

# **Creating a *Disciplinary Commons* in Computer Science Education:**

## **Final Project Report**

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## **Executive Summary**

The *Disciplinary Commons* project had two primary objectives: 1) to *document* and *share* knowledge about student success in learning on courses in Computer Science (CS) in two- and four-year institutions in Washington state, providing the basis for meaningful articulation between regional institutions, and 2) to improve the quality of teaching – and hence learning – in CS within Washington state by establishing practices for the scholarship of teaching by making it *public*, *peer-reviewed*, and amenable for *future use and development* by other CS educators. The mechanism for achieving these goals was through a series of monthly meetings involving ten Computer Science faculty in the Puget Sound region focused on the teaching and learning within their classrooms, with each person documenting their teaching in a *course portfolio*. Surveyed on completing the project, all participants agreed that the *Disciplinary Commons* was a good use of their time, that they would recommend a similar experience to a colleague, and that they connected to a network of people in the region who are interested in teaching. Further, participants discussed the value of the *Disciplinary Commons* in providing the time and structure to systematically reflect upon their teaching, to exchange concrete ideas for teaching their courses with other CS educators in the discipline, to learn skills that apply directly to course and program evaluation, and to meet colleagues at other two-year and four-year institutions so as to better help their students with the transition between institutions.

## **Project Description**

Formal articulation agreements between 2-year colleges and 4-year universities are commonplace, and yet have proved insufficient to ensure the smooth transition for students from one institution to the next. Not only do these agreements lack explicit documentation of course content, goals, and methods, they also lack explicit objectives for student learning and mechanisms for evaluating whether students have met these objectives. A different means is required for documenting and sharing knowledge across institution.

The *Disciplinary Commons*, supported by funds from the State Board of Community and Technical Colleges, the Founder's Endowment Fund of the University of Washington, Tacoma (UWT) and UWT's Institute of Technology, had two primary objectives.

- The first is to *document* and *share* knowledge about student learning on courses in Computer Science (CS) in two- and four-year institutions in Washington state, providing the basis for meaningful articulation between regional institutions.
- The second is to improve the quality of teaching in CS within Washington state by establishing practices for the scholarship of teaching by making it *public*, *peer-reviewed*, and amenable for *future use and development* by other CS educators.

The *Disciplinary Commons* was structured around a series of monthly meetings involving ten Computer Science faculty in the Puget Sound region focused on the teaching and learning within their classrooms. Each participant completed a *course portfolio* in monthly increments on a course that they were teaching during the academic year. Seven of the ten participants chose to focus on the introductory course in computer programming. Participants were drawn from community/technical colleges and baccalaureate degree granting universities in the Puget Sound region, and are listed in Appendix A along with institutional affiliation. The principal investigator (and author of this document) acted as project leader and the facilitator of each monthly meeting. The initial meeting was a full-day meeting in September 2005, at the Institute of Technology. At this meeting, participants were introduced to the course portfolio model, to the objectives and structure of the project as a whole, and to key skills for beginning their portfolio work. Participants then met one afternoon per month over the 2005-6 academic year (at locations that rotated among each of the participant's home institutions), learning additional skills of classroom assessment and peer review, and critically evaluating one another's course portfolio work-in-progress. In addition, participants did peer observations in one another's classrooms during the academic year to provide additional feedback to enhance teaching and learning effectiveness. For the penultimate meeting in early May, participants presented their work at a session of the Pacific Northwest Higher Education Teaching and Learning Conference, sponsored by the State Board of Community and Technical Colleges. The project website can be accessed at <http://depts.washington.edu/comgrnd/>.

Although regional in nature, the *Disciplinary Commons* was linked with a *Disciplinary Commons* project in the UK with similar goals and structure, led by Sally Fincher of the University of Kent at Canterbury. This enabled mutual critiques of complete portfolios across the continents by participants in both of the *Disciplinary Commons*, as well as collaborations between the workshop leaders for purposes of planning and evaluation.

The course portfolio, well known as a method for advancing teaching practice and improving student learning (Hutchings, 1998), is a set of documents that "focuses on the unfolding of a single course, from conception to results" (op cit, p.13). The purpose of the course portfolio "is in revealing how teaching practice and student performance are connected with each other" (Bernstein, 1998, p77). Table 1 outlines the portfolio increment completed prior to and discussed at each monthly meeting, which also served as the focal topic of that meeting.

As can be seen, the course portfolios created by project participants include a course's learning objectives, its contents and structure, a rationale for how this course design meets its objectives, the course's role in a larger degree program, and the institutional context in which the course is offered. Importantly, the portfolio also includes evaluations of student work throughout the term, indicating the extent to which students are meeting course objectives, as well as implications for future offerings of the same or similar courses. Each participant in the project constructed a course portfolio for a course that they teach that is on the path for a baccalaureate degree in a computer science-related program. Completed portfolios for each participant have been made publicly available on the Internet at <http://depts.washington.edu/comgrnd/portfolios/portfolios.html>.

