is so commonplace that it is taken for granted. Many of them are less interested in how computing works than in how to make it work better in the solution of specific problems, drawn from virtually all other domains of human knowledge. There will always be a need for students who study computer science. Informatics provides a complementary path to reach other students for whom understanding and developing computation *contextually* is crucial to the problems that motivate them. Like mathematics, probability, and logic, in the future computation science will be taught embedded in many other areas. Indeed, informatics is a path within which the technical accomplishments of computer science, mathematics, and statistics become embedded in the ways we interact, imagine, and produce throughout the scope of human experience.

Dennis P. Groth (dgroth@indiana.edu) is Associate Dean for Undergraduate Studies and Associate Professor of Informatics in the School of Informatics and Computing at Indiana University, Bloomington.

Jeffrey K. MacKie-Mason (jmm@umich.edu) is Associate Dean for Academic Affairs, the Arthur W. Burks Collegiate Professor of Information and Computer Science, and a professor of Economics and Public Policy in the School of Information at the University of Michigan.

a See http://www.infosci.cornell.edu/courses/info2040/2009sp/

b See http://www.cis.upenn.edu/~mkearns/teaching/NetworkedLife/

Educational Master Plan

Information Submission Form

1) Title: Student and Faculty Attitudes and Beliefs About Computer Science

2) Author: Clayton Lewis, Michele H. Jackson, and William M. Waite

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The curriculum should inspire students to view CS as both accomplishment and intellectual discipline.

BY CLAYTON LEWIS, MICHELE H. JACKSON, AND WILLIAM M. WAITE

Student and Faculty Attitudes and Beliefs About Computer Science

WHAT STUDENTS THINK about a discipline—its structure, usefulness, how it is learned—plays an important role in shaping how they approach it. Just as faculty members aim to have their students learn the facts and skills of a discipline, they may also want to shape student beliefs and attitudes. Here, we report the attitudes of undergraduate computer science students early and late in the curriculum, comparing them with faculty attitudes in the same department. The results reflect the places where students think what faculty want them to think, where they do not think that way, and whether there is evidence that final-year students agree more or less with faculty than students in introductory courses. Together with earlier research, the results provide insight into sometimes surprising attitudes, and can help guide curricular improvement.

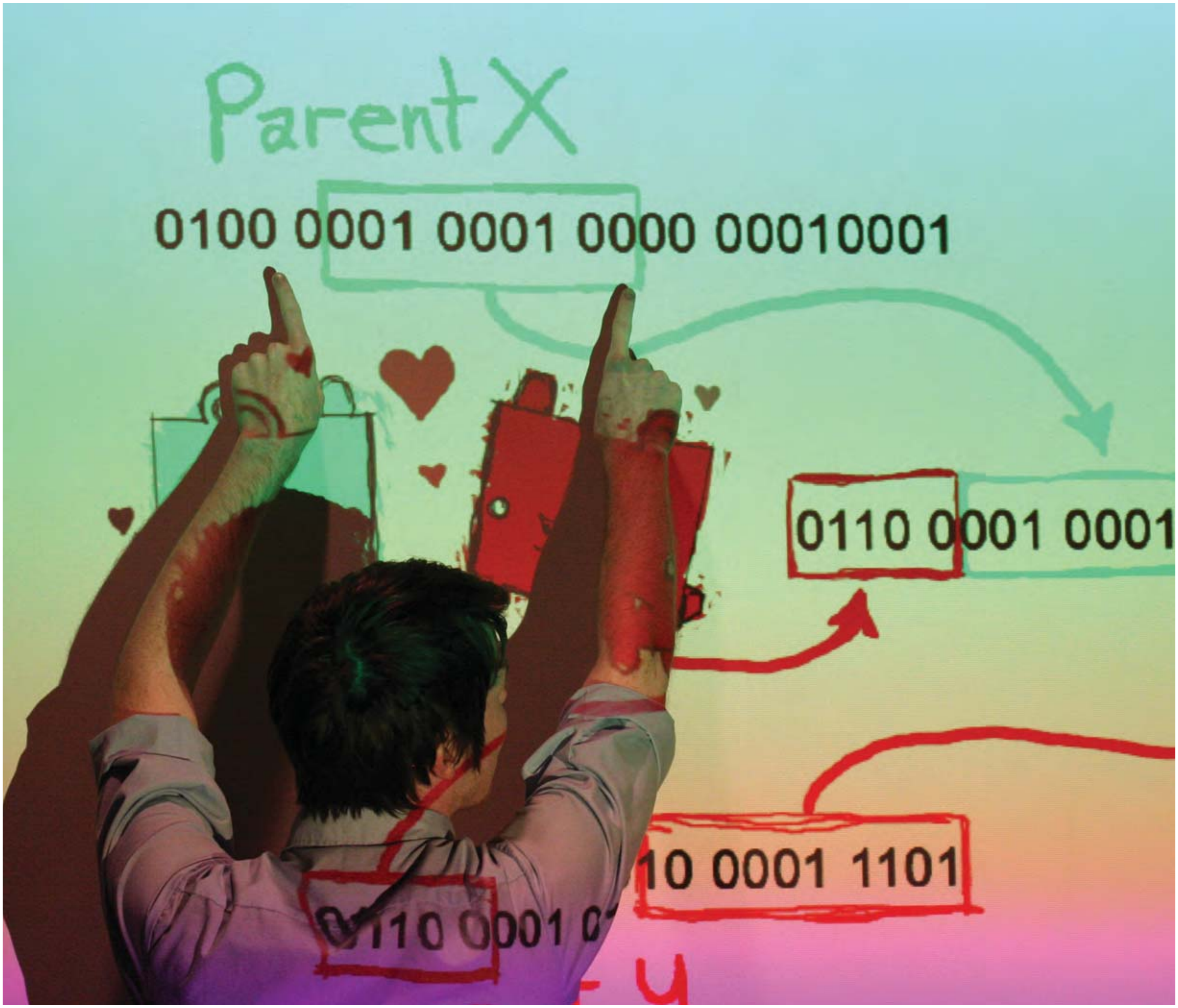
In physics education, research[1,13] into key attitudes and beliefs about physics as a discipline and how they change suggests that courses sometimes shift student attitudes away from the attitudes endorsed by faculty. In particular, students may move toward the view that physics is mainly about memorizing and evaluating formulae, rather than about a conceptual understanding of the natural world.

