

## **Two Challenges Faced by Teaching Oriented Computing Faculty**

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This white paper focuses on some of the challenges faced primarily by faculty teaching computing fields at schools with high teaching loads. Although the large research schools graduate a large number of computer science majors, the computer science graduates from non-PhD granting programs out number them by a two to one margin.

(See <http://www.cra.org/info/education/us/index.html> and <http://www.cra.org/info/taulbee/bachelors>)

### **Two of my biggest challenges preparing undergraduates for computing careers:**

1. The expanding range of subfields in computing makes it difficult to have a cohesive and logical curriculum in four years. This also makes it very difficult for faculty to maintain a level of expertise in such a wide ranging curriculum particularly at primarily teaching schools where the teaching load is 3 or more courses per term.
2. Increasing the number of incoming computing majors.

### **What might the community do to address the challenges above:**

1. A possible approach is for schools to become more of a center for computing learning where partnerships are formed with industry experts who will teach a course/year in their respective specialties. The full-time faculty members would focus on the lower level core courses and a much less frequent upper division special topic offering.
2. A directed PR campaign aimed at the 1<sup>st</sup>-12<sup>th</sup> grades to increase the interests in the field.

### **What might an ideal undergraduate model for computing education look like in five years?**

1. The curriculum could model a traditional Arts and Sciences college requirement where there is a set of core computing courses (conceptually along the lines of the CSI-II, Data Structures, senior Capstone, etc.) which all students must take. These would be taught primarily by the schools tenure track faculty. Additionally, there would be a set of advanced special topics courses taught by the industry experts. This would require a large number of industry experts who will commit to teaching a course once a year or every other year.
2. A much larger number of computing majors.

**What inhibitors might prevent the nation from achieving goals it sets for computing education? Any strategies that may enable the transformation of undergraduate computing education in the US?**

1. In order to attempt the change in the traditional teaching structure at such schools would require a shift in the salary payment structure of a school. A proposal is to reduce the permanent faculty positions (through retirement and attrition). When an opening occurs use the funding for these “expert partners” to cover the needed courses. Most significantly would be the “adjunct” salary increase which at most schools presently is not realistic in attracting an industry expert.
2. A large inhibitor is lack of mathematical/logical preparation in k-12. A student cannot develop a desire for such fields without an understanding and appreciation of the basics in the field.

**What stakeholders should be involved in designing strategies to catalyze the transformation?**

1. The largest cost will be incurred during the initial restructuring period. Certainly present computing faculty need to buy in along with school administrations. Additionally, the industry that will provide the expert partners will need to be supporters of the plan.
2. The mathematics and computing teachers in 7<sup>th</sup>-12<sup>th</sup> grades along with all K-6 teachers.

**What is the role of government in this process? Professional societies? Universities and faculty? Others?**

1. Government and industry should support the initial efforts through funding sources to establish and promote the new structure. Professional societies need to provide forums to disseminate the effort plans and results. Universities and faculty need to do the leg work in implementing the restructuring.
2. Get more non-math phobic K-6 teachers. Efforts by the Conference Board of the Mathematical Sciences and National Council of Teachers of Mathematics need further expansion and support.  
(see <http://www.math.umd.edu/~dac/650/kalsipaper.html>)