**Table 1: Portfolio Increments and Monthly Topics**

September	Course Objectives
October	Institutional and Curricular Context
November	Course Content & Structure
December	Teaching Methods
January	Rationale / Teaching Philosophy
February	Evidence of Student Learning
March	Grading
April	Self- and Peer-Observation
May	Conference Presentation & External Review
June	Complete Portfolio Presentations

## Outcomes

Outcomes were evaluated in two primary ways. One was through a set of constrained-answer post-project survey questions that each participant anonymously completed. Participants also provided explicit statements of lessons learned and project outcomes within their portfolios and on open-ended questions on the post-project survey. All participants indicated that the Disciplinary Commons was a good use of their time, that they would participate in another Disciplinary Commons, that they would recommend a similar experience to a colleague, and that they connected to a network of people in the region who are interested in teaching. Eight of ten participants shared parts of their portfolio with someone not participating in the Commons project, nine of ten were able to get insight into teaching issues that they face, and all thought that they were likely to contact participants in the Commons project in the future about teaching-related questions.

Participants made specific comment on a number of benefits from participation, from which the following quoted text is drawn. One concerned the opportunity “to reflect on what you are doing,” to “focus on the big picture” concerning how the course fits into larger curricular and program goals. Another stated “The value of reflection is immeasurable.” A third participant stated that this reflection allowed you to “know why you do things the way you do them!”

There were comments on receiving validation for what participants already did well: “It was good to see that many of my instincts about teaching were sound and that all my hard work in preparing the materials and assessment tools for this course was well placed. Participation in this portfolio project made me feel valued for my hard work and expertise.”

Other comments discussed how participants developed skills in course assessment, i.e. “How to perform a basic test on the effectiveness of an element of my teaching”. The project thus allowed participants to sometimes “realize that some of your practices do not directly relate to course objectives – a reality check!” And for some, it demonstrated “How to look more critically at what is actually happening in my classes.”

Many participants spoke about specific changes that they would make to their course the next time that it was offered. One stated: “partition the lesson plans so that it’s not all didactic lecture. Intermix some lab work, a break or two, engage students … In effect, more stringent partitioning of the material into ‘units’ that can be sequenced along with labs to ensure better delivery, and better use of time.” Another commented “I want to have more peer assessment built into the team projects I assign. I want to continue to find ways to make the classroom experience interactive.” A third stated “An analysis of the final lab assignment suggests … that students often have difficulty with *flow of control*. … Possible solutions include either doing more imperative-type programming in the course or perhaps giving more practice exercises focusing on flow of control.” And another stated that he would “Rework the homework grading sheet criteria to provide more detail.”

An unexpected outcome resulted for all faculty teaching at 4-year institutions in interacting with colleagues from community colleges. One participant captured this succinctly: “Probably the most important thing I learned from participating in the Commons project was an appreciation for the local community colleges. Before they were really just an abstraction and now I have visited several CC campuses, attended a CC class and know how fabulous the faculty are.”

Several spoke of the value of working closely with peers to improve teaching, that the project helped them to “find new ways to enhance the course’s effectiveness from peer insights” and “through our sharing we have learned a lot about where to set the bar on quality.” Another stated “I was surprised to realize how private the process of teaching can become . . . by making it more public and more available to scrutiny I am more accountable for the quality.” One stated “one significant result has been the increased rapport with the other members of the Disciplinary Commons. As we each worked our own Course Portfolio, we were editing and revising based on input from others who taught the same courses. Collectively our insight to the process of teaching the material, and to the students we teach grew. . . . as Lee Shulman says, we have begun to put an end to our pedagogical solitude.” And finally “I think we have achieved what many teams envy: that magical balance of collaboration and critique, competition and cooperation, individuality and respect, work and fun.”

## Conclusion

The *Disciplinary Commons* was developed to meet two primary objectives: to provide a mechanism to document and share the teaching and learning that occurs within the computer science classroom in 2- and 4-year colleges and universities within the Puget Sound region of Washington state, and to improve student learning by making teaching scholarly, i.e. public, peer reviewed, and amenable for future adaptation and use. The mechanism involved monthly meetings of ten CS faculty from regional community colleges and universities focused on the incremental, mutual creation and critique of course portfolios drawn from the classrooms and courses of the participants. Measurable outcomes indicate that the first objective was met, and while it is too early to tell the effect that this has had on student learning, the outcomes indicate that there has been a positive effect on the participants’ teaching. It is hoped that this project will be the first of several having similar goals and structure.

## References

- D. Bernstein, “Putting the Focus on Student Learning”, from *The Course Portfolio*, P. Hutchings (ed.), American Association for Higher Education, 1998.
- P. Hutchings, “Defining Features and Significant Functions of the Course Portfolio”, from *The Course Portfolio*, P. Hutchings (ed.), American Association for Higher Education, 1998.

## **Appendix A: *Disciplinary Commons* participants**

Josh Tenenberg (project leader)	University of Washington, Tacoma
Janet Ash	Green River Community College
Donald Chinn	University of Washington, Tacoma
Ravi Gandham	Bellevue Community College
Michael Gelotte	Bellevue Community College
Richard Hoagland	South Puget Sound Community College
Laurie Murphy	Pacific Lutheran University
Brad Richards	University of Puget Sound
John Staneff	Pierce College Fort Steilacoom
Phyllis Topham	Shoreline Community College
Jeffrey Weiss	Pierce College Puyallup