CS faculty are also likewise concerned with student attitudes: "CS is just programming;"[17] "As long as a program works it doesn't matter how it is written;" and "Theoretical CS is not relevant to the real world." Do students hold such views? As they move through the curriculum, do their beliefs come to resemble those of faculty teaching them?

Our study collected and analyzed data on these points. Specifically, we collected responses to 32 questions about attitudes and beliefs from beginning and advanced CS undergraduates and from faculty at the University of Colorado at Boulder. The results revealed some areas in which student responses clearly agree with faculty and others where they disagree. Comparing the responses of beginning

» key insights

- The attitudes of beginning CS students are more varied than final-year students, suggesting the curriculum plays an important role in shaping them.
- Final-year CS students generally show little appreciation for skills involving creativity and reasoning, emphasizing instead CS as outcomes.
- Understanding how student attitudes are formed and strengthened helps faculty develop more effective CS curricula.



PHOTOGRAPH BY NIC MCPHEE

students with those of more advanced students also suggests how progress through the curriculum changes student beliefs and whether such change is toward or away from what faculty believe.

We gathered 38 survey items from four sources: the Colorado Learning Analysis Survey for physics,[1] selected on the grounds they were relevant (or relevant with small changes) to CS; an interview study of student attitudes toward group work in the CS curriculum[16]; faculty suggestions on student attitudes causing them concern; and Carol Dweck's work[7] on student attitudes about the roles of aptitude and effort in academic success.

We discussed the 38 items with a group of six volunteer students to determine whether they were easily understood. We discarded six items based on student input and changed the wording of others to make the intent of the survey statements clearer. The final survey consisted of 32 items; the table here includes the item numbers (nonconsecutive) we used in coding the data and in analyzing the results.

Each of the 32 items asked faculty to indicate whether they strongly disagreed, disagreed, neither agreed nor disagreed, agreed, or strongly agreed. We gave students the same options but also asked them what they thought a CS professor would want them to say; for this response they were also allowed to indicate "don't know." The survey included a "catch" item (for both faculty and students) that should be left intentionally blank so responses from participants who simply filled in responses without reading the items could be discarded.

In the final week of the spring 2006

Survey results

Item #		Faculty	% Agree with Faculty Response CS1	CS2	Senior	Senior Agreement with Faculty	Change Seniors vs CS1
Cluster 1: Computer Science as Accomplishment							
	Subcluster: Don't just learn from the examples.						
10	There is usually only one correct approach to solving a computer science problem.	Reject	91	98	95	☺	4
40	To learn computer science, I only need to memorize solutions to sample problems.	Reject	80	94	90	☺	10
54	Reading books or manuals is usually a waste of time in computer science.	Reject	75	73	61	😐	–14
	Subcluster: The end justifies the means.						
20	On a computer science assignment, what matters is getting the desired result, not how you arrive at the result.	Reject	42	51	46	☹	4
52	If a program works it doesn't matter much how it is written.	Reject	55	73*	80	☺	25*
68	Doing things the "right" way isn't as important as just pushing through to a solution.	Reject	44	55	68	😐	24*
	Theme: Work in the real world.						
16	In the real world, computer scientists spend a lot of time working alone.	Reject	51	65	66	😐	15
18	In the real world, computer scientists' work is mostly programming.	Reject	25	57*	76	☺	51*
62	Managers are usually people who can't cut it technically.	Reject	46	47	58	😐	12
	Theme: Group work.						
8	If you work in a group you can't take as much pride in the results as when you work alone.	Reject	62	53	73	😐	11
36	You can only truly understand something if you figure it out on your own.	Reject	51	53	51	😐	0
	Other						
6	Getting through the computer science curriculum basically means being able to recall something you've read or been shown.	Reject	48	55	54	😐	6
14	I cannot learn computer science without a teacher to explain it.	Reject	51	57	63	😐	12
28	A significant problem in learning computer science is being able to memorize all the information I need to know	Reject	24	51	68	😐	44*
56	In the computer science curriculum, if you spend enough time coding you'll get all you need to get from the courses.	Reject	27	45	73	😐	46*
66	If you know what you are doing you can leave work to the last minute and still get it done.	Reject	46	53	49	☹	3
Cluster 2: Computer Science as an Intellectual Discipline							
	Subcluster: Computer Science is creative and valuable.						
50	The work you do in computer science in the real world requires a lot of creativity.	Endorse	83	82	68	😐	–15
58	Research in computer science often develops really important ideas.	Endorse	56	84*	66	😐	10
60	Reasoning skills used to understand computer science material can be helpful to me in understanding things in everyday life.	Endorse	70	80	61	😐	–9
	Related items: Concepts and understanding are important.						
12	I am not satisfied until I understand why something works the way it does.	Endorse	79	82	80	☺	1
22	Theoretical computer science, such as analysis of algorithms, isn't very relevant to the real world.	Reject	73	75	56	😐	–17
44	When I solve a computer science problem, I explicitly think about which computer science ideas apply to the problem.	Endorse	72	65	44	☹	–28*
46	If I get stuck on a computer science problem, there is no chance I'll figure it out on my own.	Reject	59	84*	85	☺	26*
64	If you can do something you don't need to understand it.	Reject	79	80	80	☺	1
	Other						
4	Nearly everyone is capable of succeeding in the computer science curriculum if they work at it.	Reject	30	26	34	☹	4
26	After I study a topic in computer science and feel that I understand it, I have difficulty solving problems on the same topic.	Reject	45	57	61	😐	16
48	There are times I solve a computer science problem more than one way to help my understanding.	Endorse	41	49	61	😐	20*
	Items on which faculty disagreed						
24	The curriculum in computer science covers many disconnected topics.						
30	I find that reading the textbook carefully is a good way for me to learn the topics covered in my computer science courses.						
32	It's better to jump into a problem instead of trying to analyze it first.						
34	It's a lot more satisfying to do an assignment on your own than with help.						
38	When you submit a group project, the instructor can't tell how good your individual work was.						

semester, we administered the survey by email to faculty and in paper form to students in three CS courses: first-semester introductory (CS1), second-semester introductory (CS2), and senior-level capstone design.

Discussion

We obtained responses from 13 faculty (of a total of 25). For student surveys, we received 71 surveys from CS1, 48 from CS2, and 41 from senior capstone. The survey was voluntary, though no more than one or two students in each class declined to participate. No surveys contained a response to the catch item, but we did reject one survey because the last three pages had identical responses for each item.

We tallied responses by grouping "strongly disagree" and "disagree" as negative responses, "strongly agree" and "agree" as positive responses, and all other responses, including omitted responses, as neutral. We examined the responses by faculty to classify the items as either rejected or endorsed by faculty. Using the criterion that 75% or more of faculty had to agree to reject or endorse an item, we excluded five items as not showing consensus among the faculty (see cluster 2 in the table).

We placed the remaining 27 items in thematic categories using a combination of what Adams et al.[1] called "predeterminism" and "raw statistical" grouping. We first sorted them into groups reflecting our sense of the relationships among them, without reference to the data (predeterminism) and used hierarchical cluster analysis, a statistical technique, to identify items participants commonly responded to in the same way (using the SPSS 16 package[2]).

Before we performed cluster analysis, we transformed responses for items in the same thematic category so answers reflecting a related underlying attitude would be coded the same. For example, we transformed the responses to item 64 ("If you can do something you don't need to understand it") so a negative response would match a positive response to item 12 ("I am not satisfied until I understand why something works the way it does").

We used the results of the cluster analysis to modify the groupings to bring the resulting categories in line with the data, where appropriate. That is, where the data showed the participants commonly answered two items the same way, we grouped these items together, even if they were not grouped together in our original classification. In other cases, where the data showed that two items we thought were related were actually commonly answered differently, we adjusted the grouping to reflect that fact.

The table shows the resulting groupings of items. At the highest level, they fall into two broad clusters: "CS as an accomplishment" and "CS as an intellectual discipline." Within them, "subclusters" are groups of items that were statistically related, while "themes" were items with related content not strongly related in the data. For example, items 8 and 36 both relate to aspects of group work, so they are thematically related, but participants often gave different responses to them. In cluster 2, the items in the subcluster were closely related in the data; the "related" items formed a larger cluster around them and were less related to the "other" items in the cluster.

We marked each item in the table for which faculty shared consensus to show whether faculty rejected or endorsed the item. The percentage of students in CS1 and in CS2 and seniors (final-year students) who agreed with the faculty consensus is also shown. For most items, the percentage of CS1 and CS2 students endorsing the faculty position did not differ significantly; an asterisk next to the percentage for CS2 indicates the percentage is significantly different at the 5% level from the percentage for CS1 (according to a two-tailed Fisher's exact test, a test for judging differences between groups when using small samples).

A face symbol indicates whether the seniors' responses were one of the following: *generally in line with faculty responses* (75% or more of seniors endorsing the faculty position), marked by a happy face; *mixed* (between 50% and 75% of seniors endorsing the faculty position), marked by a neutral face; or *substantially in conflict* (less than 50% of seniors endorsing the faculty position), marked by a sad face.

The last column in the table (seniors vs. CS1) shows how senior responses compared to the responses of CS1 students. The numbers are the difference between the percentage of seniors and the percentage of CS1 students agreeing with the faculty consensus on each item. A negative number means seniors agreed with faculty less than CS1 students. Asterisks mark differences in responses significant at the 5% level (Fisher's exact test, two-tailed).

Now consider an example of how the table reflects these aspects of the data. In the first data line (item 10), the entry shows (reading from left) that the faculty consensus rejected this item, and that 91% of CS1 students, 98% of CS2 students, and 95% of seniors also rejected the item, that the responses of the seniors were generally in line with the faculty consensus (the happy face means 75% or more agreement), and that the agreement between seniors and faculty (95%) was four percentage points greater than the agreement between CS1 students and faculty (91%).

Does greater agreement with faculty always represent goodness? No. We suggest later at least one item (4) on which we feel students were more right than faculty; readers might judge other items the same way. But faculty design the curriculum, and alignment with their attitudes is what they aim for. Failure to find alignment indicates a problem. Faculty weren't of one mind, of course, and we removed items on which they didn't agree, as described earlier.

In considering which items show evidence of progress or lack of progress as students move through the curriculum, we must urge caution in basing inferences on how students in the introductory classes compare with seniors; different students completed the survey in each of the classes. There were no doubt differences among the responses not traceable to having gone through more or less of the curriculum. Many surveyed CS1 students were not CS majors. A good many students join the CS program after CS1; of the senior class we surveyed, 45% joined after CS2 and 37% after CS1 and before CS2. Students also drop out of the program; about one-eighth of the surveyed CS1 students eventually ended up as CS majors. But the CS1 students reasonably represent the students available as input to the program. A finding that students late in the curriculum agree less with faculty could be due to many factors but likely shows that the output from the program is not improved with respect to the available input—a challenge to faculty charged with managing the program. The table does not present student responses about how faculty would like them to respond to each item. In some cases we bring this information into the discussion of individual items.

Among the 27 items for which we found strong faculty consensus, seniors were generally in line with faculty (75% or more agreement) on only seven items. For 16 items, we found mixed agreement (50%–75%), and for four items we found less than 50% of seniors endorsed the faculty position. Though this level of agreement was not good, it is better than for CS1 students. For 22 of the 27 items, we found seniors were more likely to agree with the faculty consensus than CS1 students. For seven of the items the difference in agreement was statistically significant. Among the five items on which seniors agreed less with the faculty consensus than CS1 students, the difference was statistically significant for one item (44).

Results by Subcluster and Theme

We now examine the data for the thematic groups of items and the subclusters to see what it says about student beliefs and how these beliefs differ between beginning and more advanced students.

Don't learn just from examples. In this statistical cluster, seniors agreed with faculty that there is more to CS than memorizing solutions or learning a single best approach to problems. They agreed less strongly that reading is important, and it may be they value reading less than, say, CS1 students.

The end justifies the means. Most seniors agreed with faculty that how a program is written is important (item 52) and were significantly more likely to share this attitude than CS1 students. This is good news. But only 68% of seniors agreed with faculty that doing things right is more important than just getting a solution, though this response represents a significant improvement over the position of CS1 students. Less than half of the seniors felt that how they do the work on an assignment is more important than getting "the desired answer" (item 20). This is a little better, though not much, than the response from CS1 students. Most seniors (76%) correctly indicated that faculty would disagree with the item, so this was not a case of students not knowing where faculty stood on an issue.

Why do students not feel that how they complete an assignment is important? This attitude may connect with a student's wish to increase the difficulty of assignments as a way to demonstrate competence. Leonardi et al.[8] found this tendency in interviews with CS students, writing:

"We found no place in the data where informants suggested that ignoring instructions would help them arrive at a better solution. Rather, they admitted readily that following prespecified instructions made the task easier. But ignoring instructions increased the challenge and introduced a higher level of risk. As one engineer observed, 'if you can do it by figuring it out yourself instead of following some cookie-cutter process then you're on your way to becoming an expert.' Success under such conditions demonstrated expertise and technical competence."

Responses on this item might reflect what students saw as the role of assignments. According to some research,[5] students may consider work on assignments to be a product offered for payment (in the form of a grade) rather than as a learning experience. Viewed this way, doing the work a certain way to learn new techniques is irrelevant.

Work in the real world. While most seniors recognized that computer scientists don't spend a lot of time working alone, a third did not. Most rejected the cartoon stereotype of the incompetent manager, though many did not. While there is room for improvement, results on these items were better than for CS1 students. Most seniors rejected item 18 ("In the real world, computer scientists' work is mostly programming"), a matter important to many people concerned about public perceptions of the field.[17] The situation was significantly better among the seniors than among CS1 students; indeed, the situation among CS2 students was also significantly better than among CS1 students, though because a good many students entered the program at CS2 this improvement cannot be attributed to what happens in the curriculum. This item also showed the greatest difference between seniors and CS1 students on the survey. Still, just less than a quarter of the seniors thought the work of computer scientists is mostly programming.

Group work. While students generally recognized that much work in computing is collaborative, and departments and programs strive to provide opportunities for students to develop collaboration skills, the results we found for the two items in the "group work" theme showed there is room for progress. More than a quarter of the seniors indicated that one can take more pride in individual work, and almost half felt that understanding must be developed alone.

Waite et al.[16] and Leonardi et al.[8] discussed negative student attitudes toward group work, reporting that many students form the misconception that individual work is the essential measure of competence for skilled professionals. Faculty did not show consensus in rejecting item 36 ("It's a lot more satisfying to do an assignment on your own than with help") and item 38 ("When you submit a group project, the instructor can't tell how good your individual work was"), suggesting that faculty, as well as students, need to do some work in this area.

Other items in cluster 1. Items 6, 14, 28, and 56 might have been expected to appear in one of the table's subclusters (perhaps in "concepts and understanding") but did not show response patterns closely related to the items in these clusters. As a group, they showed only middling agreement between seniors and faculty, with agreement by seniors being somewhat greater than by CS1 students. For item 28 ("A significant problem in learning computer science is being able to memorize all the information I need to know") and item 56 ("In the computer science curriculum, if you spend enough time coding you'll get all you need to get from the courses"), seniors agreed with faculty significantly more than CS1 students agreed with faculty.

Less than half of the seniors rejected item 66 ("If you know what you are doing you can leave work to the last minute and still get it done"), confirming a problem identified by Waite et al.[16] and Leonardi et al.[8] that students see procrastination not as a failing but as something positive, a way to demonstrate personal prowess, writing:

"The important point here is that for the informants in this study, waiting until the last minute to begin a project was not a sign of laziness or disinterest in the subject matter. Rather, beginning an assignment late makes successfully completing the task more difficult, and, thus, is a sign of their expertise and mastery of technical skill. In the laboratories on days before large projects were due, informants regularly discussed the status of their projects with one another, comparing how much they had completed. Similarly, on days on which a large project was due, student engineers typically asked one another 'When did you start?' and 'When did you finish?' Higher status was awarded to those who could wait the longest and still complete the project successfully."

Senior attitudes on this matter were hardly better than those of CS1 students and slightly worse than CS2 students; at least they weren't *much* worse.

CS is creative and valuable. Responses to the three items in this subcluster were strongly related. Unfortunately, agreement between seniors and faculty was not strong for any of them. Worse, for two items, 50 ("The work you do in computer science in the real world requires a lot of creativity") and 60 ("Reasoning skills used to understand computer science material can be helpful to me in understanding things in everyday life"), seniors agreed less with faculty than did CS1 students. For item 58 ("Research in computer science often develops really important ideas"), agreement with faculty was somewhat stronger among seniors than among CS1 students but at 66% did not constitute a ringing endorsement.

Only 68% of seniors agreed with faculty that doing things right is more important than just getting a solution, though this response represents a significant improvement over the position of CS1 students.

Related items: Concepts and understanding matter. As mentioned earlier, these items form a larger subcluster together with the subcluster just discussed. There was variation in the number of seniors endorsing the faculty consensus, pointing to the value of concepts and understanding. For two of the apparent bright spots, item 12 ("I am not satisfied until I understand why something works the way it does") and item 64 ("If you can do something you don't need to understand it"), agreement was good but hardly better among the seniors than among CS1 students. Only for item 46 ("If I get stuck on a computer science problem, there is no chance I'll figure it out on my own") was the greater agreement by seniors than by CS1 students statistically significant.

On the negative side, for two of the items in this group the seniors agreed less with faculty than did the CS1 students. For example, seniors were less likely to endorse item 44 ("When I solve a computer science problem, I explicitly think about which computer science ideas apply to the problem") than were the CS1 students. Most seniors (88%) said faculty explicitly endorsed thinking about ideas, but they themselves didn't endorse it. Why didn't they?

Interviews reported by Leonardi et al.[8] may shed light on this misalignment, identifying a "norm" among students that "expertise is measured by task difficulty" among the students aspiring to be engineers, writing:

"The norm suggests that engineers should place value on overcoming challenge and 'beating the odds.' The work practices reflecting this norm artificially and purposefully increased the difficulty of a given task, such as a homework assignment. Taken together, these practices introduced a sense of 'sport' to engineering work by providing handicaps that ultimately decreased an informant's chances of success. Informants perceived that completing a task with a handicap was a mark of an 'expert engineer.' "

Leonardi et al. also suggested that one way students increase the difficulty of assignments (so as to demonstrate their skill to themselves and sometimes to their peers) is to ignore concepts that would actually help with the work.

Other items in cluster 2. Like some of the "other" items in cluster 1, items 26 and 58 in this group might have been expected to appear in one of the subclusters but did not. They show only middling agreement between seniors and faculty, with agreement by seniors greater than by CS1 students. For item 48 ("There are times I solve a computer science problem more than one way to help my understanding"), seniors agreed with faculty significantly more than CS1 students agreed with faculty.

Item 4 ("Nearly everyone is capable of succeeding in the computer science curriculum if they work at it") reflects an interesting situation. Faculty consensus rejects Dweck's view[7] that effort is the key to success, but most seniors do not reject this attitude, only a few more than among CS1 students. For someone agreeing with Dweck, it's good that student views on the value of effort aren't changed much. It's also interesting that seniors wrongly believed faculty endorse Dweck's position, with 88% of seniors indicating that faculty would want them to agree with the item.

The data further suggests that item 4 was not very strongly related to any of the other items in the survey. Despite falling in cluster 2 in the hierarchical-clustering results, it is the item in that cluster that is least closely related to the other items.

Top-level clusters. The hierarchical cluster analysis revealed two clear categories in the data, and a review of the items in each cluster showed them to be meaningful groupings. The groups suggest that students conceptualize CS in two distinct ways: The first is "CS as accomplishment," in which the emphasis is on outcomes and what it takes to reach them, including skill, technical expertise, programming knowledge, and resources (books, peers, teachers). The second is "CS as intellectual discipline," in which the emphasis is on how CS offers a way to approach and understand the world, including how to reason, gain understanding and deep learning, appreciate the importance of creativity, and dwell on problems to be able to explore them fully. This intellectual-discipline view is very much the perspective on the field emphasized by Wing[17] in her work on computational thinking.

Faculty must consider ways to move students toward the idea that "The work you do in computer science in the real world requires a lot of creativity," rather than away from it.

The fact that these two clusters emerged from the data is important. Interestingly, earlier research discussed a similar contrast between accomplishment and creativity in engineering.[3,14,10] It is possible that the two perspectives—CS as accomplishment and CS as intellectual discipline—could be in tension with one another. How might they be reconciled or otherwise aligned?

We can revisit some of the data reviewed earlier and consider how it reflects on these perspectives. Seniors were in conflict with faculty on two items in cluster 1, and the responses from CS1 and CS2 students were similar. First, seniors believed that waiting until the last minute is acceptable if you have the know-how (item 66). Second, they believed that getting the desired result is more important than how you get there (item 20). These results directly confirm the findings of earlier research,[8,15,16] highlighting the emphasis on accomplishment at the expense of other considerations that might be important to faculty or to effective learning.

In cluster 2 there was conflict with faculty on item 44 ("When I solve a computer science problem, I explicitly think about which computer science ideas apply to the problem"). Faculty and CS1 students agreed that they intentionally reflect on which CS ideas apply to the problem they are trying to solve. Less than half of seniors claimed to do so. This, too, supports the view of CS as competence, where skill is the application of knowledge, rather than a type of reasoning or discipline. This item (44) was the one with the greatest difference between CS1 students and seniors, in the negative direction.

The only other conflicting item is potentially troubling if we are concerned with access to the CS major. Faculty did not endorse the statement that anyone could succeed at CS if they worked at it (item 4); students in all groups consistently disagreed with faculty on this.

Looking at differences between seniors and CS1 students with respect to their agreement with faculty, with the exception of item 54, on the importance of reading, all items for which seniors agreed less with faculty than CS1 students were in cluster 2. Compared to CS1 students, fewer seniors believed "real-world" CS requires creativity (item 50); fewer believed that either the reasoning skills of CS (item 60) or its theoretical concepts (item 22) were relevant to everyday life, and (as we discussed), fewer still were intentionally reflective when solving CS problems (item 44).

Overall, the average agreement between seniors and faculty was 67% for cluster 1 and 63% for cluster 2, not very different. But the average increase in agreement with faculty, comparing seniors with CS1 students, was 16 percentage points for cluster 1 and only one percentage point for cluster 2. The results suggest the curriculum falls significantly short in helping students develop the perspective that CS is an intellectual discipline.

Conclusion

The survey results and analysis suggest a number of challenges to the curriculum in which the students and faculty participated. Using one item (50) as an illustration, faculty must consider ways to move students toward the idea that "The work you do in computer science in the real world requires a lot of creativity," rather than away from it. A next step could be collecting longitudinal data from the same students as they move through the curriculum. Collecting data in key courses at the beginning and end of a semester would also be useful in separating the effects of selection from the effects of courses themselves and in zeroing in on the effectiveness of courses intended to promote particular attitudes and beliefs.

Besides being important learning targets in themselves, the attitudes and beliefs explored here may also be important in other ways. Studies in university physics education show that student attitudes and beliefs relate to performance on content assessments.[1,13] Studies in physics education also show direct evidence of selection, rather than a change in attitude, as more advanced students are compared with beginners. This selection effect raises the possibility that understanding student attitudes and beliefs could be important in terms of retention and understanding why some groups are less well represented than others in CS programs. Although we did not collect data on gender, it is possible that attitudes and trends differ for male and female students, and that understanding them could help address underrepresentation of women in CS.

Development of attitudes and beliefs as learning goals is a key part of the process by which college education socializes students into their professions.[4,11,12,18] Waite et al.[15,16] presented curricular and pedagogical innovations pointing in the right direction on a number of issues (such as increasing student involvement during class and creating team-based assignments that require genuine collaboration rather than a "hands off" approach). For example, reducing the weight placed by faculty on assignment grades and encouraging collaboration can improve student attitudes toward assignments.[15] Such innovation could make a big difference if adopted and reinforced throughout a curriculum. What kind of force is needed to make it happen?

"Curiosity" is one possible answer. If you are a CS faculty member, how would your students respond to the survey? Its results came from just one department, likely not yours. You might think your students would never deliberately make their work more difficult or that they are all aware of the value of CS research. But are you sure?

Curiosity is very important in fueling improvements in physics education, as faculty found their students did not respond as they would have wished on evaluation instruments shared across institutions (see, for example, Crouch and Mazur[6]). Data on this problem provided the foundation for efforts that produced measurable improvements. Can CS faculty achieve the same results?

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Clayton Lewis (clayton.lewis@colorado.edu) is a professor in the Department of Computer Science at the University of Colorado at Boulder.

Michele H. Jackson (michele.jackson@colorado.edu) is an associate professor in the Department of Communication at the University of Colorado at Boulder.

William M. Waite (william.waite@colorado.edu) is a professor emeritus in the Department of Electrical, Computer, and Energy Engineering at the University of Colorado at Boulder.

Educational Master Plan

Information Submission Form

1) Title: Technologies Corning to Your School Soon

2) Author: DIANE J. SKIBA

3) Source: Nursing Education Perspectives (March / A p r i l 2OIO VoI. N o . 2)

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- ☐ Society
- ☐ Technology
- ☐ Economy
- ☐ Environment
- ☐ Politics and Legal Issues
- ☑ Education
- ☐ Other: ______

5) Relevance: Teaching with Technology/Emerging Technology

6) Page / Section: 114-115

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On the Horizon: *Technologies Coming to Your School Soon*

DIANE J. SKIBA

EVERY YEAR, the New Media Consortium, a not-for-profit organization committed to the examination of the impact of new and emerging technologies on learning, research, and creative inquiry, collaborates with the Educause Learning Initiative to provide a comprehensive review of emerging technologies. An international advisory board spends a year examining the literature, reading research reports, and interviewing people across a variety of industries to ultimately create a list of emerging technologies that will impact teaching, learning, and research. The result of this work is the annual *Horizon Report,* online at www.nmc.org/publications.

So, what are the trends and critical issues facing the academy in 2010? Four trends were identified:

- The abundance of resources and relationships induced by open resources and social networks is increasingly challenging us to revisit our roles as educators in "sense-making," coaching, and credentialing.
- More and more, people expect to be able to work, learn, study, and connect with their social networks, whenever and wherever they desire.
- Technologies are becoming more decentralized.
- Students are increasingly seen as collaborators, and there is more cross-campus collaboration.

The first trend is based on the increasing amount of open-access resources available on the web and the growing number of learning opportunities that are accessible from a variety of sources. Institutions of higher education are not the only places to obtain knowledge and gain skills necessary to work in our society. For example, persons interested in computer programming can seek out open-access courses offered by Stanford University or MIT and learn new skills that will make them eligible for meaningful employment. They can then sit for certification offered by software companies such as Microsoft and Oracle — all without the benefit of a college degree.

With the high tuition charged by colleges and universities, this approach may be a good alternative for many, and a trend that forces higher education to examine its role in mentoring and preparing students. The growing use of social networks, and the wisdom of crowds, have also become a pain point for higher education. As students call upon their networks for knowledge and answers to questions, what is the role of the instructor? Does the academy still maintain the coach and mentor role in this new world of social networks?

The second trend points to two major influences in everyone's lives: mobile phones and social networking. Most of our students want immediate access to information, especially since they are juggling numerous competing demands, such as work, school, and family. "A faster approach is often perceived as a better approach, and as such people want easy and timely access not only to the information on the network, but to their social networks that can help them to interpret it and maximize its value" (Johnson, Levine, Smith, & Stone, 2010, p. 4).

As noted in the third trend, technologies are no longer tethered to specific devices or services. The use of cloud computing and browser-based software is making information accessible from any device, anytime and anywhere.

The fourth and final trend is the least pervasive in higher education, but it is gaining popularity. Some schools are already promoting a collaborative culture where students and faculty can interact with each other across departments to learn, study, and even conduct research.

Given these trends, critical challenges have been identified:

- *The role of the academy — and the way we prepare students for their future lives — is changing.* It is important for the academy to adapt teaching practices to meet the needs of students to learn critical inquiry, attain mental flexibility, solve large-scale complex problems, and, through civic engagement, examine social issues (Johnson et al., 2010).
- *New scholarly forms of authoring, publishing, and researching continue to emerge, but appropriate metrics for evaluating them increasingly lag behind or fail to appear.* Think about your own college. Do your appointments, tenure, and promotion committees consider blogging a form of scholarship? Is creating a YouTube video considered a scholarly dissemination mechanism, equivalent to publishing a journal article? Is developing a wiki with evidence to support a particular nursing intervention a type of research?
- *Digital media literacy continues to rise in importance as a key 21st-century skill, but there is a widening training gap for faculty.* As more and more tools are accessible, faculty get lost in the technology and forget that "digital literacy must necessarily be less about tools and more about ways of thinking and seeing, and of crafting narrative" (Johnson et al., 2010, p. 5).
- *As a result of shrinking budgets, institutions increasingly focus more narrowly on key goals.* We all know this reality: more students, fewer resources, but greater demand for innovation.

Given this context and the possible impact of these factors, let's examine the emerging technologies projected in the *Horizon Report* for 2010. These technologies are presented within an adoption framework that identifies the likelihood of their impact on learning, teaching, and research within the academy. The adoption framework is presented in three horizons: the near term (within 12 months), the midterm (two to three years), and the far term (four to five years). The advisory committee identified six technologies, two for each of the adoption horizons: *near term,* mobile computing and open content; *midterm,* e-books and simple, augmented reality; and *far term,* gesture-based computing and visual data analysis. Here we will focus on emerging technologies for the near term.

The Next 12 Months MOBILE COMPUTING With over a billion phones sold per year, it is not surprising that students want access to information and knowledge anytime and anywhere. But mobile computing extends beyond the use of PDAs for accessing information in the classroom and in clinicals. It is interactive, participatory, and full of multimedia. Mobile computing particularly highlights the increasing use of smart phones with audio and video capacity.

Here are a few examples of health-care-related applications that students are using from their mobile devices. Just think, years ago, you would have needed a mainframe computer to run these applications.

- *Harvard Medical School* developed an iPhone application about the H1N1 virus. Students can access outbreak maps, a checklist of symptoms, information on how to avoid the flu, and how to treat the illness.
- *University of Louisville School of Medicine* uses smart phones to fill in prescriptions and check on drug references (www.allbusiness.com/health-care/health-care-professionals-physicians-surgeons/13161277-1.html)
- *University of Alabama's* Computer-Based Honors Program students are developing an iPhone or iPod Touch application to send blood sugar reminders to patients and to provide resources for diabetic patients to manage their disease. This development is tied to a research project comparing standard diabetes management practices with self-management practices supported by mobile technologies.
- *Purdue University* developed an application for mobile devices called Hotseat that allows students to participate in discussions, ask questions, and respond to teacher questions through various social networking tools, such as Facebook and Twitter (http://purdue.edu/hotseat).

OPEN CONTENT As noted in the *Horizon Report*, "At its core, the notion of open content is to take advantage of the Internet as a global dissemination platform for collective knowledge and wisdom, and to design learning experiences that maximize the use of it" (Johnson et al., 2010, p. 13). MIT's Open Courseware Project started many years ago and was the trailblazer for the open content movement. Like MIT, other universities, including Tufts and Stanford, consider it a "social responsibility" to provide open access to the community. More and more courses, even textbooks offered by the publisher Flat World Knowledge, are readily available. Some programs use Creative Commons as a means to offer free licensing of their materials.

In the *Chronicle of Higher Education*, Young (2010) describes how students have two professors: one official and one virtual. The official professor is the instructor at the college where students pay for classes. The virtual professor is usually encountered on the web through free video lectures or open content resources. Young tells of a returning nursing student who found free online video lectures from another school that were easier to understand than those of her current official instructor.

Think about this in your own classes. Would open content be a threat to you and/or a real advantage for your students? As noted in the report, the trend has profound implications in terms of intellectual property and student-to-faculty relationships. Here are a few examples of open content.

- Stanford University has a wealth of videos and podcasts available on a multitude of topics. Some are lectures, some are presentations by guest speakers, and some are highlights of students' projects. You can subscribe to Stanford's service and be updated on topics of interest. I use their Human Computer Interaction Guest Lecture Series in one of my courses. Visit www.youtube.com/user/StanfordUniversity.
- Johns Hopkins School of Public Health offers a variety of courses for public access. Visit http://ocw.jhsph.edu/ to learn about adolescent health, aging, infectious diseases, mental health, glocal health, and genetics.
- Carnegie Mellon University's Open Learning Initiative provides both instructor-led and self-paced learning opportunities with student assessments and intelligent tutoring capacity. Instructors from other schools are encouraged to use the materials, available at http://oli.web.cmu.edu/openlearning.

Question to Ask Yourself Where are you, your school of nursing, and your university in terms of mobile computing and open content? I hope that, with your colleagues, you will examine these questions. Remember, the adoption time frame for these emerging technologies is very short.

- Does my school or college have the necessary infrastructure to support mobile computing in the classroom?
- Can my e-learning platform be made accessible from a mobile platform?
- How can I facilitate learning though the use of mobile computing?
- Do my students have smart phones and are they interested in using them for learning?
- Do my students now use open content from other schools, instructors, or organizations? What are they using and why?
- Do faculty in my college or school use open content to supplement their courses? Is there content that might be useful for students in my school?
- Are there any reasons for having an academic policy about open content or mobile computing? Does one already exist on my campus?
- If a faculty member develops open content to share, can these materials be used for promotion and tenure? Are they considered scholarly works? Who owns my content, me or the school?

All of these questions are important to consider. If you have any good suggestions that you want to share with others, send me an email at Diane.Skiba@ucdenver.edu. NLN

References

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Young, J. (2010, March 10). Students find free online lectures better than what they're paying for. *Chronicle of Higher Education*. Retrieved from http://chronicle.com/article/Students-Find-Free-Online-L/48776